Expert and Government Review Comments on the IPCC WGIII AR5 Second Order Draft – Summary for Policymakers

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30397	SPM					Figure is not clear or legible	Accepted. The key insights of the figure has been provided in a much simplified new figure.
19971	SPM					Figure 3 a-b. I would include all GHG emissions here. This information is available in the literature. The inclusion of non-CO2 gases and LULUCF sources makes a major difference in the outcome. There is no analytical basis to exclude any gases or sources, incl. LULUCF. Please check, and present the numbers including all sources and gases	Rejected. After consultation across WGs it was decided not to use information on other GHGs. They cannot be aggregated using CO2eq metric over such long time horizons. Moreover, available dataset does not provide the same level of consistency as the other ones used.
19972	SPM					The results would be much more policy relevant If the results would be presented for all GHG emissisons. In this way also reductions for all GHG emissions compared to 2010 levels could be presented for different years (2030, 2050)	Accepted. Revised version includes all GHGs.
19973	SPM					Very nice figure! Please explain if CO2 emissions include land-use. I would start in 2005 for all three figures. I would also include a figure of all GHG emissions, at least for the upper figure. This could be included upper right. Please reword optimal policy response. Please use one terminology for the cost-effective pathways. Now in the text it is mentioned as cost-effective and in figure cost-optimal. Please improve the last sentence of the legend, as not clear.	Accepted. Revised, simplified version includes all GHGs.
19974	SPM					Does the upper figure presents the full range? Could you be more precise on how many scenarios do underly the delayed pwathways. I would also indicate in Table 6.2 and Figure 6.7 the number of scenarios underlying these delayed and optimal pathways.	Accepted. We have simplified and revised the figure and clarified the ranges. Delay scenarios no longer shown. We have a dedicated figure for that in the revised draft.
19975	SPM					The pledges are introduced very briefly in CHapter 6, and definitly needs more text to explain. For example, what is the reason for the range of outcomes, is this due to the comibination of assumptions around conditionality of the pledges, accounting rules for double counting, surplus emission units or land use credits (as in most of the pledges studies, and in the UNEP gap reports), or is it because of the different models. The range is normally as high as the BAU emission levels, so this range presented here seems rather low. The range is norrmally also presented for all GHG emissions. This is extensively explained in Chapter 13. I would make more cross references to Chapter 13. The numbers presented here on the emission levels resulting from the pledges, also needs to be consistent with the numbers presented in Chapter 13. In Chapter 13 it is based on many model studies published in journals (like Nature), and also in a series of UNEP gap reports, whereas here, the authors refer to a AMPERE protocol. For many readers it is unclear how these emissions range from the pledges are being calculated, except for the persons involved in the AMPERE project. I would recommend the authors present a range (preferable based on CO2-equivalent emissions) using the Chapter 13 information, as this Chapter extensively described these pledges, and also present the very detailed studies underlying these ranges.	Noted. Figure removed.
20090	SPM					The information according to which India will suffer the most is highly visible in this figure, and should be detailed : are there modal bias, or it this explained by some specificity ? (energy mix, etc)	Noted. Figure removed.
25828	SPM					Several abbreviations are not defined in the SPM (e.g. CCS on p.16 l.19; RE on p.17 l. 5; IT on p.18 l.1; ETS, FCCC, MRV in figure SPM.14 p. 23)	Accepted - abbreviations spelled out with first mentioning.
26065	SPM					Please explain the LowEl scenario. Please explain what the number stands for, is it the increase compared to the deafault, so that for example the LowEl scenario is approximately 50 % higher, or is it the normalised value, so that the LowEl scenario is approximately 50 % lower?	Noted. Figure removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29285	SPM					Power technologies in developing countries need to address climate change together with their challenge of providing their population with access to modern form of energy. Without dedicated policies, despite progress estimated by the New Policies Scenario (IEA 2011), in 2030 still 1 billion people will lack electricity and 2.7 billion people will still depend on traditional uses of biomass for cooking and heating. Still this scenario would have spent $275 billion in electricity access to decrease the share of people without electricity from 19% in 2009 to 12% in 2030, and $21 billion for the deployment of improved cook stoves, so the proportion of people without clean cooking declines from 39% to 33% in the same period. Compared to the New Policies Scenario, the Energy for All Scenario would require an additional investment of $640 billion in electricity access and $74 billion for cooking facilities, achieving universal access to both electricity and clean cooking in 2030.	Noted. In the Technical Summary we added a dedicated finding on this matter.
32593	SPM					This is a very helpful table but its value could be enhanced with some further development. Notably, the title "Removing barriers" is really a subset of the wider issues and tools that can help to help economies approach the 'best practice frontier' (including varied policies to enhance energy efficiency, including 'nudge' type instruments). Similarly, 'promoting long term investments' may not adequately convey that this covers the full panoply of skills development, urban development and other infrastructure, the wide range of innovation-related policies, etc, which all define broadly how the 'best practice frontier' - or option sets - may evolve in higher or lower carbon directions. See my comments on SPM text and Chapter 15.	Taken into account - table removed.
22930	SPM					In SPM, several targets/goals are mentioned, e.g. the 1.5 and 2 degree targets (p. 9, l. 33), 450 CO2 eq in 2100 (page p.9, l. 28), and 450 ppm or 550 ppm goals (p. 15, l. 8) . According to Table 6.1, if the target is 450 ppm stabilization, scenarios in Category 1 should be explored. If the target is 450 ppm in 2100 or 2 degree C above pre-industrial in 2100, scenarios in Category 2 and 3 meet the target. The required emissions reductions are quite different between scenarios in Category 1, 2 and 3. According to Table 6.2, the emissions target is 44% (medium) compared to 2005 in 2050 in Category 1, whereas that of Category 3 is 88%. SPM clearly mentions that "This SPM puts an emphasis on scenarios in the neighborhood of 1.5 and 2 degree targets". This sentence gives an impression that AR5 explores mitigation efforts to meet 1.5 and 2 degree targets. I am afraid that Category 3 scenarios cannot achive the stabilization targets of 1.5 or 2 degree C in the long run. Several targets are mentioned in SPM, so it is very difficult to follow the logic. I recommend to take more care of the consistency.	Taken into account - we have added table SPM.1 clarifying the relationship between emission budgets, forcing and temperature change consistent with the WG1 assessment. We have deleted the setence the reviewer refers to and provide a broader focus in our discussion of scenarios in the new draft.
21530	SPM					It could be informative to add certain prices for fossil fuel power generation, at certain levels of fossil fuel prices	Taken into account - the comment is obsolete as Figure 12 has been deleted due to space constraints.
24398	SPM					General observation: The SPM does a good job of covering energy efficiency in buildings but not demand response. More broadly, the SPM recognizes that decarbonizing the electric sector is the most important goal. However, it provides little description of the carbon-free electricity alternatives and even less on the challenge of integrating variable, carbon-free electricity sources into the electric grid from both supply- and demand-side standpoints. Surprisingly, the word "utility" does not appear anywhere in the SPM. In reviewing Chapter 7, I found that many of my concerns were addressed there. It's not clear to what extent the Chapter 7 authors have reviewed the SPM.	Accepted, more detailed information on the role of energy demand reduction has been included. In addition, the challenge of integrating RE into existing energy systems has been noted.
24391	SPM					The figure does not reflect the recent, large drop in the price of crystalline silicon PV installations. Also, regarding geothermal power, binary cycle and flash steam are shown, but these resources are very limited. EGS, or enhanced geothermal systems, (hot dry rock) has enormous resource potential, but, of course, this technology is not yet developed and it is difficult to estimate costs. But I think it should be included, because of the very large potential for base load electricity.	Taken into account - the comment is obsolete as Figure 12 has been deleted due to space constraints.

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24019	SPM					SPM. Comment: Would it be possible to add an overall conclusion to this SPM?	Rejected - the SPM already is a summary highlighting the main findings from a 2000 page report..
27278	SPM					Figure SPM.1 represents change in global anthropogenic GHG emissions by major economic regions. Economic regions represented in the figure relate to G-20 membership, which is inadequade, since it does not correspond to a relevant grouping in the context of climate change, as it is based solely on economic factors. It is noted that the text following the table adequately presents trends based on groupings that are traditionally used in the international climate change context (Kyoto Protocol Annex B and non-Annex B Parties). Social development figures must also be used as basis for comparison in the consideration of trends by the IPCC.	Accepted. We have converted to a grouping that is more frequently used in the scientific literature provided by the World Bank. In general, the choice of classification is driven by the question under consideration.
34036	SPM					What do the different shades of blue in the bars represent? A key would be useful.	Noted. Figure removed.
25536	SPM					The caption of this figure can be significantly improved or the figure simplified. Currently, it is very hard to understand what is shown in the figure (in particular what is included in the "total contributions to forcing").	Noted. Figure removed.
32690	SPM					Consistent with IPCC Guidance Note on the Consistent Treatment of Uncertainties, each statement in bold in the SPM should be qualified in terms of the two components to the IPCC confidence metrics: “evidence” and “agreement”. Currently, there are a variety of unsatisfactory approaches: some of these statements that have no qualification, others only one, others two.	Rejected - where appropriate, findings are also formulated as "statements of fact" without using uncertainty qualifiers. This is consistent with the IPCC guidance note you refer to.
32691	SPM					Given the emphasis put in this SMP on consumption-based GHG emission approaches, there is a need to present in the SPM these approaches and compare them to production-based GHG emissions approaches for both developed and developing countries (cf. 4.4.2 Consumption patterns and carbon accounting)	Taken into account. We do not put an "emphasis" on consumption-based emissions. There is only a single finding and one figure on this in the new version reflecting the growth in the literature in this field. Different country groups are covered in these in section SPM.2.
19719	SPM					The summary does not consider any scenarios of inability of mitigation measures to stabilize the climate. Forced but highly effective measures of SRM geo-engineering are not even mentioned. Energetic potential of CDR methods or negative CO2 emissions is not analyzed. It should be mentioned that such potential is too low to provide stabilization of the CO2 concentration (Lenton T.M. and Vaughan N.E., 2009. The radiative forcing potential of different climate geoengineering options. Atmos. Chem. Phys. Discuss., vol. 9, pp. 2559-2608).	Taken into account. We mention scenario configuration for which a given concentration level in 2100 can no longer be achieved in the new version of SPM3.1. SRM geo-engineering is not a component of the intregrated models in the literature. However, we have added three findings on geoengineering to the Technical Summary.
30085	SPM					The table is unclear, incomprehensive (lacking policy instrument types) and may be critisised from several perspectives. I would suggest to provide a more classical division of policies in terms of administrative, economic and informative. Questions raised in reviewing the figure are many, such as why is a price signal suitable (only?) in the entire economy. What about sector approaches? What does suitable mean? That what is not included here is less suitable or not suitable at all? Etc etc.	Taken into account - table removed.

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30176	SPM					The policy document of AR5 could benefit from the (Figure 1. P. 22027). In - Moser, S. C., & Ekstrom, J. A. (2010). A framework to diagnose barriers to climate change adaptation. Proceedings of the National Academy of Sciences, 107(51), 22026-22031.	Noted. It is the task of IPCC Working Group 2 to deal with adaptation. It does not seem appropriate for IPCC WG3 to have a figure on this, but we extended text on the link between mitigation and adaptation.
40879	SPM					The intention of the figure should be made more explicit. For example, policy costs for just ES and health could be understood to be cheaper than CC.	Noted. Figure removed.
40876	SPM					Please indicate what the legacy means…(ex. IMACUM)	Noted. Figure removed.
40878	SPM					.The graph in SPM 5 is not easy to understand. Please indicate the Legend for each curves clearly. Also, the meaning of the inserts should be notified.	Accepted. The key insights of the figure has been provided in a much simplified new figure.
40875	SPM					The figure 450 and 550 should be switched.	Noted. Figure removed.
40874	SPM			24	1	Climate finance is discussed in Chapter 16 and 2 paragraphs in SPM.5.2 are spent for the subject, but the relationship between climate finance and the UNFCCC is irrelevant in the IPCC context and therefore, lines 1 -5 may be omitted.	Rejected - climate finance is part of UNFCCC negotiations and that is reflected in the literature which we are assessing here.
34034	SPM					Overall this section has not discussed the relationship between consumption and territorial emissions and the role of trade in it. This section should highlight that some of the emissions reductions seen in developed countries is due to carbon leakage (Peters, G.P. and E.G.Hertwich. 2008. CO2 embodied in international trade with implications for global climate policy. Environ Sci Technol 42(5): 1401-1407 and other references in section 5.3.1 This section should clearly define country groupings (developed and developing; OECD, Asia, LAM etc) and apply them consistently. References back to figures and charts should also support the assertions being made. Additionally, certain assertions have been made without being substantiated.	Rejected. The section continues to discuss both production and consumption based emissions based on a series of studies similar to the one highlighted by the reviewer. Regional groupings need to be chosen carefully depending on the scientific question under consideration.
34038	SPM					What is N that appears in both the figures with different corresponding numbers?	Accepted. We have added an explanation to the caption.
31700	SPM					Does not really address a key factor that most mitigation options require relatively high upfront costs – govts and consumers struggle to get over that barrier.	Accepted. Cost aspects have been more integrated into the findings of the subsequent draft, based on the underlying assessments in the chapters.
23539	SPM					I was wondering why there is no mention of the new high output solar plants that Robert Kennedy Jr. and co. are developing, one in conjunction with Abu Dhabi. These are supposed to be cheaper and quicker to produce than nuclear plants (and also to maintain), safer, and capable of producing comparable energy. I am not an engineer, but had heard of these.	Rejected - space constraints do not allow for a detailed discussed of these very specific aspects at the SPM level.
23540	SPM					How can there be mention of behavioral change in this section without mention of population dynamics? Slowing and eventually reversing population growth remain important practical goals over the next centuries.	Rejected. Population is cited in other parts of the text. SPM 2 addresses drivers. Section 4.2.2. deals with behavioral change in end-sectors, surely affected by changing populations and lifestyles
24066	SPM					A mentioning of non-internalisation of external effects should be more prominent.	Rejected.

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29089	SPM					This section could usefully be retitled to "Health co-benefits, risks and sustainable development" and should include references to other health co-benefits of a low-carbon society - not just the health benefits from reduced air pollution, but also that green spaces improve mental health and wellbeing, and increased active travel (walking and cycling) reduces obesity and improves the respiratory-cardiovascular system etc. as well as fewer cars resulting in a reduction in road traffic accidents. Key references below that directly address health co-benefits below: Lancet. 2012 Jun 9;379(9832):2189-97. doi: 10.1016/S0140-6736(12)60779-X. From the Earth Summit to Rio+20: integration of health and sustainable development. Haines A, Alleyne G, Kickbusch I, Dora C. Soc Sci Med. 2012 Mar;74(5):680-3. doi: 10.1016/j.socscimed.2011.12.008. Epub 2011 Dec 23. Sustainable policies to improve health and prevent climate change. Haines A. Lancet. 2010 Nov 27;376(9755):1802-4. doi: 10.1016/S0140-6736(10)62139-3. Health co-benefits of policies to tackle climate change. Ganten D, Haines A, Souhami R. Lancet. 2009 Dec 19;374(9707):2104-14. doi: 10.1016/S0140-6736(09)61759-1. Epub 2009 Nov 26. Public health benefits of strategies to reduce greenhouse-gas emissions: overview and implications for policy makers. Haines A, McMichael AJ, Smith KR, Roberts I, Woodcock J, Markandya A, Armstrong BG, Campbell-Lendrum D, Dangour AD, Davies M, Bruce N, Tonne C, Barrett M, Wilkinson P.	Rejected. We have dissolved this section and made the issue of co-benefits and SD as cross-cutting one.
31706	SPM					More importantly, when it gets to the social and political aspects of CO2 policy/agreements the report becomes very high level and academic. This is where the heart of the issue lies and the report doesn't provide much in the way of learning's from twenty years of activity.	Noted.
32102	SPM					The whole section is not precise enough. Many technical terms in economics and social sciences are not defined or used ambiguously. Moreover, the degree of evidence and agreement are not mentioned.	Accepted - text revised.
23542	SPM					I find this section helpful but stated in such a way that it seems to promise more than it actually delivers. Qualifying the section to focus on ONE aspect of human decision-making while holding open that more aspects may emerge as worth studying in future reports is important. In particular, the absence of the problem of COLLECTIVE human decision making is striking. As we all know, climate change is a problem of COLLECTIVE human action. And collective action is notoriously difficult. At least signalling the incompletenes of your section, perhaps by indicating this one other area you do not address as a token of the type of unexplored aspects of human decision making -- that would be a good idea, I think. (Also, consider the discussion of collective action in chapter 1, section 1.4.3.)	Accepted - section removed. Part of you concern gets addressed by section on international cooperation.
31289	SPM					The section on trade policies in the TS report should also be present in the SPM as this is an important issue in the international negociation on which clear messages are needed.	Rejected - severe space constraints in the SPM mandate use of a condensed outline.
31701	SPM					This section needs to be clearer in highlighting that as most signatories to the Protocol, eg the non-Annex I parties, had no obligations or requirements to mitigate, this led to high participation. The need to have such parties take action in future is a key challenge, which should be more clearly expressed.	Accepted - text revised.
23104	SPM					This section takes an overly economistic approach to looking at policy, and neglects to mention the encouragement of lifestyle changes (especially in industrialized, high-consumption economies) as an important policy option. While the economic instruments mentioned can play a role, limiting policies to these unnecessarily narrowly frames the range of possible policy actions.	Accepted - text revised.

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40962	SPM					Contents of SPM SOD are not in consistent with Table of Contents of WG-III Assessment Report 5. Contents include as sub-chapters in SPM SOD are not in consistent with WG-III Assessment Report 5 Table of Contents. Table of Contents of WG-III AR5 is an approved Table of Contents by the Bureau of IPCC. SPM shall follow the architecture of WG III Assessment Report 5: Framing, Pathways and Assessment of Policies, Institution and Finance. SPM SOD appears largely imbalance when summarizing findings and assessment from WG-III AR5. Scaling (high, medium and low) of evidence, confidence and agreement appears a misleading approach to present facts based on assessment of scientific literatures.	Rejected. It is not an IPCC procedure that the outline of the SPM need to mirror the outline of the report. However, in the revision process the author team has taken steps to reflect the broad structure moving from "framing issues" in SPM.1 to "policies and institutions" in SPM.4 via emission trends and drivers and mitigation pathways in section SPM.2 and SPM.3 respectively.
40963	SPM					SPM is largely missing on addressing long-term mitigation scenario. It appears that SPM is currently focusing on emission trends and mitigation from energy systems whereas other emission sources are rarely discussed in details. Such sector includes: livestock, land use and land use change. While point source of emission can be targeted for mitigation, SPM shall discuss mitigation option from changing lifestyle and consumption patterns realizing the needs for developing countries need for energy to meet basic needs (health, food, drinking water, sanitation, shelter and education). Subsidies on other sector – Agriculture shall be also discussed in the context of mitigation.	Rejected. Evidence from 1200 long-term scenarios are presented, which include the whole basket of greenhouse gases. An entire section (former SPM.4.2.3) is dedicated to the AFOLU sector. Further efforts have been undertaken to represent all major gases in figures, tables and text as appropriate.
40964	SPM					SPM is missing discussion on Sustainable Development in developing country context (energy access, income level and Human Development Index). SPM shall have a summary section on Sustainable Development	Taken into account - section SPM.3 was modified to reflect more evidence on sustainbale development.
40965	SPM					SPM does not provide any guideline of colour code convention, for example Figure SPM 3, red has been used fo developing countries. A colour Accord shall be adopted as per IPCC Convention if there is any. [Asia's emission shall not be highlighted as red!]	Accepted - implemented consistent colour code for all figures.

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33967	SPM					The outcome of the IPCC AR 5 WG III that has struck me most, concerns the crucial role that CDR (incl BECCS) will now have to play. This is a completely new state of affairs compared to the situation a few years ago. BECCS/CDR is now not only an option, but an essential tool for stabilization. Given the new significance of CDR/BECCS, I suggest that some of the background to those findings is put together in a new paragraph in the SPM. This would make the treatment of CDR/BECCS more consistent, without changing anything of the substance in either SPM or the full report. This text in this paragraph could be compiled of pieces taken from several places in the SPM. Exactly how a new paragraph would reflect on the rest of the text in the SPM (or in the Main Report) I have not worked out, but I believe this is relatively straightforward to do. My suggestion for the contents of the new paragraph is (without references or confidence levels included): "An overall conclusion is that BECCS or/and other CDR technologies are now indispensable in order to reach any ambitious stabilization scenario of 450 ppm CO2eq, irrespective of target year (2050 or 2100). If ambitious stabilization targets such as 450 ppm CO2eq are to be met, delays in international cooperation will increasingly require the large-scale application of CDR technologies and can dramatically increase the rate of emissions reductions and the costs of mitigation. The Cancun agreements are broadly consistent with stabilization at 550 ppm CO2eq, and are consistent with 450 ppm CO2eq emissions trajectories only in the context of widespread use of negative emission technologies, such as BECCS. Sufficient delays in global mitigation efforts – for example, delaying global action beyond 2030 – can render ambitious mitigation levels such as 450 ppm CO2eq by 2100 physically infeasible without substantial overshoot and negative global emissions in the second half of the century, using BECCS or other CDR technologies. Indeed, many models in recent multi-model comparisons could not produce 450 ppm CO2eq scenarios with limited technology portfolios, particularly when assumptions preclude the use of BECCS. "	Noted. The proposed language does not fully reflect the science and cannot be considered as guidance. The author team is very aware of the role of BECCS/CDR and will consider further the necessity for additional information on BECCS.
20996	SPM					Please specify whether "Land-use" includes land-use change or not.	Accepted
23377	SPM					Policy instruments should include spatial planning tools (such as mixed-land use; densification, etc) as useful regulatory instrument to avoid high-carbon urban development model and to reduce travel demand of urban population.	Taken into account - table removed.
32589	SPM					See my comments on co-benefits, in general and specifically in relation to TS and Chapter 3. This SPM section has a reasonable (if limited) classification of co-benefits & risks (air quality, energy security, costs, other) - but the specific wording is confusing (Why are the four points referred respectively to "Climate policy decisions", "Most mitigation options", "many mitigation options", and "many climate mitigation options" ? Also on "Energy security" the bigger issue may be the costs of volatility in fossil fuel markets. But most fundamentally the framing feels very dated and out of synch with what many of the empirical chapters stress: climate change is one of numerous issues faced in the course of economic development and often the choices are neither clear or separable. Particularly concerning policies deriving from First and Third domain effects - but also for example the fiscal and security implications of carbon pricing - one can hardly define distinct "climate mitigation options", as opposed to investments which simultaneously provide a number of benefits.	Taken into account
32587	SPM					Nothwithstanding the complexities and difference between production and consumption, I do wonder if the dimension of "decoupling" of emissions from economic growth could be more clearly communicated; Figure SPM.5 is very hard for most readers to see and get the core messages. Is there an alternate or could at least text be clearer about this?	Accepted. We have replaced Figure SPM.5 (new SPM.6) with a more simple Figure from chapter 1.

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27279	SPM					Section SPM.2 presents emission trends and drivers that are largely related to economic criteria. Such analysis by the IPCC must also take into account social indicators (such as per capita income and HDI, and others), and present social development criteria as basis for comparison of emissions among regions and groupings	Noted. Per capita income is taken into account as for example shown in the new Figure SPM.6. However, the relationship between composite indicators like HDI and emissions is uncertain and cannot be easily represented.
32585	SPM					This section needs to acknowledge the underlying and massive uncertainty in both GDP and energy/emission growth rates. As clearly explained in AR4, the baseline scenario is the most important factor. It might help also to acknowledge the 'Solow residual' - that economics has yet to come up with a satisfactory explanation for some of the main drivers of economic growth. Without such an explanation, there is always a risk that the models focus on the "lighted areas" but ignore bigger determinants of future human welfare and the potential role of energy and climate stability in these.	Taken into account. We have added a finding on baselines, but we think that our discussion of uncertainties in GDP estimates are fair. The new scenarios contain high and low energy demand scenarios which narrow the uncertainty in this regard. Throughout the SPM we highlight the interplay between supply and demand annd the associated technological and economic risks.
32586	SPM					My sense is that the SPM team have made good judgement about use of the global scenarios models in focusing more on the physical/trajectory / structural insights, than specific cost numbers. Perhaps added to the para on costs one might consider a cross reference to a TS discussion of modeling complexities and limitations (see comment on structural modeling assumptions TS). Also a key point for SPM is that for the purposes of tractability, global scenario models generally assume an 'optimal baseline', whereas in reality they are projecting a 'business as usual' case - reflecting the status quo bias and innumerable other factors indicated throughout the AR5 - and it is inherently harder to probe the extent to which other trajectories may be more or less 'optimal'in practice.	Accepted. We have added a reference to underlying discussions in the Technical Summary which have been further elaborated.
20013	SPM					Insert "Table 6.1" of chapter 6 (p.19 line 7-18) somewhere appropriate to explain categorization of the scenarios.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
25527	SPM					In order for a clear and traceable link between the working groups, the results of section SPM.3 should better be clearly delineated by RCP consistent concentrations, instead of the (equally arbitrary) 450 and 550 ranges.	Accepted. We have added Table SPM.1, which clarifies the link between WG3 scenario categories (by forcing) and RCPs.
32848	SPM					The readability of this section needs to be improved. Many sentences are very long and complex. Use more simple statements in the beginning of each paragraph to bring about the main message.	Accepted. The entire section has been revised.
21091	SPM					The order of mitigation options for energy sector should be reversed, in order to present best options (no regret options that gives minimal emissions and risks) first. So the first would be renewable energy, then nuclear and fossil energy.	Accepted - RE now mentioned at first.
26141	SPM					The section on AFOLU contains difficult terms, e.g. the verb "hinge" on page 20, line 31.	Editorial

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32592	SPM					For a topic as central as "human decision making" this feels too brief. At least one other topic that governments might well find to be of interest is regulatory approaches. Based in part on the UK government review of sustainable development economics (the "Price review"), the UK's Joint Regulators Group has noted that climate chagne the the exemplar of a problem that simply cannot be handled through traditional Impact Assessment tools of CBA analysis, and the UK Energy regulator Ofgem has found it necessary to develop a fundamentally different approach to Impact Assessment to cater for long term strategic and sustainability issues (Ofgem, 2012). For elaboration see comments to chapter 2 regarding Impact Assessment frameworks.	Accepted - text revised.
40966	SPM					This section has highlighted three issues – Risk Management, Sustainable Development and Ethics. Introduction shall not start with framing issues instead shall introduce the SPM in a way that conveys main message of emission trends and drivers and mitigation opportunities.	Rejected. In line with the underlying report we clarify first some basic concepts and ideas in section SPM.1 "framing issues" that are important to understand the rest of the report.
40969	SPM					This section does not contain emission trends by sectors (as per WG III Outline) SPM 2 shall include emission trends based on WG III architecture – sectoral emission trends and then drivers. While the whole WG III report deals by sectors, introducing geographical trends appear not appropriate especially referring to 'developing countries' in consecutive paragraphs. For example, Figure 1.3 (from WG-III AR5) shall be used in SPM.	Accepted. We have moved the Figure on historic emission trends of sectors into section SPM.2.
40976	SPM					Absolute emission shall be presented instead of % Absolute production and consumption-based emissions shall be presented in order to compare a fair share and responsible country/countries.	Rejected. This is a valuable comment, but the author team to decided to remove this graph as it depends on too many assumptions for a high-level document.
32841	SPM		14		14	Confidence level missing	Insufficient information to assign this comment to a finding.
41001	SPM					Missing regional groupings details	Noted. The figure has been removed in the new version of the SPM.
41002	SPM					This section only contains 3 sub-sectors. Not-balance cross sectoral mitigation options SPM 4: shall include all cross-sector as per WG-III report SPM4.1 covers three cross sectoral strategies for mitigation – human settlement, energy and transport. Other cross sectoral issues as Agriculture and Forestry and Livestock are missing. It appears that cross-sectoral mitigation options are focused on energy and transport sector and have not focused on other sectors such as AFOLU and Industry.	Noted. The new section SPM3.2.3 contains three sub-sections (buildings, transport, industry) for the energy end-use sectors. We continue to reserve new section SPM3.2.4 for the AFOLU sector.
41018	SPM					Only contains 3 subsections SMP 5 shall include finance section in consistent with WG-III report	Rejected - severe space constraints in the SPM mandate use of a condensed outline.
40877	SPM					The paragraphs of SPM 5.2 is rather long. Therefore, is would be better to shorten the sentences and introduce various kinds of fora, include, bi-lateral or sectoral projects.	Accepted - text revised.
25551	SPM	0				Please use the word of "stabilization" carefully. Many scenarios particularly in lower levels of concentration, e.g., Categories 1-3 in Table 6.1, include overshoot scenarios of concentration or/and temperature. Please distinguish the "450 ppm CO2eq stabilization" and "450 ppm CO2eq in 2100", for example.	Accepted - text revised.
25552	SPM	0				Please insert Tables 6.1 and 6.2 of Chapter 6 into the SPM because these figures are very important and help us to understand the scenarios which have already been depicted in the SPM.	Accepted. A new version of Table 6.1 has been included in the SPM, but the layout is very different now.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20218	SPM	0				Statements on regional distribution of mitigation burden, needs of technology transfer, and spillover implications are lacking	Accepted. The text on effort sharing has been retained, but without regional specifics. A paragraph on spillover effects and the potential devaluing of fossil fuel endowments has been added based on the latest literature.
20220	SPM	0				The massively improved transimission and distribution infrastructure may result in reduction in energy effficiency that my not be justified on cost effectiveness --- see ch 7, page 23, lines 30-36.	Noted. Related section in the report was revised but sentence on the challenges of RE integration and the related costs has been added.
20221	SPM	0				Reflect risks due to large scale bioneregy deployment -- see table 11.A.2	Noted. Further care has been taken to carefully summarize the broad literature on this important topic.
31266	SPM	0				Even if this report deals with mitigation of climate change, it would be interesting to have targeted cross references on important matter generaly linked to the adaptation side (such as risk management, costs of inaction, etc), as it is bit done in the technical sumary. For instance, the section p.55 of the TS on trade-off between mitigation and adaptation financing could be useful in SPM.	Accepted. It is limited what can be drawn from the WG3 report, but some language has been added on adaptation in different sections. Key IPCC product for this is the synthesis report.
30576	SPM	0				There is a general overreliance on using entire paragraphs from the Technical Summary in the SPM. This creates a choppy, disjointed sequence of messages in the SPM. Greater effort should be put towards crafting some new paragraphs that merge information from existing paragraphs.	Noted. We perceive it as a strength to have a clear connection between TS and SPM, but efforts were undertaken to improve the flow of the SPM.
30577	SPM	0				The quality of the Figures in the SPM is generally poor. Readability was negatively impacted by very small font sizes, complicated Figures, insufficient supporting captions and other factors.	Accepted - figures and captions revised comprehensively.
30578	SPM	0				There is no discussion in the SPM (or elsewhere in the WGIII report) of the new scenario process. This is a surprise as these were expected to inform the AR5. A brief mention of the new process, and a status report, would be helpful to governments. Descriptions of the new process should also be consistent across the WGs.	Rejected. The space in the SPM is too limited, but we added a box on the scenario process to Technical Summary.
30579	SPM	0				Repeatedly, there is reference to the goal of stabilizing atmospheric GHG concentrations at 450 ppm CO2-eq. This is not a well-accepted international climate policy goal. An explanation for repeated reference to this goal is required in the SPM. If this is a consequence of using output from integrated assessment models, this should be part of the explanation provided. If WGIII or WGI can provide support for linking 450 ppm CO2-eq to a global temperature target, this should also be part of the explanation provided.	Noted. A clearer link between forcing and temperature has been added (new Table SPM.1). We further made sure that there is a more balanced treatment of forcing categories in the SPM (and TS).
30580	SPM	0				There is repeated reference to "transformation pathways" or "scenarios". These terms need defining/explaining in the SPM.	Noted. We have tried to improve the clarity of language in this regard.
30581	SPM	0				In a number of places, there is reference to Developed and Developing Countries while the accompanying Figures use alternate descriptors. Consistency would be helpful.	accepted - text and figures are revised and made consistent to the extent possible. However, in some cases paragraphs include additional results beyond what is presented in a particular figures.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30582	SPM	0				Overall, the SPM is quite long, which will increase challenge of approving it during a plenary meeting of the WG. Suggest shortening where possible.	Accepted - text was shortened.
30583	SPM	0				The text often switches back and forth from data including all GHGs to data including only CO2 emissions. While, in some instances, the use of only CO2 emissions is clearly induced by the subject of the text (i.e., emissions related to fossil fuel burning), in other instances, it is not clear why the authors did not choose to use the full set of GHG emissions. We suggest using data of GHG emissions whenever possible to offer a more comprehensive picture of total emissions and to always be clear on which gases are included.	Accepted. We tried to report all GHG emissions wherever helpful in the new SPM. However, due to the over-proprotional growth of fossil-fuel related CO2 emissions since AR4, some more attention is directed towards these emissions. Moreover, sometimes results for all GHG emissions are not available.
32596	SPM	0				A final thought - shoudnt the SPM include something pertaining to the financial crisis, debt and investment? This has for example become a central issue in UK policy debate (see House of Lords, European Affairs Committee report, May 2013, and references therein)	Taken into account - only few information added due to the limited availability of peer-reviewed literature on recent events.
34278	SPM	0				General Comment: The SPM text is unbalanced & biased. Sustainable development issues, equity considerations, the historical responsibilities of industrialised countries, the technological & financial requirements / needs of developing countries, as well as lifestyle & consumption patterns should be properly addressed in the SPM and in the background chapters. Most of the emphasis is put on present & future emissions of the developing countries, with very limited references to the historical & per capita emissions between industrialised and developing countries.	Rejected. There is a balanced treatment of different perspective. For example, for the first time the IPCC provides estimates for long-term historical, current, per capita, production and consumption emissions. There is little region specific information on long-term scenarios due to space constraints.
33526	SPM	0				We would like to see information about shale gas in this SPM, its energy versus carbon ratio, expected price levels on the longer term and its impacts on the price of energy from other sources through substitution, and other impacts such as methane leakage, earthquakes, surface and groundwater pollution.	Noted. Sentence on natural gas has been included, addressing its mitigation potential estimated from lifecycle assessments, and emphasizing the issue of fugitive emissions. Information on the emission intensity of gas based electricity generation and the levelized cost of electricity are presented in the Technical Summary.
33527	SPM	0				There is no mention of geo-engineering in the SPM, despite the growing (political and societial) relevance of this response strategy. Please consider adding a paragraph about this.	Rejected. CDR technologies are a key feature of the SPM. SRM is less treated as we know little about their role in the context of mitigation as this literature is just emerging. The Technical Summary has now three dedicated paragraphs on geoengineering.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33528	SPM	0				We think a conclusion regarding the availability of fossil fuels would be useful. We suggest something along the lines of: "Some fossil fuels will remain available in sufficient quantities for centuries. It is a misconception that scarcity of fossils fuels necessitates a quick shift to renewable sources. Estimates of the availibility of coal at current use rates are in the order of a thousand years. Although traditional sources of gas and in particular oil will be running out in decades, substantial new sources, such as from shale, have now entered the market. However, the use of fossil fuels not only produces CO2, but also causes pollution, affect landscapes, and creates vulnerable dependencies."	Accepted, sentence on the availabiliy of fossil fuels not being the driving factor for limiting GHG concentrations to levels of up to 650ppm has been included.
33529	SPM	0				We note that paragraphs 1.4, 2.3, 3.3, 3.4, 3.6, 3.8, 3.9, 3.10, 4.4, 4.5, 4.6, 4.7, 5.2, 5.4, 5.7, 5.8, 6.2, 6.7, 7.2. 7.3, 7.6, 7.7, 7.11, 7.12, 8.5, 9.2, 9.4, 9.5, 9.6, 9.9, 10.2, 10.3, 10.4, 10.5, 10.7, 10.9, 10.10, 10.11, 11.2, 11.3, 11.4, 11.5, 11.10, 12.4, 12.5, 12.6, 12.7, 12.8, 13.3, 13.5, 13.8, 13.9, 13.10, 13.11, 13.12, 14.2, 15.2, 15.4, 15.9, 15.10, 15.11, 15.12, 16.3, 16.4, 16.5, 16.6, 16.7 and 16.8 are not referenced in the SPM. This seems unbalanced. The focus lies in chapters 6 to 9, which is odd.	Rejected. Not all sections of the eport are of equal importance and there is a need to focus because the space constraints are very severe in the SPM.
33530	SPM	0				we miss a consideration of the relations between mitigation and adaptation in the SPM, except for page 3 lines 9 to 16, while many of the chapters do. Perhaps a sentence that the Synthesis Report considers this in dept is sufficient (if true).	Taken into account - we added more information on the interplay of mitigation and adaptation to the Technical Summary.
24992	SPM	0				When the SPM discusses the cost of mitigation, it is essential that it compare this to the cost of allowing climate change to continue, so that we have a true cost-benefit study. Suggested further reference: Garnaut, R. (2011). Update Paper 1: Weighing the costs and benefits of climate change action. Garnaut Climate Change Review Update 2011, released 3 February 2011 (http://www.garnautreview.org.au/update-2011/update-papers/up1-key-points.html)	Rejected - the Synthesis Report will try to cover both aspects in an integrated fashion. The SPM of WGIII is devoted to mitigation only.
30460	SPM	0				It would be very useful to see a better reflection of the current knowledge on support and promotion of the REDD+ safeguards as agreed in CP16, FCCC/CP/2010/7/Add.1 and addressed as well in CBD COP 11, 2012 (UNEP/CBD/COP/DEC/XI/19).	Taken into account - to the extent peer-reviewed literature exists, some information has been added to section SPM.4.
26419	SPM	0				There is a considerable amount of discussion about BECCS in chapter 7, but the summary for policymakers should include a few key sentences that more clearly state the role of BECCS in relation to meeting various mitigation targets.	Rejected. We continue to focus on the role of BECCS for ambitious mitigation scenarios between 430-530ppm CO2eq, where the literature highlights the importance of the technology.
20463	SPM	0				Table 6.1 of chapter 6 should be located somewhere in SPM, as readers can then realize the details of category 1 to 3 by examining this Table.	Accepted - we added the table to section SPM.3.1.
20464	SPM	0				Realizability of the pathways not only in the long term future but also from now to 2050 should be described, as most international negotiations have focussed their attention on the realizability of the pathways from now to 2050 or around.	Noted - the relationship between short and the long-term remains a focus of the SPM.
20465	SPM	0				page 9 from L28 to L29 says that the probability (of remaining below 2 degree C target) is approximately 40% to 50% for 550 ppm scenario. In spite of this description SPM deals mainly wityh category 1 scenario but does not with category 3 scenario. Since realizability of the pathway of category 3 seems much higher than that of category 1 particularly in the near and medium term future, category 3 scenario should be treated throughout SPM with the same weight as of category 1 scenario.	Noted. Temperature information was very preliminary in the reviewed draft. The discussion has been updated and a table SPM.1 has been added summarizing information on emission budgets, forcing and temperature change.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22890	SPM	0				geoengineering (more specifically SRM) MUST be mentioned by at least 1 para in SPM	Noted. It depends what the reviewer understands by geoengineering. Some CDR technologies are an essential component of the scenario literature and continues to be treated in depth. SRM technologies are only treated implicitly in the SPM, but have now dedicated paragraphs in the Technical Summary.
22891	SPM	0				uncertainties in climate change issue may result both in earlier timing or later timing of mitigation. Balanced description is necessary.	Accepted - text revised.
22892	SPM	0				Insert a paragraph that there is a heated debate over the renewable energy diffusion by subsidies - regarding costs, environemntal effectiviness, intermittency and associated back up costs. See Frondel (2010) for example.	Noted - we added information on this aspect to section SPM.4 .
21494	SPM	0				The SPMs should allow for easy comparison between results of the different Working Groups. This requires significant effort to streamline the three WG SPMs so that they refer to similar scenarios in their discussions. The SPM for WG III seems to focus on two stabilisation scenarios (450ppm and 550ppm), but they are not explicitly motivated. Do they best cover the range around 2 degrees C? Or is 550 ppm between RCP 2.6. And RCP4.5? SPM of WG1 seems to talk mostly about RCPs, WG3 only talks about 450 and 550. How does this fit together and what is the relationship? At present it is not possible to compare as different metrics are used to describe scenarios across the SPMs of the different WGs or even within the SPMs of a given WG. This makes it impossible for a non-expert to compare across WG SPMs. The 3 draft SPMs are not fit to allow cross comparison and should be adapted to make them comparable. See also lines 7 to 16 on page 3 and lines 35 to 37 on page 9 that recognise the need to be able to look across Working Groups to draw policy conclusions. It seems logical that in each SPM of each WG there is a table or graph with information on the RCPs in the document and how they relate to certain emissions profiles, concentration levels (including temporary overshoot) and temperature changes. On this level a possible example for a type of graph could be figure 6.11	Accepted. We have added a Table SPM.1 which provides all required information to broadly link to RCPs and other Working Groups.
21495	SPM	0				In general the content of this SPM has very detailed scenario analysis with many quantitative numbers that contrasts with a very vague analysis of policy recommendations on how to mitigate effectively climate change.	Accepted - we expanded the section on mitigation policies (section SPM.4.), which will always remain distinct in its nature due to the type of evidence provided in the literature and the strong dependency between mitigation measures and institutional settings. We do, however, not make specific recommendations because this would run against the mandate of the IPCC.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21496	SPM	0				The SPM frequently aggregates countries to make generic statements about "developed" and "developing" countries whereas the analysis in the background uses regional groupings. It therefore does not make sense to focus on "developed"/"developing" in the SPM, particularly given the large differences between countries that fall under these categories. Please remove these categorisations and amend to better reflect the underlying analysis focus on regions and large emitters.	Rejected. While we have increased the stringency between regional groupings in text and figures, the choice of a specific grouping will depend on the nature of the finding. While convenient, it is not helpful to focus on only one grouping throughout the SPM.
22803	SPM	0				In general a very detailed scenario analysis with many quantitative numbers contrasts with a very vague analysis of governance and policy issues.	Accepted - we expanded the section on mitigation policies (section SPM.4.), which will always remains distinct in its nature due to the type of evidence provided in the literature and the strong dependency between mitigation measures and institutional settings. We do, however, not make specific recommendations because this would run against the mandate of the IPCC.
22804	SPM	0				In general a very nice SPM with a clear structure and story. The only thing I am missing is a section "what is new since AR4"? In some cases, new empirical changes are mentioned, e.g. rising emissions or the advancement of RES or progress for zero-energy buildings. But this is empirics, what about new scientific findings? It is indicated that ethics will play a much larger role, but there is only one paragraph on ethics. One example where new scientific results are availble are more low stabilisation scenarios. Have there been more such things? Have costs of mitigation increased / decreased? Have there been surprises or breakthrough findings since AR4? I think this should come as a collection at the beginning.	Accepted - we further strengthened the focus on evidence that is new/has changed since AR4.
22805	SPM	0				The focus is on two stabilisation scenarios (450ppm and 550ppm) that are not motivated. Do they best cover the range around 2deg? Or are these scenarios, especially 550ppm, chosen by chance? Or is 550ppm between RCP 2.6. and RCP4.5? Moreover, the link to the RCPs is not clear. SPM of WG1 only talkes about the RCP, WG3 only talkes about 450 and 550. How does this fit together and what is the relationship?	Accepted. We cover a broader range of scenarios now and provide a new table SPM.1 with a link between emission budgets, forcing and temperature. Broad links to the four RCPs are also provided.
22824	SPM	0				As chp. 6 has a big weight in the SPM I think it would be very important to point out the principle limits of the IAM approach and/or the paradigm under which they operate (normative scenarios under an economic perspective of cost minization, as described in chp 6. sec 6.2.)	Accepeted - the Technical Summary in particular provides detailed information on concepts and methods including IAMs.
22846	SPM	0				The SPM can be read as "we are currently not on track to reach 2 Deg". But let's assume the UN would agree on that analysis and ask what they should do next, then they won't find any answers to that in the SPM. It might be a good idea to include a box with no-regret options and/or a box with best-practices. At least an attempt should be made to answer that question	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22849	SPM	0				The uncertainty languege is a bit problematic. On the one hand it is given for empirical evidence, e.g. on p. 7, line 7. On the other hand, confidence statements are given for pure model results, e.g. p. 11, line 29. The problem is that it is not clear, what is an empirical finding or reality, for given by physical constraints in emissions, or what is only a pure model result.	Taken into account - according to the IPCC guidance note on the consistent treatment of uncertainty, confidence statements can be used for all kinds of evidence, including model results and theory.
29528	SPM	0				There is no mention of increasing returns to scale and the importance of path dependence to scenario outcomes in the SPM. Increasing returns are a pervasive phenomenon, and path dependence is everywhere. The mentions of increasing returns in Chapter 4 minimize the possibility of path dependence, but does not reflect our latest understanding of the phenomenon.	Noted.
34691	SPM	0				Both the TS and SPM need to make it easier for policymakers to understand how the timing of global peak and decline in emissions will affect availability of choices in the future; annual reduction rates required thereafter and their feasibility; the extent to which we will have to rely on technologies that don't yet excist in commercial scale and the sustainability and feasibility of which is questionable in light of other societal goals; and the risks of exceeding key thresholds with irreversible impacts. There should be a text box (at least) in both the TS and SPM that discusses the timing of global peak and decline in emissions. This will be a key debate in the upcoming UNFCCC negotiations. IN OTHER WORDS, what the WGIII concludes, is that it is still possible to stay below 2 degrees, with 60 % certainty, but if global emissions don't peak before 2020, the goal seems possible only with the help of uncertain technologies that haven't been tested in commercial scale, and that come with a lot of uncertainties and challenges (CCS, BECCS and other CDR options. In this light, achieving peak and decline before 2020 would reduce risks related to untested technologies and large-scale biomass expansion, which could turn out to be unviable due to competing needs for land, forests and water resources.	Taken into account. The issue of peaking is difficult to deal with in a scientifically sound manner. We have strengthened the findings on the relationship between short term action and long-term outcomes and have added a figure on this, which also highlights the range in emission reductions required for a given emission level in 2030 (SPM.8). Equally, we have identified the upscaling requirements for those emission levels in a seperate new figure (SPM.9).We continue to highlight the increasing reliance on CCS and BECCS and related lock-ins for ambitious long-term atmospheric concentration levels in 2100 such as 450ppm CO2eq-
34692	SPM	0				Given how much consideration is given to the role of economics in the WG III report overall, it seems like the SPM would really benefit from a para that would reflect the limitations and ethical and methodological critiques that have been put forward with respect to the application of Cost Benefit Assessment to climate policy, as outlined in Chapter 6, but also in Chapter 2, page 33, lines 3-19: One strong and recurrent argument against CBA is specifically related to its failure to deal with low probability, catastrophic events that might lead to unbounded measures of either costs and/or benefits.	Taken into account - the introduction SPM.1 has been completely reworked highlighting key insights from the framing chapter, which are relevant for understanding the entire document. Accordingly we have renamed that section into "framing issues".
34254	SPM	0				Perhaps it could be stressed more, that energy efficiency is an excellent tool for an energy system largely dominated by fossil sources. In an overwhelming carbon-free system, this argument is no longer valid – here resource efficiency might be a more interesting target.	Taken into account. We mention the role of resource efficiency particularly in the context of the discussion of the industry sector.
34255	SPM	0				In systems with a high share of intermittent souces, energy efficiency will not help – technical integration of RES is key. Some solutions e.g. storages are not energy efficient, since they overall need energy to run – but they are desperately needed.	Noted.
34259	SPM	0				The diagrams are far too complex for policy makers, they need to be simplified.	Accepted - almost all figures have revised and simplified.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26713	SPM	0				The report is vey comprehensive and not so easy to follow. The messages need to be more clear and precise and expressed in a simple way for increasing the understanding. Please keep in mind that the document is intended to be a summary for policy makers. Differences in the conclusions compared to WG3 AR 4 should be explained as a service to the reader.	Accepted - we simplified the text.
25408	SPM	0				In SPM especially in the sections SPM3 and SPM4 there appear words "stabilisation at 550ppm", 550ppm goal", "stabilisation goal". Does the word "stabilisation" have the same meaning in the previous IPCC reports up to AR4 and the recent WG1 report (SOD)? So far in these ealier reports, "stabilisation" has been taken to mean that the concentration of CO2 or the total efffect(radiative forcing) of all GHGs is held constant at a certain constant level for an indefinetely long time, typically multiple century to a millenium long period, as schematically shown in Fig 5.2 of the Synthesis Report of TAR. If stabilisation in this SPM has the same meaning as before, stabilisation at 550ppm would cause global mean temperature rise of 3 deg C continuing over that long period and could result in substantial melting of Greenland ice sheet. If this is really the case, there must be description and discussion on this dangerous outcome, somewhere in SPM. On the other hand, in Chapter 6, in 6.3.2.1, in connection with Table 6.1, there is a statement saying that now concentration stabilisation is only "one type of scenarios" as stabilisation scenarios (of recent studies). If "stabilsation" in SPM has broader and different meanings in response to the discussion in Chapter 6, it is essential to state clearly that the meaning or implication of "stabilisation" is now different from the one in the previous reports and why and how it has been changed, touching upon interpretaion of the Article 2 of UNFCCC. Shortcomings of the traditional stabilisation concept and suggestion to braoden "stabilisation" concept is discussed in a paper by Matsuno, Maruyama and Tsutsui(2012, Proceedings of the Japan Academy, Ser. B, 368 -395; also available free at http://www.jstage.jst.go.jp/browse/pjab).	Accepted. We no longer refer to stablization goals, but stabilization levels in 2100. We have added a new Table SPM.1 linking emission budgets to forcing and temperature changes consistent with Working Group I.
23804	SPM	0				Parts of the SPM are quite policy presciptive (particularly the section on emission trends and drivers). This is not really necessary. State the numbers, don't interpret them with an agenda (which seems to be a rich vs poor equity agenda)	Accepted - we were careful to avoid policy prescriptive language.
25178	SPM	0				Interestingly SPM does not contain a single table with numbers	Taken into account - new tables 'with numbers' added e.g. in section SPM.3.1.
25179	SPM	0				Majority of the figures are too complex for a policy maker to comprehend and it looks as if written for a post-doc in energy modeling	Accepted - we simplified figures.
25180	SPM	0				Even the language of the SPM is a bit difficult, very technical sometimes (more useful for a macro-economic modeller) and at times very philosophical	Accepted - we simplified the text.
25181	SPM	0				There are many headline statements which seem prescriptive	Accepted - we were carefull to avoid policy prescriptive language.
25182	SPM	0				Wish AR5 SPM had adopted some of the good points from AR4 SPM. Some of the iconic figures and tables given in AR4 SPM, which are of great interest to policy makers could have been given. E.g. SPM fig:6, SPM fig:5A,fig:5B, Table SPM 5. We strongly suggest inclusion of figure on costs and potentials for different sectors and a table similar to SPM 5.	Accepted - figures on costs and potentials added to section SPM.3.2. However, AR5 authors deliberately avoided the same type of mitigation potentials as provided in AR4 due to the controverse scientific discussions on them in the scientific literature.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25183	SPM	0				Interestingly AFOLU/ LULUCF are excluded from most of the figures and paras related to GHG emissions, What is the rationale for excluding LULUCF? Land use sectors account for almost third of the GHG emissions, and why they have been excluded from bulk of the sections of SPM.	Rejected. Section SPM.2 includes figures on emissions including those from AFOLU. Emissions from AFOLU are part of the scenario results in section SPM.3.1. There is an antire section on AFOLU in section SPM3.2.
25184	SPM	0				Different sections of SPM use different grouping of countries and difficult to compare across sections	Rejected. Different scientific question are more appropriately answered by using different regional groupings.
25185	SPM	0				Evidence and confidence levels should be reported for all findings reported in SPM	Rejected - where appropriate, findings are also formulated as "statements of fact" without using uncertainty qualifiers. This is consistent with the IPCC guidance note on the consistent treatment of uncertainty.
25186	SPM	0				It is suggested that results that have high confidence and robust evidence should be given priority in reporting In SPM.	Rejected - findings with lower levels of certainty can also be policy-relevant. The fact that certain findings have only low confidence can be policy-relevant. It is a major job of the IPCC to establish transparency in this regard.
25187	SPM	0				The country grouping is inconsistent throughout the report. The grouping of countries should follow UNFCCC or other UN groupings rather than clubbing countries under grouping wherein development stages and per capita emissions widely differ among countries (e.g. G20). 2) The framing chapters have articulated the issues such as sustainable development, ethics and equity; but these issues are inadequaltely covered in the assessment Chapters of the report. The SPM needs to clearly highlight the key findings using the framing paradigms (e.g. sustainable development) and concepts (e.g. equity) which are essential lements for framing the policies. 3) The key conclusions ate marked with confidence levels. It is not clear how these confidence levels are obtained; i.e. whether these are available in the literature or are derived using statistical analysis of the data available in the literautre ot are based on judgements of IPCC authors. The SPM should have a brief section which clearly states the methodology used for arriving at the confidence levels; since proper understanding of this information is vital to the policy making process.	Rejected - the literature provides many different perspectives on how to group countries, including economic regions, and the report tries to reflect this diversity of perspectives. However, we have changed towards a most widely used definition of economic regions from the Worldbank. How confidence levels are attached to findings is clearly outlined in the IPCC Guidance note on this matter. We have added a reference and a brief decription of the mechanics in a footnote.
30086	SPM	0				I would recommend including a para on where the growth in energy demand is expected to take place, given reports estimating that the absolute majority of the growth in energy and fuel demand will be in non-OECD countries.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38888	SPM	0				The most useful portions of Chapter 2 have not been presented within the summary. For this document the discussion in Chapter 2 related to the design and assessment of policy and programs under uncertainty is highly relevant and should be highlighted. A discussion that highlights the relative utility of the decision frameworks given the level of uncertainty associated with the problem of climate change as discussed in section 2.3 is warranted in the summary.	Taken into account. We have turned the introduction into a new section SPM.1 on "Framing issues", which bring out key findings from chapters 2.4 more prominently.
38889	SPM	0				In a great deal of the text "responsibility" is established and appears to be based on historical emissions and predate any agreements to address climate change. Therefore, the dates at which responsibilty is assigned should not be pre-1990. This in particular should be modified for Figure TS.3 and Figures SPM.3 and SPM.4. In part b of TS.3, the time bins should be 1750-1990, 1990-2010, and then 2010 (or most recent data). There are 2 figures(TS.3 and TS.4) and (SPM.3 and SPM.4) that pertain to consumption and production, only 1 figure is needed and there is no figure that reflects sector distributions and emissions (eg, Figure 1.3 should be drawn forward to the TS and SPM). If one of these figures must be kept at all, we propose to use Figure SPM.4 instead of Figure SPM.3 - once the revisions we suggest in our other comments are made.	Taken into account. We do not use the term responsibility. However, we aim to provide the diversity of literature on emission trends and drivers since AR4. The standard reference period continues to be 1970-2010 consistent with the major publicly available emission databases. We have reworked the Figures in section SPM.2 including the ones highlighted by the reviewer. There is only one figure on consumption-based emissions in the new draft.
38890	SPM	0				There must be more emphasis on education and public awareness, to drive political action. At the present time, there must be close ties between government action and technical mitigation strategies in two ways: (1) governments must subsidize products and policies that lower GHG emissions, especially since such strategies will increase the cost of goods and services and (2) governments must refocus/realign their financial support of research activities in industry, academia, and government laboratories ; such activities are absolute necessary to generate breakthrough advanced and inventions that directly address GHG mitigation.	Noted. Findings of the type highlighted cannot be provided in an IPCC report as they are policy-prescriptive.
38891	SPM	0				The report should put more emphasis on the synergistic link between economic growth and the development of mitigation strategies and new manufacturing efforts to curb GHG emissions. The two are not mutually exclusive. Indeed, in the U.S. last year alone, the econoym grew by 2.2% while energy CO2 emissions fell almost 4%. A more robust framing of this might be warranted in Chapter 5, as well.	Noted.
38892	SPM	0				Statements about developed and developing should be focused on regional basis.	Noted.
38893	SPM	0				The SPM should provide much more clarity and focus on what is new since AR4 - highlight the latest state of knowledge and new developments since AR4. This should be the focus across all sections of the SPM, while highlighting the key points, it should note any changes since AR4 that have medium-high agreement/confidence. It should also be careful to frame discussion in the context of more recent trends (in terms of social, economic and environmental developments between and within countries).	Accepted - we strengthened the focus on evidence that is new since AR4.
38894	SPM	0				Several of the sections and figures in the SPM are not policy-relevant / representative of the key messages from the underlying text. The main objective of the WG3 report is to indicate where mitigation potential lies from different sectors and different technologies. This is what would be useful to policymakers. To that end, the authors need to heavily revise or replace altogether several figures in the SPM, including Figures SPM.2, SPM.3, and SPM.4, while Fig 1.3 and Table 6.1 ought to be brought forward to the SPM as they are critically important to understand the issue.	Accepted - text and figures revised and new table SPM.1 included establishing the link between emission budget, radiative forcing and temperatures - consistent with Working Group I.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38895	SPM	0				Statements that are "low confidence" and/or "low agreement" have no place in a SPM. An example exists on p. 20, lines 6-8. Moreover, though, a scrub of the SPM is warranted on two counts: (1) to ensure the uncertainties assigned are genuinely reflective of the peer-reviewed literature, and (2) statements / findings / conclusions that are based on anything less than "high confidence" and/or "high agreement" should only be included in the SPM under exceptional circumstances; otherwise, most policymakers will gloss over the uncertainty assignments and could very easily walk away with the wrong impression.	Rejected - findings that are known to be accurate with lower levels of certainty can also be policy-relevant.
38896	SPM	0				The WG3 report (and the SPM) presents a number of framings for how you can look at emissions - on a regional, historic, cumulative basis, etc. What is lacking, however, is a presentation of how much embedded carbon exists in existing capital stock, so-called "infrastructure lock-in". One could argue that emissions prior to ~1990 (when the UNFCCC was established) should be weighted less because the world did not know that GHG emissions were harmful. Now, the world knows and those who continue to invest heavily in C-intensive infrastructure do so with the full knowledge of the ramifications. An excellent article to cite in this respect would be Davis, Caldeira and Matthews, Science, 329, 10 Sep 2010, p. 1330-1333. The figures in this paper are really valuable and easily digestible to the layperson - something that cannot be said for many of the figures in the SPM (e.g., Fig SPM.2, SPM.3, SPM.4).	Rejected. The report looks back at historic emission patterns as well as ahead. This one publication is covered in the report among others, but it is not warranted to lift this to the SPM. There is a much broader literature on this topic and the simplicity of the figures associated in that publication is related to specific assumptions taken, which is not possible for an assessment like this one. In fact, the integrated models cover infrastructure aspects and the report highlights issues around lock-in effects into carbon intensive infrastructures.
38897	SPM	0				Much of the chapter is framed by the developed/developing country split, which does not adequately capture the disparity in economic development among developing countries. It would be better if the report attempted to quantify mitigation opportunities in terms of expected future percentage of global energy demand and challenges by type of country. For example, industrialized “developed” countries, high emission emerging market countries, transition economies, smaller developing countries, least developed countries.	Taken into account. We continue to use multiple regional groupings depending on the underlying scientific question. We converted towards an new grouping of economic regions (Worldbank) as commonly used in the literature.
38898	SPM	0				Greater care must be given to the use of CO2 vs CO2e. Often times, CO2e is used when the authors are only talking about energy CO2 emissions. Additionally, whenever the discussion centers around only energy CO2 - this needs to be stated very explicitly as energy CO2 is (only) 60.7% of global GHG emissions according to Fig. 1.3. It can really mislead policymakers if they don't "see" the other 40% of GHG emissions.	Taken into account. Wherever possisble we look at all GHG emissions and have carefully revised the text to make clear when done otherwise.
38899	SPM	0				A better summary of Chapter 16 should be included in the SPM, specifically highlighting the current barriers to scaling up climate finance, the importance of enabling environments, and the different instruments that can be used to unlock larger scale financing.	Accepted - we added these aspects to section SPM.4.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38900	SPM	0				Mitigation costs may exceed what is listed as model results because the models make strong assumptions. This should be stated earlier and more often. The caveat paragraph on page 13 may not be enough.	Rejected. The broad ranges covered provide a good reflection of the literature and we continue to caveat assumptions for greatest transparency in the document. Mitigation costs may equally be lower. We provide a series of boxes in the Technical Summary, which provide all required information for a sound conceptual understanding of mitigation costs and associated limitations.
38901	SPM	0				All of the figures should be accompanied by an obvious citation from the original paper as well as clarifications for any new acronyms or axis labels. Readers should be able to go directly to that paper while reading the IPCC report or at least understand where the figure originates. Consistency across figures would be helpful, though of course most come from different sources. There should be a way to develop an IPCC format for figures that provides necessary information to the reader so that they can understand the legend and axes and any other labels of the figure. It would be particularly helpful to have a link in the electronic document to the underlying chapter and descriptions of each figure.	Rejected. IPCC summary documents do not provide references to the original source. Instead it points towards the underlying report, where the reference is provided.
38902	SPM	0				Please ensure all numbers are presented in SI unit, uniform currency unit.	Noted.
38903	SPM	0				Please ensure all conclusions across chapters are updated and in sync.	Noted.
38904	SPM	0				The authors need to take greater care to explicitly state when analyses focuses purely on energy CO2 (60.7% of global emissions) vs when it refers to ALL GHG emissions (including LULUCF and non-CO2, for example).	Accepted - text revised.
38905	SPM	0				The chapter could be edited down to reduce superfluous phrases like: this subsection discusses the specific issue of equitable burden sharing (p. 58). Such roadmap signals are helpful, but given that the title of the subsection already says that, I don't see the value added.	Accepted - text revised.
38906	SPM	0				The long length of this chapter is partly due to detailed discussion of the theory of SD; unfortunately, there are less concrete examples applying such constructs to climate change. The result is a theoretical discussion without solutions. Perhaps this is the nature of this topic compared to others, but there needs to be more cross referencing to other substantive chapters regarding application. Such cross references and examples will help inform policy makers looking at the options to move forward. Otherwise, this chapter risks reading like a doctoral dissertation.	Taken into account. We disagree that the length of the SPM is related to the link to SD. It was a request by the Panel to embed the Working Group 3 report in a SD context. Many of the risks associated with climate change and climate change mitigation can only be understood, if put into SD context, where many other social and environmental dimensions are covered. They are characterised throughout the SPM (e.g. new SPM3.1 and SPM3.2).
38907	SPM	0				Concepts like "pathways" are vaguely defined throughout the document.	Noted.
38908	SPM	0				Either each chapter or the whole report would benefit from a section that defines acronymns.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40779	SPM	0				What exactly do the words “stabilization goal”, “stabilization at 550ppm”, “550ppm goal” etc. (which appear mostly in SPM. 3 and 4.) mean? Do they mean that GHG concentration is held at a constant level, i.e. 550ppm for a several centuries or longer beyond 2100? If this is the case, the global mean temperature could be 3 deg C above preindustrial for a long period of time, resulting complete melting of the Greenland ice sheet. Therefore, it is required to clarify what is implied by these words concerning the concentration beyond 2100. In the earlier reports up to AR4, "stabilization at a certain level” has been understood as keeping (GHG) concentration at the level for an indefinitely long time, (as typically shown in Fig. 5.2 of the synthesis report of TAR), and was the key player of mitigation strategy to realize the objective of the Article 2 of UNFCCC. According to the description in 6.3.2.1 it is now “one type” of scenarios. It is desirable to add explanations of why and in what way the roles of the stabilization has been changed in SPM and Ch.6.	Taken into account. We no longer refer to stablization goals, but stabilization levels in 2100. We provide additional background information in the Technical Summary, but the SPM does not provide sufficient space. Most important is the change from equlibrium to transient temperature concept for matters of policy relevance (see new Box TS.8)
40780	SPM	0				The expression of the emission or reduction of GHG should be unified. Please use "percentages to the total amount" or "Gt CO2 eq" or both of them.	Noted.
40781	SPM	0				Table 6.1 and 6.2 are important table and should be treated in SPM, and TS.	Accepted - table was added to section SPM.3.1 linking emission budgets to radiative forcing and temperature consistent with Working Group I.
40783	SPM	0				For mitigation technologies considered in the report, expected/estimated timing/time frames and costs of deployment and their technological potential should be assessed and included in the SPM. For example, in the AR4 WGIII report Table SPM.4. provided a comparison of key mitigation technologies and practices currently commercially available and those projected to be commercialized before 2030. This is particularly important because many overshoot scenarios heavily rely on the use of BECCS and other CDR technologies, the feasibility of which is not clearly discussed.	Noted. In the underlying report, a comprehensive assessment of different sectoral mitigation technologies and their related costs (levelized cost of electricity, levelized cost of conserved carbon) has been carried out. However, as the intercomparability of this information is limited, it can not be displayed in the condensed manner required for the SPM and is thus not included in this summary document.
40784	SPM	0				Table 6.1 is a very important table which should be included in the SPM and TS as well. However, it should be refined to be more explicit. The following revisions are requested: 1) explanations for each columns (e.g. the timing of the figures in the third column "CO2-eq Conc") and for the table are insufficient and should be added.	Accepted - table SPM.1 was added to section SPM.3.1 linking emission budgets to radiative forcing and temperature consistent with Working Group I.
40785	SPM	0				The SPM does not make clear the relationship between the 2 degree target and the 450 ppm CO2-eq, although it often discusses "stabilizing GHG concentration at 450 ppm CO2eq by the end of the century." Chapter 6 says that "many researchers have used the notion of a 450 ppmv CO2 e concentration goal as a proxy for the 2 degree goal" in the TS (page 13 lines 40-42) and in Chapter 6 (page 22 lines 18-19). The SPM should include a comprehensive table which indicates the relationship among RCPs, GHG concentrations and temperatures (e.g. relationship between 450 ppm and 2 degrees). And as overshoot scenarios are taken into account, information for temperatures should be clarified, such as reference periods for increase in temperature, time horizons for certain mean temperatures, peak temperature in comparison with pre-industrial temperature, and global mean temperature increase above preindustrial at equilibrium for each RCP scenario.	Accepted - we have clarified the text in this regard. Further clarification is provided through new tabel SPM.1.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40786	SPM	0				) The AR4 WGIII report provided a similar table, AR4 WG3 Table SPM.5. However, the AR4 table provides global mean temperature increase above pre-industrial at equilibrium, using ”best estimate” climate sensitivity (degrees Celsius), whereas Table 6.1 provides "indicative 2100 temperature above preindustrial" . "Global mean temperature increase above pre-industrial at equilibrium" comparable with the AR4 table, and the timing when such equilibriums are reached should be provided for each category in an additional column in Table 6.1, and if such figures are not available for the AR5 categories, then the reasons for that should be explained. 3) For the right-most column, it should be more explicitly explained in the chapter text that a majority of the 450ppm scenarios and some of the 550 ppm scenarios newly developed after AR4 are overshoot scenarios, which were not included in AR4; and that therefore, the "indicative 2100 temperature above preindustrial" are based on many overshoot scenarios. At the same time, when (the possibly modified) Table 6.1 is adopted in the SPM , Table SPM.5 from AR4 WG3 should also be cited and juxtaposed, accompanied with an explicit explanation of the differences between the two tables.	Taken into account. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes. Note that WG1 AR5 does not provide a best estimate of climate sensitivity. Moreover, we changed from equilibrium to transient climate sensitivity for policy relevance as explained in the new box Box TS.8.
40787	SPM	0				At the same time, when (the possibly modified) Table 6.1 is adopted in the SPM, Table SPM.5 from AR4 WG3 should also be cited and juxtaposed, accompanied with an explicit explanation of the differences between the two tables..	Rejected. An SPM has no space for such comparison and the tables are not comparable anyway as AR5 switched to the concept of transient climate sensitivity for policy relevance as explained in the new box TS.8.
28283	SPM	0				Although it is said in the beginning that - where possible - results of the SRREN are cited in the AR5, it seems as the role of renewable energy and their mitigation potential is underexposed throughout the SPM and TS, in particular in the chapters on "energy supply". Not only the falling technology costs should be addressed in the SPM and the TS but also the newly added capacities of RE and their mitigation potential (as done in chapter 7).	Rejected
28284	SPM	0				Although it is said in the beginning that - where possible - results of the SRREN are cited in the AR5, it seems as the role of renewable energy and their mitigation potential is underexposed throughout the SPM. Please cite SRREN and the role RE plays for mitigating climate change here prominently, esp. when it comes to the "energy supply" chapter. We suggest highlighting the mitigation potential of renewable energy here as it is also done in chapter 7, page 23 (7.5.3.) "These factors indicate the potential for substantial GHG emissions reduction through many forms of RE deployment". Not only the falling technology costs should be addressed in the SPM and the TS but also the newly added capacities of RE and their mitigation potential (as done in chapter 7).	Rejected. We have a para on renewable energy in SPM, but we do not feel that the proposed language is appropriate.
28285	SPM	0				Avoid references to figures to the next page with turning pages; example: page 7, line 12, reference to "Figure SPM.5".	Noted.
28286	SPM	0				A Summary for Policymakers should be easily to understand - especially the graphs. But many graphs are complicated and hard to understand, simpler graphs should be prioritized. SPM.7, SPM.8, SPM.9: statement unclear; SPM.11 also hard to understand.	Accepted - we simplified text and figures.
28287	SPM	0				Check the main headlines and maybe harmonize TS and SPM, e.g. SPM chapter 4 "Mitigation options by economic sector" vs. TS chapter 4 "Technological and behavioral options by economic sector"	Noted.
28288	SPM	0				Formatting of the explanation-text of the figures: more different to the "continuous text" for better discrimination, e.g. insert the explanation-text of the figures or more distance to the "continuous text"	Comment unclear. We believe that the reviewer refers to the captions. We feel that they are clearly distinguished from the body text/findings of the SPM.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28289	SPM	0				General remark on figures and graphs: some graphs are very complex and not self-explanatory. Also the sub-texts do not really clarify the graphic elements. For policy makers, who have not always a deep insight into the scientific background, these figures might be more irritating than helpful. It might be better to leave out these figures (see comments below) and try to give more concise information in the texts)	Accepted - we simplified text and figures and provide more comprehensive captions.
28290	SPM	0				1.) There is a big focus on the use of CCS technology, while a comprehensive view on renewable energies is missing, which is not balanced and, therefore, not consistent with the mandat of IPCC to be policy relevant, but not policy prescriptive. 2.) The role of nuclear power is illustrated in a contradictory manner. The role as mitigation option plays a very prominent role in the SPM, while at the same time the low costs of nuclear phase out scenarios in comparison to other scenarios are neglected. Also the high economic, social and environmental risks of nuclear power are not mentioned sufficiently enough in the SPM. In some countries nuclear power is not regarded as a mitigation option due to the high risks. Please revise your statements. 3.) Please check the use of the terms "costs", "mitigation costs", "macroeconomic costs", "marginal costs", incremental costs". If some of these are synonyms, please agree on one word. Furthermore, please explain in the glossary und use language in the SPM that is understanbable for non-economists and non experts, e.g. policy makers.	Rejected. The literature since AR4 highlights the importance of CCS as a technology - also in combination with bioenergy. This is not the case for renewable energy sources in the same way. The treatment of nuclear energy is not contradictory. In fact, it is highlighted in the draft that mitigation costs are not so strongly affected by a global phase out. We invested additional efforts to clarify cost concept, but do this mainly in the Technical Summary.
28291	SPM	0				Important policy relevant information from the underlying report is missing, incomplete or badly presented in the SPM (and TS). This includes information on options for international cooperation (effort sharing principles, CBDRRC (include Fig. 6.28 – Fig 6.30 is not helpful), information relevant to the 2C limit, climate finance, role of non-technological options. While avoiding being policy-prescriptive, IPCC should still be policy-relevant.	Noted. The SPM is a selection of findings from 2000 pages of report. There will always be different opinions how this selection should look. Intense discussion on this topic were held with authors on this issue and the SPM changed considerably throughout as an outcome.
28292	SPM	0				It is stated that ethical considerations are considered throughout the report and strengthened since AR4. This intention is however not reflected in the SPM. The SPM contains one single paragraph on ethics, and this contains only questions. Please provide more information on ethical issues, also presenting potential answers to the questions raised. This concerns for example the issue of effort sharing.	Accepted - more information added to section SPM.1.
28293	SPM	0				It would be helpful for all sub-chapters to add a box listing all emission trends and drivers, all long-term mitigation scenarios, etc. classified by degree of certainty / level of confidence in order to quickly realize which results/which evidence is robust and which is uncertain.	Noted.
28294	SPM	0				Labeling some figures with and some without (a), (b), ... is confusing.	Noted.
28295	SPM	0				Many comments we have on the SPM also hold for the TS, and vice versa, but are not always repeated. Please check.	Noted.
28296	SPM	0				Many paragraphs in the SPM do not contain references to the underlying reports. These must be added in each paragraph.	Accepted - references have been carefully checked and added where required.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28297	SPM	0				Needs for climate finance and potential sources of revenue are one of the major topics discussed in the framework of UNFCCC. The WG3 report should provide information on the need of investments, mitigation costs, sources of finance and mechanisms to mobilize capital including (co-)benefits, adverse effects, risks and uncertainties in a comprehensible manner in the SPM (and TS). Currently the information presented in the SPM (and TS) is not presented in a concise manner that would be easily accessible to policy makers. Please provide coherent information for different parameters (e.g. investment needs both for energy efficiency and low carbon energy supply) and in all sectors.	Accepted - more information added to section SPM.4
28298	SPM	0				Perhaps overview of all statements at the beginning or the end of SPM, including estimation of confidence? (= bold text of paragraphs)	Rejected.
28299	SPM	0				Please add uncertainty statement (level of confidence) to EVERY statement (= bold text of paragraphs) where it is possible (for example on page 6 Line 14: "Human settlements accounted for 75-81% of global CO2 emissions between 1990 to 2008. (XXXX)")	Rejected - where appropriate, findings are also formulated as statements of fact without using uncertainty qualifiers. This is consistent with the IPCC guidance note on the consistent treatment of uncertainty. Your example, though, deserves an uncertainty qualifier. It was added.
28301	SPM	0				Please define carefully in the SPM (and in the glossary) what is meant with technical expressions like climate finance, mitigation costs, marginal cost, incremental costs, investment etc. This is vital for non-experts, policy maker, and the public in order to understand the basic messages of this report.	Accepted - box TS.14 covers these aspects in the Technical Summary.
28302	SPM	0				Please provide information on the uncertainty language including a figure 1 from the "Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties IPCC Cross-Working Group Meeting on Consistent Treatment of Uncertainties, Jasper Ridge, CA, USA 6-7 July 2010." Clear and coherent information on the uncertainty associated with each major statement is essential for policy makers. In addition, the use of uncertainty classifications does not seem consistent.	Accepted - footnote 1 explains the use of the uncertainty language.
28303	SPM	0				Please to limit sentences to a maximum of two lines to focus much better the statement. This would greatly improve readability und usability, in particular for policy makers. (Example of a too complicated sentence page 8, line 8-10: "The balance of evidence suggests that the appropriate response to most of the relevant uncertainties is to accelerate mitigation efforts compared to what would be most appropriate in the absence of such uncertainties.")	Noted.
28304	SPM	0				Please revise the description of the spectrum of policy approaches. Aside from its rules-based structure, the Kyoto Protocol has targets that are set by the individual nation states largely themselves (with the modification of Art. 3.7ter now for CP2). However, this is far less "centralized" than for example a formulaic allocation regime approach would suggest, in which each country receives a specific target based on a set of agreed indicators. Secondly, the second approach is commonly discussed in the international arena under the key word "policies and measures" which should be included here. Thus, the text on lines 31ff should read something like "At one of the spectrum is strong multilateralism, whereby countries and regions agree to mutually binding rules or standards to guide their actions, for example with a single formulaic allocation based approach of linearly converging percapita emissions. A more flexible approach is to keep mutually binding rules, but to allow flexibility in regard to the target setting - with the Kyoto Protocol being an example of such an approch. A less-centralized approach would structure international cooperation around policies and measures, i.e., harmonized national policies, where national or regional policies are made compatible through, for example, harmozed carbon taxes, cap and trade schemes, or standards. "	Taken into account - we added more information on these aspects to section SPM.4.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28305	SPM	0				The aspects of behavioral changes are neglected in the SPM. Please include Ch 3, p 8, lines 1-3 ("Achieving strong mitigation will require major technological, STRUCTURAL and behavioral changes. Markets, left 1 to their own devices, will underprovide technological change, even in the presence of a carbon price. 2 Studies suggest that environmental and technology policies work best in tandem.") in the SPM. This statement could be included in SPM-Section 3, or SPM-Section 5.	Taken into account. We have highlighted the role of technological and behaviroural options in Section 3.1 and 3.2 and the underlying institutional requirements for ambitious mitigation. SPM.4 discusses the interaction between market-based instruments and technology policies.
28306	SPM	0				The conditions of the scenarios need to be explained in a comprehensible manner in the SPM to be useful for policy makers. For example, is the current debate on economic growth included? Which parameters have been considered for human well being (GDP or others?), which policy options and behavioral changes are taken into account? All results on future mitigation option depend on such assumptions and the underlying assumptions must be outlined in a transparent manner for the sake of the credibility of the report.	Taken into account - though the severe space constraints put a limit on our freedom to cover all these apsects in the SPM. The full report, however, does.
28307	SPM	0				The order of the issues discussed (esp. ch. 2 and 3) does not seemed to be structured well throughout all chapters in the SPM. Topics are raised several times and are not set in context. Also reader is confronted with specific findings (e.g. chapter 2) which offer new insights, but there is no introduction into the issue or further background offered. This should be improved to allow for better accessibility of the document.	Noted.
28308	SPM	0				The role of renewable energy in solving a set of challenges (mitigation, energy supply and access to decentralized energy) is not well represented in the SPM.	Rejected. RE are covered equally as other supply side options. CCS and BECCS gets special attention due to its particular role in ambitious mitigation as highlighted in the literature since AR4.
28309	SPM	0				The results presented in the SPM must be put into context, advantages and disadvantages, risks and uncertainties should be communicated, for example when presenting different technological mitigation options. Findings must be qualified and backed up by scientific evidence including information from past experience in a comprehensive way. The presentation of the results in the SPM would greatly benefit from putting them into context of previous experience or other options, or helping the reader with interpretation, what a statement actually mean for practical purposes.	Accepted - text revised.
28310	SPM	0				The SPM is still similar to the TS in language and technical detail. The issues raised could be brought up in a more consistent way, by cross-referencing and by clustering results which were generated in different sections of the report (e.g. the dimension of risks relating to a number of options to mitigate or to transform the economy). For policymakers language should be less technical and more illustrative.	Noted.
28311	SPM	0				The SPM (as well as the underlying chapters) is missing detailed information on one important part of the recent scientific literature. Namely the question what kind of gap there is in 2020 between pledged emission levels and cost-optimal pathways to stay below 2C with a likely chance. The current paragraph on page 11, lines 27ff is too short, not directly related to 1.5C and 2C, and unclear in regard to the broad literature overview...	Rejected. The issue of relationship between short and long-term action is highlighted in the summary. The concept of emission gaps is not used due to concerns about its scientific robustness. Instead a notion of foreclosing options and differential transition dynamics is used.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28312	SPM	0				The SPM provides incoherent regional information for various parameters, as different region sets are used. Please use consistent regional groups, in particular in the SPM (Fig. SPM.1 should be adapted to the sets used in Figs SPM 2 and 3) so that these figures can be compared.	Rejected. The adequate regional grouping depends on the underlying scientific question.
28313	SPM	0				The SPM suggests that limiting global temperature increase to 1.5 or 2C requires CCS (BECSS) or CDR technologies, if mitigation action is delayed. This is repeated many times, but the fact that these technologies are not yet available - and that some might never be - and the associated risks are much less emphasized or ignored. This optimistic view on technological feasibility is not in line with the mandate of the IPCC to be policy relevant but not policy prescriptive.	Rejected. The text continues to highlight that the scale and availability of this technology is uncertain. Associated risks are highlighted.
28314	SPM	0				To increase usability of the report, the regional information provided in the SPM should be accompanied by information on the countries pertaining to the different regions sets presented, at least in a footnote. For transparency reasons, a clear reference to explanations for the choices of sets should be added. In addition, comparability of regional information across WGs should be optimized, as agreed at the 31st IPCC-Session in Bali, when „Regional Aspects“ has been defined as one of the „Cross Cutting Methodology“. The SPM provides incoherent regional information for various parameters, as different region sets are used. Please use consistent regional groups, in particular in the SPM (Fig. SPM.1 should be adapted to the sets used in Figs SPM 2 and 3) so that these figures can be compared.	Rejected. Regional groupings are transparently outlined in the Annex of the report. Having multiple footnotes with more than 200 countries and regions would not be feasible.
28315	SPM	0				Under UNFCCC, 1990 is the base year for reporting of national inventories of GHG emissions, and Parties have agreed to limit warming to below 2 C compared to the pre-industrial level. Therefore, information provided by WG3 on emissions reductions and related global temperature increase should be provided compared to the 1990 or to pre-industrial conditions, as appropriate. This would also ensure coherence across Working groups and increase comparability with prior IPCC assessments.	Noted. Our standard reporting is 1970-2010 in line with available data of global emission databases used in the literature. This contains 1990, which is highlighted in many emission figures throughout the report (e.g. Figure SPM.1).
28316	SPM	0				Within the SPM it is highlighted that technological improvements/innovations will be the most dynamic contributors for climate protection. In our view, this is not consistent with the increased importance of “social/cultural/behavioral changes” outlined in various parts of the chapters. There is empirical evidence that beside a strong technological path towards better climate protection there is a potential part of society (20-30%) which considers at least some options related to lifestyle changes by looking also to non-technological solutions. Therefore, it would be good to insert aspects and potentials which are related to the discussion of a “collaborative economy” (which is still juvenile in the present, but will grow in the next decade or so at least in developed countries) in relation to climate protection potentials and social/economic effects.	Noted.
29013	SPM	0				SPM covers a lot of useful ground, but stylistically not very accessible to the non- specialist in places. Still rather laden with jargon for an SPM and some paragraphs seem overly wordy. Similarly many of the figures in the SPM make considerable demands on the non-specialist reader, to the extent that it is hard to know what lesson is to be drawn from them.	Accepted - we simplified text and figures and cut out redundancies.
29014	SPM	0				An overview of the Summary would be helpful, perhaps a one-page set of headline messages for policy-makers, along the lines of: - What is the scale of mitiation required and timescales - what does the science say are the most effective forms of mitigation for different sectors and contexts - what mitigation potential is being exploited and what isn't (and what are the barriers which need to be overcome) - in what areas is more research needed	Rejected. We discussed this in the author team, but could not agree on this.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29015	SPM	0				It would be useful in the SPM to highlight new evidence from the previous report.	Accepted - we strengthened the focus on evidence that is new since AR4.
29016	SPM	0				Frequent reference throughout to 450 and 550 ppm goals, with a preponderance on 550ppm. Firstly these are not recognised goals or targets – they could perhaps be referred to as “stabilisation levels” and secondly reference to 550 ppm CO2 Eq alone seems to imply IPCC endorsement. Perhaps this could be clarified in the introduction OR in para at line 33 on page 9.	Accepted. We changed the language to stabilization levels. We provide a new table SPM.1 to link emission budgets to radiative forcing and temperature changes for different categories of forcing and refer more cleanly to these categories in the revised text.
29017	SPM	0				Figure SPM.2, 3,4 and 5 – all focus on fossil CO2 – but it would be better from a policy point of view to have the pictures with all GHGs and Land use emissions/uptakes. The atmosphere does not ignore them – so why should we. Also from a policy viewpoint there are important policy lessons here which are unfortunately partial because all emissions have not been taken into account. This has implications for the associated narrative	Taken into accout. We have revised the figures trying to establish a better balance, but note that the growth in fossil-fuel related CO2 emissions has contributed by far most to changes in GHG emissions since AR4.
29018	SPM	0				Would be useful to have a diagram/ figure of historic emissions by sector/gas in the SPM.	Noted. Both were and still are included in the report.
29019	SPM	0				The focus is very much on the 1.5 to 2.0 degree rise, and yet, as the report itself says, these would require 'progress of a scale and pace that is unprecedented in human history'. Thus the question of the costs of failing to meet these targets is probably the most important one we face, but is not addressed by this report. This seems to me to be an obvious weakness: the report's relevance will become overtaken by events very quickly.	Rejected. This is a highly relevant question, which can only be answered by bringing together evidence from the different Working Groups. The synthesis report will therefore deal with this question.
29020	SPM	0				The document doesn't give much sense of which sector/ intervention is most important to reducing emissions overall. The description of intervention by sector would be greatly improved if the volume of the described affect, and its units, could all be placed on a similar footing. It is hard, as written, to get a sense of the priority with which to think of sector interventions. For example, transport is described in terms of gains in fuel consumption, houses in terms of energy requirements.	Taken into account. We provide cross-sectoral evidence from integrated models. Sectoral potentials and costs cannot always be provided on the same footing. The author team could not agree to accept the strong assumptions that would be required to do so. It is felt that multiple metric provide scientifically more robust information even though it makes comparisons more difficult.
29021	SPM	0				The terms 'pathway' and 'scenarios' are used ambiguously in more than one sense. There are greenhouse gas 'pathways' and temperature 'scenarios' on page 9 of the SPM, whereas p. 15 refers to 'socio-economic' pathways. It also not clear from occasion to occasion whether these 'pathways' are assumptions or modelled outcomes.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29022	SPM	0				SPM, in the para at the bottom of page 20. 'Sustainability and livelihood concerns might constrain deployment levels. Achieving such levels would require, among other options, extensive use of agricultural residues and second generation bio energy..'. I think I am right in saying that the levels in the second sentence are not the constrained levels of the previous sentence, but I'm not sure; they might be. If things are 'required', how can they be also 'options'. I myself don't know what an agricultural 'residue' is - manure? - or what makes a biofuel 'second generation'.	Accepted. We have clarified the language.
29023	SPM	0				In a few places the it could do with bringing to life a bit more to be more helpful for policy-makers, perhaps by use of examples or case studies. For example while IPCC probably won't wish to make recommendations for overcoming barriers, simply highlighting that they exist isn't particularly helpful. Case studies or concrete examples of barriers and how they've been overcome by use of particular interventions in particular contexts (e.g. use of behavioural economics) might provide a bit more food for thought for readers.	Noted. Doing so within the word limit of a SPM might be difficult though.
29024	SPM	0				Its a shame that the health sector is not mentioned - maybe they are not aware of the research that has been done in this area and the huge gains to be had - eg the fourth largest organisation in the world? see NHS Sustainable Development Unit's work, with David Pencheon. (Supply chain / procurement strategies for organisations do not seem to be mentioned - these emissions make up 60% of the NHS Carbon footprint.)	Noted. We are aware of this topic, but it was felt by the auhtor team that it is not a major one that deserves attention in an IPCC summary document.
25109	SPM	0				Please insert Table 6.1 of Chapter 6. In doing so please clarify the following points, especially in comparison to Table SPM5 of AR4/WGIII. 1) The last column of the Table 6.1 shows indicative "2100" temperature increase above preindustrial level, whereas 5th column of SPM.5 of AR4/WGIII shows "equilibrium" temperature increase above preindustrial level. What I understand is that the climate sensitivity remain unchanged between AR4 and 5. In this connection it is absolutely necessary to have "equilibrium" temperature increase for each category in order that readers can compare those two tables. 2) Also clear explanation is necessary whether radiative forcing, CO2eq concentration of Table 6.1 is at 2100 or at equilibrium. I would imagine those are at 2100, as CO2 concentration is clearly shown as 2100 concentration. (Also I would imagine radiative forcing, CO2 and CO2eq concentration in SPPM 5 of AR4/WGIII are the ones at equilibrium). 3) Please add a column showing the situation in 2050 (same as Table SPM5 of AR4/WGIII. 4) That said, my question is as follows; In Cat.1 of Table 6.1, 2100 temperature above pre-industrialiation is indicated as 1.3-1.7, while Category I of Table SPM 5 of AR4/WGIII shows equilibrium temperature increase above pre-industrialization as 2.0-2.4. What I would like to know clearly is that 1.3-1.7 increase at 2100 will become 2.0-2.4 at the equilibrium at later years or not. Though there are minor differences, all other figures are almost the same between Cat. 1 or Table 6.1 and Category I of Table SPM 5 of AR4/WGIII, especially when climate sensitivity remain unchanged between AR4 and AR5. If not, what are the reasons. Without clear explanation, either SPM Table 5 or AR5 Table 6.1 may become incorrect. This is the crucial point for the credibility of the IPCC report.	Taken into account. We provide a new Table SPM.1 that links emission budgets to radiative forcing and temperature changes. For the latter AR5 applies the concept of transient climate sensitivity in line with the underlying literature. This is more policy-relevant for the current discussion in international climate policy. We added a box TS.8 to explain this in detail.
25110	SPM	0				General impression of the figures are rather hard to understand for non-experts including policy makers. Policy makers may read only SPM. Take Figure SPM 10 for example. Readers may wonder what are Contraction and Convergence or Common but differenciated Convergence. Also why consumption losses of India for C&C and CDC are so different among 3 models. If those figures are pasted on each chapter, this does not cause any problem because readers are expected to be, to some extent, experts. But SPM is different. If possible, it is better to make figures more friendly to ordinary readers by, for example, adding notes.	Accepted - we simplified figures and text.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23926	SPM	0	0	0	0	The SPM/the WG III AR5 report lacks any information how the various story lines related to the emissions scenarios assessed relate to the actual development of the world since 1990. However, such comparison would be quite useful information and it would help to identify the actual barriers that need to be overcome in order to change the current development path into a more sustainable, low GHG emission path way.	Accepted. We have added a sentence in SPM.2 how recent emission trends (2000-2010) compare with projected levels. Moreover, we provide an estimate of radiative forcing levels in 2010 consistent with the concepts applied in the scneario part.
23927	SPM	0	0	0	0	The SPM/the WG III AR5 report lacks more detailed information on a business as usual scenario - it would be useful to consider the full range of business as usual scenarios and the underlying assumptions. This would help to understand better the changes required in order to move towards emission reduction scenarios and the associated barriers that would need to be addressed.	Accepted. We have added a finding on baseline scenarios at the end of section SPM.2.
23928	SPM	0	0	0	0	The SPM is missing any analysis to which extent Parties/regions are actual living up to their pledges as defined under the Cancun agreement. This would be very policy relevant information without being policy prescriptive.	Rejected - the IPCC's mandate is to assess the scientific and socio-economic literature on climate change. It is not our mandate to monitor the fulfillment of political pledges.
23929	SPM	0	0	0	0	Information on actual investments in mitigation options and their actual contribution to emission reductions in the past 20 years would have been very helpful and policy relevant - unfortunately such information has not been included in the SPM of the AR5 WGIII report.	Taken into account - more information on investments has been added to section SPM.4.
23930	SPM	0	0	0	0	Given the lack of information addressed above related to GHG emissions it seems difficult for the WGII report to inform about the possible impacts of climate change in the medium term and by the end of the 21 century under a business as usual scenario. How can the IPCC motivate decision makers to invest more in deployment of mitigation technology if the IPCC AR5 will not demonstrate the added value in terms of avoided climate change impacts?	Noted - information from both WGII and WGIII are brought together in the Synthesis Report.
23931	SPM	0	0	0	0	This SPM is quite about the overall carbon budget that would be consistent with meeting a given temperature target and how fast we are consuming that budget under various scenarios, including business as usual scenarios. It is strongly recommended to include such policy relevant information.	Accepted. The new table SPM.1 in section SPM.3 adds such insights - consistent with information from the Working Group I assessment.
23932	SPM	0	0	0	0	It might be policy relevant to compare emission reduction plans (e.g. for the year 2050) with the emission reduction scenarios of the AR5 in order to identify in which direction countries are planning to move in the future and to allow for a comparison how these plans match with the 2 degrees targtet or even an 1.5 degrees target. In addition it would be policy relevant to identify not only the gap/gaps (by region or globally) but also the various potentials and their costs/their barriers etc.	Noted. The IPCC assesses the available literature. Information on emission pledges by countries in 2020 are included in discussions on long-term mitigation pathways.
23933	SPM	0	0	0	0	It would be very policy relevant to compare the current/planned efforts of regions against relevant indicators that have been identified as being relevant in the context of the consideration of equity.	Taken into account - added more information on effort sharing and equity considerations to section SPM.3.1.
23934	SPM	0	0	0	0	The current wording/information is neither very user-friendly nor easy to comprehend for policy makers. This may significantly reduce the impact of the WG III in the real world. It is strongly recommended to work hard and to translate the results into e.g. concepts and metrics that are already well established and have been used also by WG I or AR4 in the past.	Accepted - language was simplified and metrics unified.
23935	SPM	0	0	0	0	It is strongly recommended to screen the information included in the SPM with respect to its policy relevance given the recent development since 2010 - some of the findings might be outdated.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23936	SPM	0	0	0	0	It seems important to better link the actual development in the real world (e.g. shift of production of goods to emerging economies, population growth in mega cities etc., population growth in Africa, etc with the story lines that underpin the emission scenarios that informed the WG III report.	Noted. We have strengthened the links between historic trends and future scenarios - particularly in sections SPM.2 and SPM.3.1.
23937	SPM	0	0	0	0	It would also be very policy relevant to better describe past trends since 1990 in various regions, identify in the AR5 the drivers of the development since 1990 and highlight the required changes that would move us to low GHG emission scenario. Any findings related to the likelihood of meeting/not meeting the 2 degrees goal/a 1.5 degrees goal would need to be underpinned by such more in depth information.	Noted. Regional emissions and their underlying drivers are mainly highlighted in the description of historic trends. There are rigid space constraints in a SPM for a regional discussion. The underlying report contains a lot of regional information.
23962	SPM	0	0	0	0	It is noted with concern that the SPM fails to identify the most relevant barriers to reduce GHG emissions in a more speedy manner. It is quiete why fossil fuels are still explorated although much more proven reserves are avialable than are coherent with a 2 degrees target. It would be very much apprecaited if some information is provided on the most relevant barriers.	Noted - added more information on barriers to section SPM.3.2 and SPM.4.
23963	SPM	0	0	0	0	Unfortunately the SPM also does not assess how the barriers to reduce GHG emissions faster than in the past could be overcome and how existing policy instruments could be strengthened in order to increase their effectiveness. Again such additional information should be included in the SPM given its relevance for the policy level.	Noted - added more information on such barriers to section SPM.4.
40873	SPM	0	0			In general, it should be further emphasized that AR5 doesn't indicate appropriateness of 450 ppm or 550 ppm as policy objective/target. Such note appears on SPM page 9, but further emphasis would be very much appreciated.	Noted
28280	SPM	0	0	0	0	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY - “Feasibility” of staying below 2C The SPM misses a paragraph that explicitly addresses the technical feasibility and mitigation-related economic implications of staying below 2C with a likely chance. Furthermore, the technical feasibility and economic implications of returning to 1.5C by the end of the century ought to be discussed in order to support the international policy making debate (without being policy prescriptive). This paragraph could be sourced from material in FAQ 6.1 and FAQ 6.3. The information should be mainly derived from the RCP2.6-like scenarios (i. e. Cat 0 and Cat 1) which present, according to the information provided in WG1, an approximately likely chance of staying below 2C (certainly more than 50:50%) and might imply a 50:50 chance of returning to 1.5C by the end of the century. Thus, please provide a concise statement in the SPM in regard to the technical feasibility and economic implications related to mitigating climate change to 2C and 1.5C in order to support the international deliberations on this issue. Currently the WG3 report seems quite pessimistic about the feasibility of low emissions scenarios as it states e.g. in the SPM that limiting global temperature increase to 1.5 or 2C requires CCS (BECSS) or CDR technologies, if mitigation action is delayed (SPM, p 210, l 22). These two related options are presented without sufficiently explaining the underlying assumptions, for example about the incentives for emission reduction or infrastructure requirements, or information on how to overcome barriers. Please give a more balanced and neutral message.	Rejected. Working Group III does not assess feasibility, which is a binary concept. Instead we are trying to lay out the economic, technological and institutional requirements of alternative long-term atmospheric stabilization levels. Further note that the literature on 1.5°C integrated scenarios is extremely limited and does not provide a basis for a comprehensive assessment. Information about the requirements and risks of bioenergy, CCS and BECCS are provided and have been largely retained in the new draft.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28281	SPM	0	0	0	0	THIS IS ONE OF THE HIGH PRIORITY COMMENTS OF GERMANY - Options of international cooperation The SPM notes the importance of international cooperation for reaching ambition emission reduction targets, but misses to present a differentiated consideration of different options of international cooperation. This information is however essential in the context of considerations of Parties to the UNFCCC, for example in the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) on the design of the new agreement. Different approaches and instruments (e.g. concepts of efforts sharing, equity considerations, institutional change, carbon market etc.) and their implications (pros/cons, risks, uncertainties, costs, SD) should be presented in a comprehensible and balanced way. In this regard, please revise the description of the spectrum of policy approaches in the SPM, p 22. Furthermore, please present the Kyoto Protocol in a balanced manner. Aside from its rules-based structure, the Kyoto Protocol has targets that are set by the individual nation states largely themselves (with the modification of Art. 3.7ter now for CP2). This is far less "centralized" than for example a formulaic allocation regime approach would suggest, in which each country receives a specific target based on a set of agreed indicators. Secondly, the second approach is commonly discussed in the international arena under the key word "policies and measures" which should be included here. Thus, the text on lines 31ff should read something like "At one of the spectrum is strong multilateralism, whereby countries and regions agree to mutually binding rules or standards to guide their actions, for example with a single formulaic allocation based approach of linearly converging per capita emissions. A more flexible approach is to keep mutually binding rules, but to allow flexibility in regard to the target setting - with the Kyoto Protocol being an example of such an approach. A less-centralized approach would structure international cooperation around policies and measures, i.e., harmonized national policies, where national or regional policies are made compatible through, for example, harmonized carbon taxes, cap and trade schemes, or standards." In this context, we suggest correcting Fig. 13.2 and deleting it in the SPM and TS.	Noted - revised text in section SPM.4. Added more information on different options for international cooperation.
28282	SPM	0				Agriculture, Forestry and Other Land-Use (AFOLU): The possible interactions or even conflicts of mitigation options, like e.g. large scale afforestation, "carbon optimized" land-management etc. with the targets of the Convention for Biological Diversity (CBD) should be taken into account. The uncertainties related to land-use, land-use change and forestry are a major factor to be taken into account where research and measures for mitigation but as well for adaptation options are concerned.	Noted. These aspects are covered in the underlying chapter text.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28300	SPM	0				Overall, the SPM reads very technical and is not at all easy to digest. Many paragraphs have to be read more than once to be understood. The reader loses appetite to read till the end if it is so cumbersome. The graphs do not facilitate understanding but provoke the opposite. The vast majority of graphs are too small (e.g. SPM.5, SPM.6, SPM7, etc). Several grapsh are definitely not understandable to a non-scientist (e.g. SPM.7, SPM.8). Some graphs are of a nice size and easy to understand, but do not convey any new or important assessment result (e.g. SPM.14, Table SPM.1). In general, it would be helpful it there was in interpretation of the results of the graph/table in the text and not only the key to the graph. Please, indicate where results are new/different to AR4 results. Most of the Summary reads as if this was the first AR ever written. The AR5 is an up-date of the AR4. It is important for policymakers to know how knowledge evolves. If human knowledge on a certain subject did not change, then state so and reference back to the AR4. It is not necessary to present the full subject again. Space should primarily be devoted to findings that are new in the literature.	Accepted - text and figures are thouroughly revised to make them easier to understand. The focus shifted on evidence that is new or that changed since AR4.
35191	SPM	0				The current storyline of the SPM is neither complete nor balanced. It fails to reflect key viewpoints from Chapter 2, 3 and 4, especially those on ethics, equity, sustainable development, historical responsibilities of developed countries and the differentiation between developed and developing countries. It is strongly recommended that: 1) These key framing issues mentioned above should serve as the fundamentals to develop the SPM, and should be sufficiently addressed in different sections of the SPM. 2) Interrelations between the above key framing issues and substantial topics including emission trajectories, transformation pathways, suitable conditions for technology development in each sector, mitigation potentials and costs, and institutional policies should be clearly established and thoroughly discussed, especially when addressing finance and technology transfer issues.	Accepted - evidence on 'framing issues' added to section SPM.1 and elaborated in relation to past emission trends, and mitigation pathways and measures and policies in subsequent sections SPM.2 and SPM.3.1 and SPM.3.2 and SPM.4 respectively.
35213	SPM	0				The language used in SPM should be clear and friendly to non-English native speakers.	Accepted - language simplified.
40984	SPM	0				While there is an attempt to balance the section by summarising mitigation scenarios from Chapter 2, Chapter 3 and to a limited extent from Chapter 4, this section mainly summarises outcome of Chapter 6 of AR5 WG-III. This is in a way imbalance as the discussion spans overs 6 pages of SPM (over 25%). This section appears not reasonably structured. Each of the sub-section appears stand-alone and greatly disjointed. Sections largely reflect quoting from Chapter 6 of AR5 WG-III.	Rejected. Chapters 2,3 and 4 are supposed to frame the report. Empirical evidence is presented subsequently. Chapter 6 receives a lot of attention as it summarizes the vast literature on long-term mitigation scenarios.
25458	SPM	1		25		consider deleting those which have "low evidence, low agreement"	Rejected - there can be also insight that is uncertaint but policy-relevant nevertheless.
25459	SPM	1		25		some of the headlines have no evidence or agreement	Noted - please note that the IPCC uncertainty guidance note on the consistent treatment allows for the expression of statements fact where appropriated.
25462	SPM	1		25		Somewhere at the beginning we need to define what "near term" etc mean ie. what sort of time frame? It is important for policy makers.	Taken into account - please note that the definition of such terms varies hugely across literature sources.
20077	SPM	1				The SPM structure (emissions, long term scenarios, mitigation options per sector, options by governance level. Appears far clever that the WGIII general structure	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22450	SPM	1				Could better inform policymakers about alternative options (not only 450/550ppm). Lack of information on 1.5 or 3-5C mitigation targets, at least one or two sentences indicating the direction of costs, benefits, risks, side-effects, co-benefits etc. SPM should also indicate possible role of sinks and geo-engineering for mitigating climate change (do not only mention emission reductions). Moreover also technological risks/side-effects (and manifold distributional effects) should be pointed out more explicitly in the SPM in order not to be biased (not only co-benefits). Sector chapters should be better integrated. Insufficient information on possible contribution of each sector to mitigation in general (relative to other sectors). Change sentences (in SPM and particularly in TS!) which suggest a theory of values in the tradition of logical positivism/empiricims: “there is no best policy” (two times), or “subjective” values, “no correct ethical perspective", etc.	Taken into account - text revised.
25975	SPM	1				The language of the SPM is a bit detached; when one reads the main report the conclusions are shown to be really important, but the SPM doesn´t highlight them. Where is the journalistic style? Summaries need to be cogent, even more when they are aimed at decision makers. TSM should be written in a way to preempt deniers´ misuse of the statements. Grahs are visualy not easy to read.	Accepted - text and figure revised.
25523	SPM	1		25		On page 3, line 13, the importance of providing the perspective of "risk management" is highlighted. The rest of the SPM actually doesn't do a very good job at providing such a perspective. For example, results are reported as binary options to fall within a certain category of mitigation scenarios (or as feasible vs infeasible). Instead, providing information on trade-offs would be a clearer way of providing this risk-management perspective. Probably, it is quite late right now to still reframe much of the analysis, but I just wanted to highlight that the SPM is currently rather inconsistent in this aspect.	Taken into account - text revised.
33554	SPM	10		10		The heading in the right panel is not appropriate, optimal or delayed measures is just one possible assumption, so we propose to replace it by: "Timing of policies".	Noted. Figure has been removed.
33555	SPM	10		10		This figure is complicated. We think it is visually confusing to show three categories and propose to limit it to any of these three.	Noted. Figure has been removed.
22816	SPM	10				as the 550ppm scenario is mentioned in the text, it would be good to include it also in the figure	Noted. Figure has been removed.
28452	SPM	10				Are the emission pathways referring to CO2 or CO2eq?	Noted. Figure has been removed.
28453	SPM	10				he difference between the left and right panel is not clear. The scenarios must be explained (different policy (or which other) options tested? have all scenarios been considered? are the results (e.g. peak year dependent on the choice of the scenarios?). The categories must be explained (related to the stabilization concentration?). The ends of the small arrows do not correspond to the associated text. What does delay mean (how many years)?	Noted. Figure has been removed.
29043	SPM	10				It would be good if the SPM could include information on the estimated ranges of some key economic parameters that fall out from the analysis presented. Notably, what is the mean and range of the global carbon price for key years (2030, 2050, 2100) for the different CO2e emission pathways for the different scenario categories (as presented in Figure SPM.6); what is the mean and range of the global prices of oil, coal and natural gas associated with these different emission pathways for the different scenario categories? This would help the policy maker assess how realistic it is that certain mitigation actions noted in the text (see e.g. those given in sections SBM.4.2.3 and SBM4.3) will be commercially viable by the dates given.	Rejected. We provide different types of information regarding technologies, emission pathways and costs throughout the SPM. It is not easily possible to summarize everything in one place cleanly.
29044	SPM	10				levels seem very low and not consistent with Figure SPM1. Are these graphs for fossil fuel CO2 alone? Would be best to have all gases and include land use too. (same point for SPM 8 on pg12)	Noted. Figure has been removed.
25119	SPM	10				To make the figures more readable, make this figure into 2 separate figures.	Noted. Figure has been removed.
31274	SPM	10	1	10	7	Comparing macroeconomic cost of mitigation to cost of inaction and to co-benefits of mitigation policies would add some nuance to the analysis. Thus paragraphs dealing with co-benefits should be placed close to this paragraph rather than on page 12.	Rejected. Costs of inaction are already mentioned for a given mitigation goal. We have a seperate finding on co-benefits.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30625	SPM	10	1	10	7	Suggest the flow of information in the SPM would improve if this paragraph were moved to be adjacent to other paragraphs about costs of mitigation on page 11. For example, these lines could precede the paragraph currently on lines 1-8 on page 11.	Noted. Section was completely re-written.
20083	SPM	10	1	10	7	Here the mention of the 4% GDP loss ins perhaps not enough. In a consumption approach, could the consequence of a +2°C stringent climate policy on lifestyles be required. For instance cost of energy, size of habitats, meat in diet, rate of car ownership. Readers must become aware of the nature of societal transition required, and GDP reflects that badly	Rejected. We describe the transformation throughout the section in various dimensions including technologies, changes in energy consumption habits, risks, costs and institutional requirements. This should not all be mixed up in one paragraph.
23717	SPM	10	1		7	Again, the key point here is that the economic ("net cost") results as reported in section 6.3.6 are not the net costs of mitigating climate change simultaneously with achieving other SD goals, which is the type of mitigation scenario recommended by the report taken as a whole. Namely, achieving goals such as the elimination of poverty with less income inequality, in addition to mitigating climate change, might yield very different macro-economic futures for the world from those that any IAM currently models, and might yield significant increases rather than decreases to GDP, and other economic indices. So why only report to the global community the results for rather "bare bones" mitigation scenarios that are not recommended on page 10 of the SPM, lines 1-7? Also, as we discuss below, these economic results are unknowable and do not meet the "medium confidence" criterion for inclusion. If you still feel a strong need to report these partial economic results for "bare bones" mitigation scenarios, we would, at most, report them in section 6.3.6 only, and not in the SPM and TS. Moreover, the interaction with other parameters, such as future life styles and more equal living conditions between regions, has to be stressed. So far the report still differentiates sharply between industrialized and developing countries as a given fact, and does not provide for the perspective of economic convergence between regions.	Rejected. We have a seperate finding, which highlights the macro-economic costs under multiple objectives as they can be currently found in the literature. There will always be more comprehensive system boundaries to an analysis. Therefore we clarify what the reported costs are. We have added a box on macroeconomic costs to the TS.
33549	SPM	10	1	10	7	We would prefer to have the cost of concentation pathways expressed in the same metric, so please express the cost of 550 ppm also as a % of GDP.	Noted. We have comprehensively revised the finding.
30445	SPM	10	1	10	3	Specify the costs of "less than 4 %" by including the information from chapter 6 (section 6.3): "macroeconomic costs of 2%-4%". Are "macroeconomic" costs including possible co-benefits and if so which co-benefits? This should be clarified in the SPM. Also, which year do the costs refer to?	Accepted. We report cost ranges in the revised finding. We added a box on macro-economic costs to the Technical Summary with background information.
22875	SPM	10	1	10	3	Replace "adantageous" by "most idealistic"	Noted.
21512	SPM	10	1	10	7	This statement is unclear. What does less than 4% GDP mean (global, compared to a certain year, or per year)? Probably this is compared to baseline growth projections. The statement should also be changed to cover the full range as given in the technical summary on page 21 (Figure TS 12) which suggest a GDP loss between 1 and 3 % (NPV 21015-2050). Actually Figure TS.12. should also go in the SPM (adapted to take into account similar comments as those given for SPM.7). Whereas SPM.7 is a sensitivity analysis while Figure TS. 12 is the main result. Can the increase in growth be given over time in the baseline, to compare order of magnitudes? Similar to 4AR which gives also impact on terms of annual average reduction in growth rates (see Table SPM.4 page 12, Climate Change 2007.Mitigation of Impacts, WGII).	Accepted. We report cost ranges in the revised finding.
34252	SPM	10	1	10	3	4% of GDP is a lot! This means, that economies with a growth rate of smaller than 4% GDP has to accept cuts in their spendings. And this is even the lower estimate.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34258	SPM	10	1	10	3	Questions: 1. How high would be the expected damage? Greater/less than 4% GDP? 2. How high would be the costs for doing no abatement, but focusing all investments on replacing infrastructure near costs, that will be flooded and so on?	Rejected. This is a question answered by Working Group 2. The synthesis report will bring the insights from Working Groups 2 and 3 together.
26721	SPM	10	1	10	7	This is the first message on costs. There are several other messages on costs and modeling at different places in the document. Some of them indicating that the costs for climate action should consider also possible co-benefits and that there are also other factors that could reduce costs. The messages on costs therefore seems to be somewhat contradictory.	Rejected. The discussion on costs has many dimensions. We try to summarize the evidence truthfully across these dimensions.
23101	SPM	10	1	10	7	The use of a 5% discount rate and the projection of a reduction in GDP of "less than 4%" do not belong in this study, for reasons described in comments on the economic framework described in Chapter 3. That is, such analysis concludes that mitigation will reduce GDP only because it assumes that growth can continue unfettered in spite of severe environmental change and that economies are currently on an efficiency frontier.It also equates well-being with consumption alone. Stating that mitigation will require suffering costs places questions of mitigation into a misleading--because marginalist, consumption-only, narrowly economistic, and based on extreme assumptions--framework, when it should instead be framed as an urgent situation of global survival. The IAM discussion in Chapter 6, and the summary of it here, should both be eliminated from the report.	Rejected. We further clarified what the costs discussed in this report are - particularly by adding a box on macro-economic costs in the Technical Summary.
23819	SPM	10	1			A one of 4% hit to GDP, or a 4% hit in every year?	Clarified the language.
23949	SPM	10	1	10	7	It seems important to put the value of 4% of GDP into context - eg. By informing about current investments in the energy system, in mitigation technologies.	Accepted. We have further strengthened information on investment, but placed those in SPM.4.
22726	SPM	10	1		7	Again, the key point here is that the economic (“net cost”) results as reported in section 6.3.6 are not the net costs of mitigating climate change simultaneously with achieving other SD goals, which is the type of mitigation scenario recommended by the report taken as a whole. Namely, achieving goals such as the elimination of poverty with less income inequality, in addition to mitigating climate change, might yield very different macro-economic futures for the world from those that any IAM currently models, and might yield significant increases rather than decreases to GDP, and other economic indices. So why only report to the global community the results for rather “bare bones” mitigation scenarios that are not recommended on page 10 of the SPM, lines 1-7? Also, as we discuss below, these economic results are unknowable and do not meet the “medium confidence” criterion for inclusion. If you still feel a strong need to report these partial economic results for “bare bones” mitigation scenarios, we would, at most, report them in section 6.3.6 only, and not in the SPM and TS. Moreover, the interaction with other parameters, such as future life styles and more equal living conditions between regions, has to be stressed. So far the report still differentiates sharply between industrialized and developing countries as a given fact, and does not provide for the perspective of economic convergence between regions.	Rejected. We have a seperate finding, which discusses macro-economic costs under multiple objectives as they can be currently found in the literature. There will always be more comprehensive system boundaries to an analysis. Therefore we clarify what the reported costs are. We have added a box on macroeconomic costs to the TS.
25239	SPM	10	1	10	1	"Under advantageous conditions for limiting cost...." the phrase needs clarification	Accepted. Revised language comprhensively.
25240	SPM	10	1	10	3	This is a very important aspect and it is suggested that a more representative sentence that has high confidence and robust evidence may be provided here. The present formulation is based on medium confidence alone. May be a wider acceptable range of costs and discount rates could be indicated that provide more robust evidence and higher confidence. Further the terms "advantageous conditions" are relative and advantageous for one geography could be disadvantageous for another, vice versa and other combinations thereof.	Rejected. Cost informations in the models are considered as more uncertain than other outputs (like technology mixes or emission pathways)

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25241	SPM	10	1	10	7	The conlusion is too sweeping. The SPM should specify: i) GDP loss is in terms of PPP or MER, ii) refers to a particular year or cumulative over a time horizon, and iii) how the GDP loss is distribued across countries (or regions) and what are its welfare implications.	Noted. We complrehensively revised the finding, but did not add regional detail.
25040	SPM	10	1	10	1	Replace "advantageous" by "the most idealized".	Noted. Revised language.
40808	SPM	10	1	10	7	In order to discuss GDP loss, the premises/assumptions (discount rate, costs of technology deployment, socioeconomic scenario used, etc.) for estimations should be explained, and the comparison with damage costs is needed. If such information is absent or ill-provided, policy decisions on actions/inactions and their scale cannot be made.	Noted. We added more details on cost discussion in a series of boxes in the Technical Summary. Damage costs are the realm of the synthesis report. They will be brought together with Working Group 3
28420	SPM	10	1	10	7	Please define here and/or in the glossary what you exactly mean by "marcoeconomic costs". Page 13 line 21 uses the term "mitigation costs". Is there a difference? And if so, please clarify.	Accepted. We added a box in the Technical Summary for clarification.
28421	SPM	10	1	10	7	Please provide information on these estimated costs relative to the 100 Bill US$ / year climate finance agreed under UNFCCC.	Taken into account - text revised.
29041	SPM	10	1	10	7	What are the costs under disadvantageous conditions for limiting costs? Could be useful to provide here as comparison and reason to act. Also what does advantageous mean?	Noted. We have clarified the text in the revisions.
25117	SPM	10	1			Change the word “advantageous” to “idealized” in order to make the meaning clearer for non-native speakers and to keep consistency within this section.	Noted. Revised language.
31313	SPM	10	10	10	11	QUOTATION: "Overshoot is possible, because carbon is removed from the atmosphere by the oceans over an extended period of time". COMMENT: This sentence seems to forget that storage in the terrestrial sinks also removes carbon over an extended period of time. (See e.g.table 11.1, page 78 and Ch 6, Figure 6.36). Both ocean- and terrestrial sinks interact with the atmosphere in the carbon balance, until the system reach stabilization. See also the figures used in AR4 that illustrated this issue. https://www.ipcc.ch/publications_and_data/ar4/wg1/en/figure-ts-31.html	Noted. Finding comprehensively revised.
28435	SPM	10	10			Please exchange "carbon is removed" by "models assume that carbon could be removed".	Rejected. This is a well established scientific insight. To what degree this is the case in the future has been simulated by many carbon cycle model experiments over the last two decades.
25134	SPM	10	11	10	15	While the treatment of "geoengineering" has improved since the First Order Draft, there is still more than a whiff of editorializing and speculation. The three sentences here are: "It can be further extended by the ability of society to create negative emissions through carbon dioxide removal (CDR) technologies. Negative emissions may be from Bioenergy coupled with Carbon Capture and Storage (BECCS) or large-scale afforestation, but there are also other CDR options that could produce negative emissions. Most CDR technologies are not mature and therefore attended by a large set of risks." This is problematic for several reasons. First, reforestation / afforestation are not "technologies" and should not be artificially conjoined with geoengineering/CDR. Some technological means may enhance sinks strategies, such as biochar, and BECCS may prove to be a promising measure, but as the text notes these are in early stages of conception and development. The broad array of technologies envisioned under CDR are clouded by very limited experience, significant ethical and institutional questions as discussed elsewhere in the text. It is inappropriate to mix all these together as "CDR" and then use the obvious availability of reforestation / afforestation as a way to jump "CDR" to the top of the queue. The wording in this section should be clarified to separate mitigation through enhancement of natural processes (A/R, potentially biochar) and other "CDR" methods.	Accepted. We make clear in the revised text, which CDR technologies are considered by models.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28436	SPM	10	11	10	11	The wording suggests that negative emissions technologies are already at hand - please reformulate, e.g.: "Potentially, it could be further extended …"	Noted. Finding comprehensively revised.
28437	SPM	10	11	10	14	There are no CDR techniques available, and it is not sure that there will be any in the future. Therefore, the statements on CDR cannot be written in the indicative tense, the conditional must be used ("it can be further extended" -> "it could be further extended", and "there are also other CDR options" -> "there could be also other CDR options"	Rejected. While those technologies are immature, they have been prooven by concept. Ambitious mitigation scenarios require a massive upscaling of many low, zero and negative emission technologies and there are different degrees of risks associated with that.
20871	SPM	10	12	10	14	How is the feasibility of BECCS? This part is written by assumption. I hope to delete this sentence.	Rejected. We make clear that this technology is not yet mature, but it is an integral part of the integrated scenario models. We also discuss the consequence of this technology being absent.
25634	SPM	10	12	10	14	This part should explain that it is uncertain whether BECCS can be utilized in the future, as described in the section TS.3.3 (page 21, line 37). Safety confirmation, affordability and public acceptance are indispensable in CCS site selection. There is a much higher barrier to adopt BECCS than CCS because BECCS requires stable biomass supply for generation at reasonable cost. Since feasibility for BECCS has not been established so far, it is not appropriate to expect huge potential for BECCS in the future, as described in (Rhodes, 2008, page323). <Reference> [1] J.S. Rhodes and D.W. Keith (2008). Biomass with capture: negative emissions within social and environmental constraints: an editorial comment, Climatic Change, 87.	Accepted. We continue to highlight the risks and barriers associated withtechnologies.
22815	SPM	10	12		15	you mention BECCS and CDR as an important solution. But the potential risks and unintended side effects are only mentioned in one sentence. I think they should get at least a full paragraph, especially concerning conflicts with food production	Rejected. There are later paragraphs on BECCs as well.
24386	SPM	10	12	10	12	CDR technologies should be defined. Excellent to mention biopower with CCS. How about biochar?	Noted.
26723	SPM	10	12	10	13	Looking at a national scale, negative emissions could also be reached by changes in the management of existing forests (increasing growth or increasing set aside forest). Considering that this may not be very relevant at the global scale we propose to add " On a global level, major contributions to…" at the beginning of the sentence starting "Negative emissions…"	Noted. Finding comprehensively revised.
26115	SPM	10	12	10	13	The phrase "negative emissions" would require clarification.	Accepted. We have clarified this in our revisions.
21514	SPM	10	13	10	14	For policy makers, it will be unclear what is meant by "other CDR options". Is there more information available about the potential impact on food production in the longer term of the use of BECCS and CDR.	Noted. CDR technologies are very different in their land requirements. We have considerably the underlying section in chapter 6 on CDR and SRM technologies. We have further clarified which technologies are considered by integrated scenario models.
25594	SPM	10	14	10	15	Keep this sentence as it shows reality.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33552	SPM	10	14	10	15	Conclusion (CDR is risky) doesn't follow from argument (CDR not mature). Perhaps what is meant is that counting on CDR to bring net emissions down is risky because CDR is not yet a mature technology. That would be a more logical statement.	Rejected. It is related both to risk of immaturity of the technology and generic risks of a large-scale deployment. We revised the text for a more specific wording.
40814	SPM	10	14	10	15	CDR technologies represented by BECCS, ocean iron fertilization, biomass burial and direct air capture(Chapter 6 page 20, line 20-21) were not widely discussed in the AR4 report and it is not clear here that the advancement since AR4 in studies among engineers and researchers on the feasibility of these technologies is well reflected in AR5. So we cannot be sure that the statement “Most CDR technologies are not mature and therefore attended by a large set of risks” is supported by certain level of evidence or confidences. Such unsupported technologies with a large set of risks should not be referred to as key technologies for achieving stabilization targets.	Rejected. We have a very elaborated section in chapter 6 (6.9) where the state-of-the-art of this literature is provided. Scenarios also include those ones, which do not apply this technologies and we highlight the risks for not meeting certain concentration levels in 2100 in such cases.
28438	SPM	10	14			The statement "Most CDR techniques are not mature..." implies that there is at least one such technique which IS mature. This is not the case. Delete the word "Most".	Accepted. Text revised.
30412	SPM	10	15	10	15	this is uncertainty in relation to future availability of these technologies not just risks. A clearer statement on negative technologies.	Rejected. It is both. We clarified the language.
34697	SPM	10	15	10	15	A sentence should be added here about the uncertainties and problems related to large-scale biomass production expansion, in terms of possible conflicts with biodiversity goals, food security, water needs, livelihoods and cultural values of forest communities and smallholder farmers etc, referring to issues highlighted in the AFOLU chapter.	Rejected. We cover these risks in a later section.
23948	SPM	10	15	10	15	It is suggested to substitute "attended" by "associated". It seems important to inform about the various risks of CDR technologies, including costs, availability of land, rate of deployment etc. in greater detail in order to allow the reader to understand the risks and their dimension better.	Noted. We comprehensively revised the finding.
28439	SPM	10	15	10	15	The risks not only result from the insufficient maturity but also from possible negative side effects. Please reformulate/ add: "….are not mature and could create negative side effects. The option of negative emissions therefore is associated with a large set of risks".	Rejected. We cannot provide this in such a sweeping manner, but have revised the text to strike a good balance.
25834	SPM	10	16			The different stabilisation categories are mentioned for the first time in the figure in the SPM. Include a table similar to table 6.2 that summarizes their meaning.	Accepted. We added a new table SPM.1, which links emission budgets to forcing and temperature changes across forcing categories.
33553	SPM	10	16	10	16	Left panel: it is not the role of a policy assumption that is illustrated here, but the impact of delayed mitigation, and we suggest to replace the heading to reflect this. Right panel|: is is not the role, but the impact of negative emissions, and we suggest to replace the heading to reflect this. We also think the graph is too complicated and we suggest to limit it to just one category.	Noted. We have removed this figure.
31314	SPM	10	17	14	25	Please clarify what is meant by "CO2 emissions" in Figure SPM 6. Does it only include fossil emissions and biogenic carbon released by land use change (deforestation/forest degradation) or does it also include temporal CO2 emissions from forest management (where carbon stocks are maintained and carbon is reabsorbed by photosynthesis) as suggested in chapter 11? (Please see chapter 11 page 34 line 22) or Chapter 7 page 46, line 15.	Noted. We removed this figure.
33556	SPM	10	17	10	21	We note that category 1 and 2 overlap. This is confusing and may perhaps be avoided.	Accepted. This has been made consistent.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28440	SPM	10	17			SPM.6: Caption: Mean pathways of which sample? How many scenarios?	Noted. We added a new table SPM.1, which links emission budgets to forcing and temperature changes across forcing categories.
28422	SPM	10	2	7	3	Is this costs per year or in 20XX?	Noted. Clarified language.
30413	SPM	10	22	10	28	This paragraph is badly worded and needs to be clearer.	Accepted. Comprehensively revised finding and section.
31315	SPM	10	22	10	37	Please consider to delete or find another word than "ambitious", as the meaning of this word depends on the reader.	Noted. Finding comprehensively revised.
30629	SPM	10	22		24	Suggest working "2030" into the bolded heading.	Accepted. We have added delay through 2030 into a headline statement on the issue of "delay in international cooperation".
30628	SPM	10	22	10	24	Does the last part of this sentence ("can dramatically increase the rate of emissions reductions…") refer to "delays in mitigation" or "application of CDR". The current wording is not clear.	Noted. Finding comprehensively revised.
23703	SPM	10	22	10	24	Is any word or phrase missing here? On line 23 CDR technologies "that" instead of "and", before "can dramatically increase the rate of emissions reductions"? Or "and can dramaticall increase the rate of emissions reductions required"?	Noted. Finding comprehensively revised.
33557	SPM	10	22	10	22	We think the word "ambitious" is a value judgement that needs to be avoided here and elsewhere in the text. Please rather specify which quantitative level is meant by ambitious.	Accepted. Attempted to keep this in mind in revisions throughout section.
33558	SPM	10	22	10	25	We think the reasoning in this bolded sentence lacks logic. It is not the delay in international cooperation that forces to enlist CDR, but the insufficient pace of global emission reduction. So we suggest to rephrase this sentence to: "If stabilisation targets such as 450 ppm CO2eq are to be met, either the pace of global emission reduction needs to excellerate drastically already in the near future, or the large-scale application of CDR technology is required."	Noted. We have comprehensively revised the finding.
25135	SPM	10	22	10	24	The section reads: "If ambitious stabilization targets such as 450 ppm CO2eq are to be met, delays in international cooperation will increasingly require the large-scale application of CDR technologies and can dramatically increase the rate of emissions reductions and the costs of mitigation (high confidence)." This is rhetoric, not factually based. There is no logical conclusion that delays in international cooperation must, and must only, require the large-scale application of CDR technologies that can "dramatically increase the rate of emissions reductions and the costs of mitigation." Other strategies (both mitigation and adaptation) exist. To add that this conclusion has "high confidence" is absurd. About the most that can be said of "CDR technologies" is just what the text elsewhere concludes: there is conceptual potential, but also substantial realization, cost and spillover risk, and major ethical and institutional hurdles. In fact, the subsequent sentence (lines 31-34) states the situation somewhat more accurately: "These pathways are characterized by increasingly risky profiles through a growing dependency on CDR technologies and the associated loss in the ability of policymakers to hedge risks freely across the mitigation technology portfolio." But we should be clear: the "growing dependency on CDR technologies" is based on a choice by modelers that such CDR technologies are viable at some inferred cost and penetration rate. This remains at best a speculative presumption. The models, in effect, show a solid line for negative emissions and stabilizing GHG concentrations, when at best those lines should show uncertainty bands.	Rejected. Model comparison exercises show that under conditions of delay ambitious concentration levels such as 450ppm CO2eq in 2100 can no longer be met without the existence of CDR technologies, because too much of the remaining carbin budget in the atmosphere is used up and there is a need to generate negative emissions.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25635	SPM	10	22	10	24	This part should explain that mitigation costs can be reduced if 2 degree target is changed to a more realistic target such as 2.5 degree. IPCC should be policy-neutral and should have responsibility to indicate unlimited evaluation results, as described in Table 6.1. The 1.5℃ target is not realistic and even 2℃ target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No4 line of this table.	Rejected. We deal with the issue of cost in a later finding. This should not be mixed-in here.
21515	SPM	10	22	10	37	The delay time scales could be quantified here.	Accepted. We have made this explicit in our revisions.
22850	SPM	10	22		28	The uncertainty/confidence statement is a bit problematic. Is "high confidence" related to biophysical constraints so that negative emissions are mandatory for 2Deg (then is should be a WG1 result) or is it only a result from the models? This should be made clearer. It would be important to disentagle the "physical infeasibility" from model infeasibility. This would also strengthen the message, e.g. it is physically infeasible to do without negative emissions. But models show that CDR is able to supply these negative emissions.	Noted. As we are dealing with a situation of delay it is a mixture of both. The remaining carbon budget and the available technologies.
25242	SPM	10	22	10	24	This sentence seems like a political statement	Rejected. It is an "if statement", which appropriately summarizes some key insight gained since AR4. We nevertheless revised this finding comprehensively.
30079	SPM	10	22	10	24	Why differentiate and only refer to internation cooperation? This also applies to national efforts. Emphasising the international situation has its merits but it also pushes the need for decisions onto more parties and may reduce the sense of urgency for domestic efforts.	Accepting. We use a more neutral term in our revised version (delaying mitigation).
40815	SPM	10	22	10	24	This statement, under the condition that early international cooperation is not realized, suggests the necessity of the large-scale application of BECCS technologies and concludes that achieving 450 ppm CO2eq without overshoot becomes physically infeasible if such delay in the cooperation lasts beyond 2030. But from a contrasting perspective, this can be interpreted as suggesting the realization of 450 ppm CO2eq target without overshoot under the early international cooperation, and even the possibility of not being dependent on BECCS technologies. For the emissions pathways without overshoot or without dependency on BECCS technologies, it seems practically possible to show concrete examples of scenarios and their premises on which the pathways rely on, such as specific portfolios of assumed technological factors and the time frames of their deployment (e.g., the scale of application of BECCS technologies or the degree of uncertainty that accompanies etc.) or transitional cost curbs over time; so such examples should be given at first, and failures in achievements in the original statement should be rephrased as a deviation from the examples.	Rejected. We do not mention overshoot in this finding. In fact, scenarios with a deployment of high levels of CDR are often characterized by large concentration overshoots. Such pathways have a larger probability for crossing a particular temperature threshold.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40816	SPM	10	22	10	25	This paragraph shows an important research result showing "delays in international cooperation will increasingly require the large scale ... can dramatically increase .. .costs of mitigation". However, it should not be limited to 450 ppm scenario, but also include 550ppm one. In Chapt.6 P42 L42-45, it is described that achieving 550 ppm scenario would require 150-200% cost increase in case participation of BRICS to be delayed by 2030.	Accepted. We broadened the concentration range discussed in the "delay" finding. We add a table SPM.1 showing the relationship between emission budgets, radiative forcing and temperature changes across forcing categories. For more ambitious scenario categories, we distinguish scenarios with high and low overshoot. delay scenarios tend to fall into the high overshoot category as more of the carbon budget is used up in the short term compared to optimal scenarios.
28442	SPM	10	22	10	24	The sentence is hard to understand, especially for a headline. Who can dramatically increase the rate of emission reductions, international cooperation or the application of CDR technologies? Maybe there are two statements in this headline that should be separated?	Accepted. We have comprehensively revised the finding.
28443	SPM	10	22	10	24	These statements should be qualified with regard to the assumptions in the IAMs, e.g. economic growth path and the unavailability of CDR technologies to this point: "Based on the assumed conditions in the IAMs, delays in international cooperation will increasingly require large -scale application of CDR technologies if ambitious stabilization targets such as 450 ppm CO2eq are to be met. If technically feasible and with tolerable risks, CDR technologies could dramatically increase the rate of emission reductions and possibly reduce the costs of mitigation." The assumptions, conditions, and limitations of IAMs have to be clearly outlined in the SPM.	Rejected. We clearly highlight the immaturity of the technology in the previous finding and describe the increased risks of high CDR pathways.
28441	SPM	10	22	10	37	Please indicate also what you mean by CDR technologies in line 24.The glossary indicates that CCS or negative emissions from BECCS are not included. The text suggests that in case of delayed international cooperation CDR is only the option to meet the 450 ppm scenario. The underlying report mentions a lot of other options, including RE (see also SRREN), energy efficiency, and behavioral changes. Please include these options in this paragraph.	Accepted. We tried to be more explicit in our revisions about that.
28444	SPM	10	22	10	37	This paragraph (with some modifications) is the most important of this section and should moved right to the start on page 8, line 8. However, please modify according to our other comments.	Rejected. Other information needs to be provided first to fully appreciate such a paragraph.
28445	SPM	10	23	10	23	The wording suggests that negative emissions technologies are already at hand - please reformulate, e.g.: "...cooperation c o u l d increasingly require the large-scale application of p o t e n t i a l CDR technologies…"	Taken into account during revisions.
29047	SPM	10	23	10	24	"and can dramatically increase the rate of emissions reductions and the costs of mitigation" is confusing in this sentence - sounds like we are saying that delays in cooperation will increase emission reductions - sentence needs restructuring.	Accepted. We compehensively revised the finding.
32093	SPM	10	24			dramatically is not precise enough	Taken into account during revisions.
26459	SPM	10	24	10	24	Suggest changing to 'can dramatically incerase the required rate of emissions reductions'	Taken into account during revisions.
31316	SPM	10	25	10	25	Please consider to delete "Sufficient" .	Accepted. Revised language.
33559	SPM	10	25	10	25	"Sufficiënt" has a positive connotation, which we think is not appropriate. Please remove this word or replace it by something like "substantial".	Accepted. Revised language.
22851	SPM	10	25		28	Is it really in the competence of WG3 to say something on the physical feasibility of 450ppm without negative emissions? You need climate models for this answer.	Rejected. All scenarios were run through a climate model.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34698	SPM	10	25	10	26	Should clarify here what exactly is meant by "delaying action". Most countries would claim that they are acting already. So it would be good to explain what would be considered "sufficient action", to no longer be classified as delaying action.	Taken into account during revisions.
25243	SPM	10	25	10	25	"Sufficient delays" This phrase is unclear	Accepted.
26114	SPM	10	25	10	25	Please delete the word "sufficient"	Accepted.
28446	SPM	10	25			"Sufficient delays in global mitigation efforts.. ": The word "sufficient has a positive connotation, please exchange with "Severe delays..."	Accepted.
28447	SPM	10	25	10	28	It is highly problematic to communicate BECCS as a viable Plan B for delaying action for mitigation. For the time being, BECCS and other CDR techniques are not at all to be considered safe and effective exit strategies (maybe except afforestation) . But the way it is written here and together with the rather optimistic view on BECCS, implies exactly this message, which should be avoided. Or at least complemented by a notion about uncertainty, critiques and possible negative side effects, for not delivering a "free ticket" to omit action.	Rejected. We truthfully report on the insights from integrated scenario literature. These are future scenarios and need to discuss future technologies. We clearly outline the uncertainty about availability and scale of such technologies and carefully describe the risks.
29048	SPM	10	25	10	28	It would be useful to clarify what is meant by 'physically infeasible' in terms of implied average annual emissions reductions rate.	Accepted. Revised language.
29049	SPM	10	26	10	26	change 'can render' to 'could render'	Accepted. Revised language.
30630	SPM	10	27	10	28	Suggest being consistent and clear about whether or not the term CDR is intended to be used generally to capture both more traditional mitigation measures as well as geoengineering options. This issue may also be solved by the glossary.	Accepted. We have a clear definition of geoengineering in the glossary, which resolves this issue.
31275	SPM	10	3			4% of GDP : annually ? Or how long, approximately ?	Noted. Clarified language.
30410	SPM	10	3	10	3	4% of GDP over what period? Is this annual?	Noted. Clarified language.
25132	SPM	10	3	10	3	The reasoning for a 5% discount rate should be explained and justified here. For these purposes, a discount rate of 3% and possibly much less is appropriate for reasons extensively discussed in the literature.	Noted. We added a box on discounting to the Technical Summary.
25533	SPM	10	3			Indicate that these macroecomic costs do not take into account avoided climate damage as a result of the undertaken mitigation action.	Accepted. We have added this qualification in our revisions.
32092	SPM	10	3			What does the economic cost of 4% of the GDP mean? The SPM should be much more precise in the dimension of this cost: which countries / regions are most likely to by impacted, which sectors, what is the human cost (development, hygiene, education et al.)?	Rejected. There is limited space to discuss all those aspects. However, we have a finding on investment needs for ambitious mitigation in SPM.4.
40809	SPM	10	3	10	3	Discount rate would give large effects onto the estimated cost. However, the uncertainty in discount rate is rather large. Therefore, please add some other information of 1% discount rate and 10% discount rate to cover the uncertainty.	Rejected. We did not add such information, but a box on discounting in the Technical Summary. Provided etsimates relate to deviations from baseline, which are not so heavily influenced by the choice of discount rate.
28423	SPM	10	3			Could the "discount rate of 5%" be explained?	Accepted. We added a box on discounting in the Technical Summary,

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28424	SPM	10	3	10	3	Please, put these cost into perspective, e.g. by comparing it with reduced damage or else.	Rejected. This is the realm of WG2 and can only be done in the synthesis report.
28425	SPM	10	3	10	4	To balance the statement that costs will be 50-67% lower for the 550 ppm goal please add "This decrease in costs, however, comes at the expense of considerably higher climate change costs" or something along those lines.	Noted. We revised the finding comprehensively.
29042	SPM	10	3	10	3	How sensitive is the macro cost result to the discount rate used? Were other rates than 5% used and could the finding be expressed as a range determined by these other rates? Were fixed discount rates used or were estimates also done using a declining certainty-equivalent discount rate? A number of top economists now agree that it is technically wrong to used fixed discount rates when looking ahead over the timescales needed to assess climate change.	Discount rates are chosen by each modeling team individually and in some cases are endogenous (e.g. following the Keynes-Ramsey rule in growth models). A 5% discount rate for the calculation of net present value mitigation costs was used ex post to establish comparability between aggregate cost estimates. The technology deployment in the individual model scenarios is governed by the individual model's assumption of the discount rate.
26458	SPM	10	30	10	31	Figure SPM.6 presents global information and makes no reference to OECD or non-OECD countries. The example "(e.g., the OECD countries or the non-OECD countries)" is irrelevant and should be deleted.	Accepted. Example removed.
33560	SPM	10	31	10	34	"These … portfolio": not clear. I guess what is meant is that in a scenario where all mitigation options, incl CDR, are needed, the option of interchangeability is lost, which makes reaching the goal more difficult (nothing is allowed to go wrong, as there is no under-used alternative left)	Accepted. Revised the finding comprehensively.
26112	SPM	10	31	10	35	This sentence is somewhat unclear; it refers to several issues / especially the part starting with: … and the assiciated loss in the ability….	Accepted. Revised finding comprehensively.
28448	SPM	10	31			Why 2030? Is this a robust statement, that 2030 is the "date of no return" for delays in action? Please justify such a statement very carefully or delete.	Rejected. The finding clearly states that this is an example. In the literature experiments have mainly focussed on 2020 and 2030 as starting point for global cooperation.
28449	SPM	10	32	10	32	The wording suggests that CDR technologies are already at hand - please reformulate, e.g.: "...through a growing dependency on p o t e n t i a l CDR technologies…"	Rejected. In the previous finding we clearly highlight that this is not the case. We cannot say thing multiple times in the limited space of a SPM.
33561	SPM	10	34	10	35	Second part of sentence (depending on … delayed) is superfluous. First part of the sentence is very important, also for explaining why uncertainty increases the (financial) need for early mitigation.	Noted. We have revised the finding comprehensively.
28451	SPM	10	34	10	34	This formulation gives the impression CDR would already exist and side effects already are known. This is not correct. Please add: "It has to be kept in mind that there still is a high uncertainty as for effectiveness and (negative) side-effects as for CDR-technologies."	Rejected. In the previous finding we clearly highlight that this is not the case. We cannot say thing multiple times in the limited space of a SPM.
28450	SPM	10	34	10	37	If possible, a graph illustrating the costs of delay should be included.	Rejected. The space is too limited in the SPM. But we have included such a Figure in the SPM.
26460	SPM	10	34	10	34	Are these 'costs' at present value?	Noted. Clarified language.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40810	SPM	10	4	10	5	It would be easier to image the cost in dollars, rather than expressed in percentage of GDP.	Rejected. Costs are given always relative to baseline.
29315	SPM	10	5			Replace "50-67% lower" with new %GDP range, similar to thesis statement.	Noted. Removed finding and bundled information in one comprehensive finding.
23702	SPM	10	5	10	5	50-67% lower than what?	Accepted. Information deleted.
25133	SPM	10	5	10	7	The sentence, “Any deviations from idealized conditions including delayed global mitigation efforts or the limited availability of individual technologies could substantially increase costs” is actually the one most deserving of highlighting in this section and is in fact one of the most important statements in the SPM overall.	Noted.
25633	SPM	10	5	10	7	This part should explain that mitigation costs can be reduced if 2 degree target is changed to a more realistic target such as 2.5 degree. IPCC should be policy-neutral and should have responsibility to indicate unlimited evaluation results, as described in Table 6.1. The 1.5℃ target is not realistic and even 2℃ target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No4 line of this table.	Accepted. We highlight that mitigation cost increase with stringency in our revisions.
28426	SPM	10	5	10	7	The sentence "Any deviations from idealized conditions… " is important. A numerical example would be much appreciated.	Examples are provided for delays in mitigation and constraints in technologyportfolios.
25118	SPM	10	5			After “50%-67% lower”, add “and delays increase the costs of mitigation several-fold or more” (Ref. p. 10 lines 34-35).	Noted. We added that mitigation costs increase with the stringency of the long-term goal.
33550	SPM	10	7	10	7	Explanation should include a note that the cost estimate is strongly dependent on the discount rate used, and that in turn the discount rate reflects an ethical judgment of how one values the future compared to the present.	Noted. We have a box on discounting in the TS.
30626	SPM	10	8	10	15	Clarification would be helpful about whether or not natural processes alone (i.e. removal of carbon by the ocean) could lower atmospheric CO2 concentrations from the overshoot level to target level within the coming century. That is, does recovering from the overshoot this century depend on achieving negative anthropogenic emissions or not? Suggest some reference be made to Figure SPM.6 panel B to help this discussion.	Noted. We tried to phrase the finding in an open way that allows for both options - which is consistent with the underlying literature. Comprehensively revised the finding.
30627	SPM	10	8	10	15	The terminology around CDR is not clear here. This problem may be solved by the Glossary, but it might be helpful to consider a footnote or to revise the text in this paragraph. Is CDR intended to be used to refer only to geoengineering methods of carbon dioxide removal or more generally to mitigation measures which reduce GHG emissions or enhance carbon sinks? Bioenergy with carbon capture and storage is usually considered a form of mitigation, not geoengineering. Large-scale afforestation may be considered either, depending on how geoengineering is defined. Suggest some revision to this paragraph so that mitigation measures which could help achieve negative emissions are introduced first, followed by reference to the less mature geoengineering CDR methods, such as direct air capture, that could also help achieve negative emissions.	Accepted. We revised the language for clarity.
33551	SPM	10	8	10	9	We think it would be helpful to define "overshoot" in a footnote.	Rejected. We try not to footnote and explain in the text instead.
25006	SPM	10	8	10	9	Given the relevance to policy makers, the highlighted conclusion should state (as it does in the Technical Summary) that scenarios for 450ppm stabilisation 'increasingly rely on net negative emissions e.g. BECCS'. In addition, issues associated with 'competing land, water, livelihood and biodiversity considerations' should be explicitly noted (consistent with Technical Summary).	Rejected. We highlight this at a later stage in the SPM in the discussions on the AFOLU sector.
26722	SPM	10	8	10	15	A question : the conclusions in the chapter 1 Introduction differs a bit from what is presented here, why?	Noted. We have worked hard on consistency across chapters.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38939	SPM	10	8	10	15	While experts in climate change would automatically know what 'negative emissions' are, it's not guaranteed that all policymakers (especially elected officials) will know what that term means. It might be worthwhile to define it at this point, even if it is defined later in the report, for clarity.	Accepted. We clarified this in our revisiions.
38940	SPM	10	8	10	37	Affordable technologies to yield negative emissions via atmospheric removal of CO2 are not currently available and not currently feasible. Only forest afforestation and reforestation can be acknowledged as currently feasible for this purpose, but their capacity to achieve the drastic removal of atmospheric CO2 is miniscule relative to the requirements of the overshoot scenario. To reflect this, lines 14-15 , might be reworded to read:"No CDR technology has been capable of being deployed on a scale large enough to effectively counter an overshoot scenario." OR revise line 13-14 where it reads: "but there are also other CDR options that could produce negative emissions." Change to "but other CDR options that could produce negative emissions have been proposed theoretically or demonstrated on a very small scale. However, Most CDR technologies are not mature and therefore attended by a large set of risks."	Noted. While we believe to highlight the lack of maturity of the technology, we have tried to further clarified the uncertainty over scale and availability of CDR technologies.
40811	SPM	10	8	10	9	The number of scenarios should be provided, clarifying the number of scenarios out of a total of how many scenarios are being referred to as ”a vast majority”.	Rejected. We do not provide this information as they are easily misinterpreted as probabilities.
28429	SPM	10	8	10	15	IPCC should be policy relevant, but not policy prescriptive. This para however conveys an over-optimistic view on CCS and CDR methods. It does neither mention that techniques are not (fully) available nor does it mention the associated (high) risks.	Rejected. We belief that the following sentence of the paragraph contradicts this comment: "Most CDR technologies are not mature and attended by a large set of risks".
28430	SPM	10	8	10	15	Negative emissions on a large scale seem very optimistic and depend also on the availability of bioenergy that could be coupled with CCS. The paragraph should make it clear that CCS technology is not available yet, nor is there any certainty that it will be available at reasonable costs in the future.	Rejected. We clearly say that this is not a mature technologiy. Later on, we highlight the risks of bioenergy as well.
28428	SPM	10	8	10	21	In the text you're referring to GHG concentrations (CO2eq) and in figure SPM.6 you're just looking at CO2 emissions. That makes it hard to compare both parts. Would it be possible to make it consistent?	Accepted.
28432	SPM	10	8	10	9	This statement depends on the conditions and parameters considered in the scenarios and the capacity of the IAM to project future situations. This information is not presented in a transparent way and the statement cannot remain in its current form without a qualifier referring to these reservations. (See also page 13, line 9 to 20, where some of the model constraints are mentioned.)	Noted. We further worked on the transparency in presenting our results.
28431	SPM	10	8	11	16	Please highlight that CCS -technology might be a future technology but is not yet fully competitive (as said on p. 17, line 22)	Rejected. Why should we say this twice?
19746	SPM	10	8	10	15	Importance of BECCS is clear here, but there is not only technical immaturity in this technology but a severe social barrier exists. CCS (and Nuclear paowe station) is now regarded as a trouble equipment, which is called NIMBY. There must be a serious social debate necessary to introduce (BE)CCS widely.	Noted.
29045	SPM	10	8	10	24	The overall tone of these lines is that 450ppm can be met, and delay and overshoot are OK because negative emissions will get us out of trouble. Whilst it is admitted that "CDR technologies are attended by a large set of risk" no such risks are acknowledged in connection with BECCS or large-scale afforestation. It would be preferable to quote from chapter 6 page 22 line 19 "This goal is possible given the options available to us today" and then add some text based on chapter 6 page 54 lines 46-48 along the lines of "but if the risks associated with negative emissions are to be avoided, no delay in emissions reductions is permitted"	Noted. We have revised the finding comprehensively.
30411	SPM	10	9	10	9	The discussion on overshoot is speculative	Rejected. It is key to the discussions in the available literature.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21513	SPM	10	9	10	10	"Overshoot is possible" but within limits only. This statement needs to take into account the limitations of overshooting and indicate the risk related to high levels of overshooting.	Rejected. It is in fact unclear how much concentration and temperature overshoot is possible. The SPM highlights the growing risks of overshoot as well as the increased risks of mitigation from the growing dependence on CDR technologies.
40812	SPM	10	9	10	11	Ocean uptake of CO2 is a passive process that is triggered by an increase in atmospheric CO2 and removes only part of anthropogenic emissions. The current statement is not clear about that fact and would induce a misunderstanding that all of anthropogenic emissions are taken up by the ocean so that the overshoot is realized It should be noted that, as stated also in TS page 16 line 2-4, anthropogenic negative emissions are required to achieve 450 ppm or 550 ppm, with mentioning that only part of CO2 is removed by ocean uptake and such a removal is a passive process. The sentence could be revised as follows: “Overshoot is not an obstacle to achieving 450 ppm or 550 ppm in 2100, because part of the increased CO2 is passively removed from the atmosphere by the oceans over an extended period of time, and the rest could be removed by the ability of society to create negative emissions”	Noted. We revised the entire finding.
40813	SPM	10	9	10	11	Ocean acidification is another major environmental issue that can directly benefit from mitigation measures, as well as global warming, so that risks and uncertainties associated with ocean uptake of CO2, such as progress in acidification or a possible decline in uptake rates in the future, should also be mentioned, referring to findings in WG1, e.g. [WG1 SOD Ch3, page 35 line 51-57], [WG1 SOD Ch9 page 10:46-54] and [WG1 SOD Ch3, page26 line 20-29]	Rejected. This is covered by WG1 and can be integrated with WG3 insights in the synthesis report. Doing this within the limited space of a SPM is not possible.
28434	SPM	10	9			The terms "overshoot" and negative emissions would be worth being explained in some more detail, as well as the different CDR-techniques	Noted. We have considerably extended the section on CDR and SRM technologies in the underlying chapter 6.
29046	SPM	10	9	10	9	Please quantify "temporary"	Noted. Temporary refers to a timing where the period of overshoot is ended before 2100.
24012	SPM	10	1	10	3	SPM.3 Long-term mitigation scenarios. ‘Under advantageous conditions for limiting costs, scenarios indicate that stabilization of atmospheric GHG concentrations at 450 ppm CO2eq could be achieved at macroeconomic costs of less than 4% of GDP (assuming a discount rate of 5%) (medium confidence).’ Question: Is it possible to know how this 4% is varying for both developed and developing countries?	Noted. This information is available, but we decided not included in the new draft.
28427	SPM	10	7	10	8	The TS includes a para (p.21, line24 to p22, line 7) which explains figure SPM.7. in a very good way. It should be included in the SPM.3 at this point.	Noted. Figure SPM.7 has been removed.
28433	SPM	10	9	10	11	The sentence "Overshoot is possible, because ..." in the Summary for Policy Makers, although scientifically true, may be misleading to policy makers. In the current financial crisis and with respect to limited national budgets, there is an analogous phenomenon to be observed that the behavior "temporary increase of budget deficits to stimulate economic growth" leads to serious effects in the long-term perspective if there are no hard restrictions with respect to the expression "temporary".	Accepted. We clearly discuss the relationship between short term and long-term action in the revised versions, which is the key to this discussion.
20994	SPM	10				Please delete models' names from the figures. The letters do not add to the legibility of the figure and, if you want to give the information about the models here, they could be listed at the end of the text below the figure	Noted. Figure has been removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35202	SPM	10	1	10	3	This conclusion is inaccurate and unbalanced. It is recommended to revise the conclusion from the following perspectives: 1. The wording of the conclusion is inconsistent with the description in the underlying report (Chapter 6, page 39, line 1-2), which is “net present value consumption losses” instead of “macro-economic loss”. Consistency is needed. 2. The value of discount rate has a large impact on the estimation of climate change loss and abatement costs. From the perspective of abatement cost, due to the fact that the economic growth rate of developing countries is relatively higher, higher value of discount rate should be chosen for developing countries. One common discount rate for all countries will underestimate abatement cost in developing countries, particularly in the near term. Therefore, it is suggested: 1) to illustrate the impacts of different discount rates on final results in Chapter 6 and explain why a discount rate of 5% is chosen; 2) to provide different abatement cost estimations based on different values of discount rate instead of providing one estimation based on only one discount rate; and 3) to specify the impact of choosing one discount rate on the estimation of abatement cost of developing countries. 3. It is suggested to add the following conclusion drawn from chapter 6 (page 45, line 40-43) after this sentence: “however, the costs of mitigation would vary substantially across countries and regions if transfer payments are not made. OECD costs would be lower than the global average, Latin America would be on average around the global mean, and that other regions including Asia would face higher costs than the global mean.” 4. It should be emphasized that the macroeconomic cost calculated by the model is only direct cost; and indirect costs such as social costs and transaction cost, etc. are not included.	Accepted. We provide the full cost ranges in our discussions. Moreover, we added a box on discounting to the Technical Summary.
32259	SPM	10	22	10	37	The magunitude of dependence on CDR and its possibility (or availability) must be discussed. It can be misunderstood that CDR can be available without constraints or limitation.	Accepted. We clarified this in our revisiions.
24234	SPM	10	26	10	27	IMPORTANT to clearly state what is meant by "infeasible"; is this physically infeasible or is it technically infeasible for the models? In energy modeling infeasible implies that a solution is not find in the space. In policy making it means that cannot happen at all beacuse of different reasons.	Rejected. We say "physically infeasible" in the absence of CDR technologies.
33953	SPM	10	34			“ several fold or more”, not clear	Accepted. We have comprehensively revised the finding for clarity.
32258	SPM	10	8	10	15	It appears that not much constraints are assumed for BECCS while some constrains not clearly specified are are assumed in the deployment of nuclear. The assumptions need to be clearly shown.	Rejected. We clearly highlight the uncertainties and risks around BECCS. However, nuclear as a technology is not comparable as it does not allow to generate negaitive emissions, which is key for many low stabilization scenarios.
22526	SPM	10	25	10	26	The wording is very open "for interpretations" , what is the meaning of Sufficient delays in global mitigation efforts? – Giving an example is not enough -2030 ? 2020?-. We need a clear message here as this is a key issue for PM. Proposal to eliminate the word "Suficient" , leaving as follows" Delays on global mitigation efforts....."	Accepted. We have tried to establish an even more precise language throughout the section.
20019	SPM	10	1			Replace "advantageous" with "economically efficient", as "advantageous" is too vague.	Accepted. We have revised the finding.
32366	SPM	10	1	10	3	"assuming a discount rate of 5%" -- suggest to expand and discuss what consequences the choice of a different discount rate would have on the macroeconomic costs. How sensitive are the results to the choice o discount rate?	Accepted. We have added a box on the discount rate to the Technical Summary.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32708	SPM	10	13	10	13	"… large scale afforestation … ": indicate where.	Rejected. This would require too much space. The underlying chapter 11 provides details.
26279	SPM	10	15	10	17	in page 3 of SPM, line 35, it is stated that CO2 eq. Emissions reached an all time high of 50.1 Gigatons in 2010. The figure shows emissions for 2010 about and even less than 40 Gigatons. There is no consistency between this two informations. Figure SPM.6 is closer to fossil fuel's emissions of 31.9 Gigatons for 2010 (figure SPM.3 on page 6) but this approach is not stated in the figure.	Accepted. Revised all figures for consistency in the SPM.
20022	SPM	10	16		21	Replace "Figure SPM.6." with "Figure 6.7" of chapter 6 (p.20 line 10-15) and insert Table 6.1 of chapter 6 (p.19 line 7-18) somewhere appropriate (as commented above) so as to be consistent with chapter 6, as firstly different scenario categories were not sorted "according to atmospheric CO2 concentration stabilization levels in 2010", secondly the values of "CO2 concentration" in 2010 given in parenthesis after the scenario categories are not "stabilization levels", and thirdly the discussions in the main text are made with GHG concentrations (CO2eq) instead of CO2 concentrations (p.10 line 22-37).	Accepted. We have included a new figure showing scenarios across all forcing categories. We have also added a new table SPM.1 showing the link between emission budgets, radiative forcing and temperature changes across forcing categories.
32368	SPM	10	17	10	21	Figure SPM.6 & text: scenario categories -- are physical science and carbon cycle uncertainties considered in these scenarios categories? How do these categories compare to the scenarios used in the WGI assessement report, including the four RCPs?	Accepted. We have added a new table SPM.1, which contains all these information.
20020	SPM	10	3			"net present value consumption" as in chapter 6 (p.39 line 1) instead of "GDP"? In either way, add explanation that it is in net present value and identify the period over which the value was calculated.	Noted. Clarified language.
20021	SPM	10	3			Add description correspond to "An important caveat to this result is that it does not account for a potential sampling bias due to the fact that high cost models may have reported pathways towards low stabilization targets to a lesser degree." of Chapter 6 (p.39 line2- 4), as this is new and extremely important finding.	Rejected. We did not perceive that this qualification needs to be added in the limited space of a SPM.
32369	SPM	10	32	10	32	"increasingly risky profiles" -- could this wording be avoided?	Rejected. We do not see why. But have revised the finding for clarity comprhensively.
23043	SPM	10	34	10	34	Confirm whether the third last word is " several-fold" or is supposed to be " seven-fold"	Accepted. We have comprehensively revised the finding for clarity.
29745	SPM	10	34	10	35	Please replace 'the degree to which international action is delayed' with the 'the degree to and durationfor which international action is delayed'	Noted. We have comprehensively revised the finding.
32367	SPM	10	9	10	11	"Overshoot is possible, because carbon is removed from the atmosphere by the oceans over an extended period of time" -- this is a misleading statement. The "overshoot" is a consequence of the long equilibration time scale of CO2 between Atmosphere and Ocean after an atmospheric perturbation and the continued uptake of CO2 after a slow-down/stop/reversal of the increase in atmospheric CO2.	Accepted. Text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33888	SPM	10				Comment: Figure SPM.6 illustrates some important consequences of delayed mitigation. I think that the figure is very important but too complicated, and that it should be simplified and included in the SR. (Figure SPM.6 is the same as part of Figure TS.7.) First, I think it is too small for the SR; I needed a magnifying glass to read parts of it. Secondly, I think it is too complex, with too many variables. The figure includes two parts; on the left, about the role of policy assumptions and, on the right, about the role of negative emissions. The plotted lines in each half of the figure illustrate two different policy responses: optimal or delayed responses. The lines also illustrate CO2 concentration for three stabilization levels (375-420, 400—450, and 450-495 ppm). Further, CO2 levels are plotted for ten time periods between 2010 and 2100. In other words, there are about 120 plotted values in Figure SPM.6. I think that is too much detail for policymakers and the general public. I suggest a focus on just the consequences of delayed mitigation. Specifically, I suggest the inclusion of only the left side of the figure. The left side has 60 plotted values, so I suggest an illustration of delayed mitigation (dashed line) at only one stabilization level, say 400-455, eliminating the dashed lines for stabilization levels of 375-420 and 450-495. (Furthermore, the dashed yellow line, illustrating the affect of delayed mitigation for 450-495, is hard to see.) The simplified figure would still have 40 plotted values. Third, the figure includes some explanatory phrases, such as “less short term emission reduction”, “rapid reductions in the medium term”, “more stringent reduction in the long term”. I think that the explanatory phrases are helpful, and that more explanation could be included in the legend . The portion of the legend for the left side states only that: Figure SPM.6. Mean CO2 emission pathways for different scenario categories according to atmospheric CO2 concentration stabilization levels in 2100: Category 1 (blue 375-420 ppm CO2), Category 2 (green, 400-450 ppm CO2), Category 3 (yellow, 450-495 ppm CO2). The left panel distinguishes between optimal and delayed policy responses {Figure 6.7} I think that the legend could distinguish the stabilization levels with both numbers (e.g., 400-450 ppm) and with projected impacts from the WGI report on physical driving forces. An example would be a figure which illustrates warming that results from CO2 concentration levels, such as the figure for a Thematic Focusing Element (TFE), such as WGI TS TFE.8, Figure 1. The WGIIL report contains a second illustration of the consequences of delayed mitigation—Figure SPM.8 (similar to Figure TS-8). In contrast to SPM.6, I think that SPM.8 is too complicated. It illustrates over 900 plotted values. I recommend its exclusion from the SR.	Noted. Figure has been removed.
40995	SPM	10	1	10	7	Mitigation costs estimate section shall move towards the end of the sub-section	Accepted. We discuss this towards the end of the section as a result of a restructuring for improving the flow.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29729	SPM	10 of 25	22	11 of 25	16	For this passage on scenarios, see also our comments in row 32 of this spreadsheet. While one effect of this passage is to highlight the immediate need to implement mitigation efforts rather than to delay them, another effect is to normalize reliance on CDR, BECCS and other untested technologies. The emphasis instead should be on the immediate need for real mitigation actions and policies such as renewable engergy and drastic changes to unsustainable production and consumption in order to reduce emissions at source. Highlighting reliance on CDR, BECCS and other untested technologies without mentioning renewable energy and production/consumption is highly biased. At p. 11 lines 12-13, DELETE: "nuclear energy and fossil fuels with Carbon Capture and Storage (CCS), with limited incremental net investment needs for energy supply." Not only is it speculative that nuclear energy and CCS would have “limited incremental investments needs,” but it also omits the potential costs of environmental disasters that both technologies imply and ignores the changes to national investment strategies (e.g., Germany, Japan) post-Fukushima.	Rejected. We need to stay truthful to the literature. CDR technologies have different characteristics in their contribution to mitigation scenarios as they can remove carbon dioxide from the atmosphere. It is a strong finding in the literature that without such technologies, it is difficult to meet ambitious targets like 450ppm CO2eq in particular without strong mitigation in the short-term. It is important to point that out as it is important to highlight the uncertainty about the uncertainty about the availability and scale of such technologies.
32242	SPM	11				Explanation about 450 NoCCS, 450 NucOff needs to be given. The meaning of the color was omitted. Green : Consumption loss, Blue : Area under the MAC curve in Figure 6.23.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
30636	SPM	11				Suggest adding the title "Integrated Assessment Models" to the top of the legend, so readers know what is in this box. This Figure, like many others, is very difficult to read in its current format, and should be enlarged. The pane references are also incorrect in the accompanying Figure caption (450 ppm panel is (a) and 550 ppm panel is (b)	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
20084	SPM	11				This figure is a) quite unreadable: too much information unsufficiently explained, and b) significative to the tendency of IPCC authors to summarize mitigation policies to costs or global carbon prices. This is too generic and in my view not that helpful for decision making	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
20085	SPM	11				This figure is interesting but unsufficiently introduced or explained, either in the text or in the legend. It limits its readibility. The distinction between NTE/OS, combined with full/delay is veru hard to understand	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25595	SPM	11				Clarification is needed why the mitigation costs with no nuclear case are almost same in this figure. If the reason comes from condition of the Model, such kind of remark should be added in order for readers to recognize.	Rejected. This is a finding based on evidence from a whole family of models. Nuclear is not a so prominent technology in the scenarios and can be easily substituted without high additional costs. CCS instead is so important as it enables to decarbonise the carbon-intensive energy supply infrastructure in those models. There is no other technology that can do this job. This is why it gets expensive.
33567	SPM	11		11		This graph is extremely complicated. We suggest not to specify the models. Such a level of detail is more fitting for chapter figures. This way the right hand legend can be deleted, and the figure becomes simpler without all the green and blue letters. We also suggest to simplify the information around the x-axes. 450 or 550 in each tech portfolio can go, as these are common for each of the panels. As the same portfolios are repeated in both panels we would suggest to number them and list the desciptions in the caption.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
25007	SPM	11		11		Specify whether the vertical axis shows gross additional or net investment, and whether it factors in consideration of offsetting benefits such as reduced energy use, pollution.	Noted. This is not investments. These are additional costs relative to a scenario where all technologies are available. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
30446	SPM	11		11		In the figure it is difficult to read off the green and blue letters	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
21518	SPM	11				Does this figure represent all cost estimates of relevant literature? Can an overview be provided of expected costs (GDP to consumption change) of meeting all RCP scenarios by more model comparison exercises? Information from an updated Figure 6.20 (ch.6) is more informative for policy makers than the sensitivity analysis offered now in Figure SPM7. Such a figure also needs to include those models that suggest negative costs (e.g. Knopf et al. 2011: The economics of low stabilisation: implications for technology change and policy, Ch.11 in Hulme and Neufeldt (eds) Making climate change for us - ADAM synthesis book, CUP, i.e. figure 11.6). The figure could also be replaced by a table. This table could be similar to Table SPM.7 on page 21 of the 2007 Synthesis Report which gives the range of all models, the median GDP reduction as well as the changes in average GDP growth rates.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22818	SPM	11				I would leave out the model names here (in the legend and in the figure), as they do not give any additional information	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
20274	SPM	11				I would suggest changing the terminology from 'CDR' to 'NETs', as in negative emissions technologies, throughout. The CDR label is mainly used to distinguish these technologies from SRMs, and since the latter will be very controversial indeed, there is no reason to taint the important discussion of NETs.	Rejected. This terminology has been agreed upon across IPCC Working Groups.
23576	SPM	11				This figure is not clear : what is the meaning of the 8 points on the horizontal axis ? What is the precise definition of the quantity plotted on the vertical axis ?	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
32710	SPM	11				The figures are too small. Impossible to read them in the current format.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28476	SPM	11				Figure should be placed immediately after the paragraph on technology (p.11, l. 1-8) and not after the paragraph on incremental investment.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28477	SPM	11				Please add also a sentence regarding the nucoff scenario to the caption.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28478	SPM	11				The figure is very small and therefore hard to read, and may be difficult to understand as readers are not always familiar with box plots. Also, the letters within the graph are confusing and the link to the models not immediately clear. Some letters are blue, some green - does that mean anything? The legend should be printed also next to the figure, and not only be explained in the text. There is no need to add 450 or 550 at the each of the labels of the x-axis as this information is part of the titles. The boxes, lines, and whiskers (ranges, median?) should be explained. All scenarios displayd at the x-axis should be explained in the caption, or a reference must be provided. In the text, the graphs are referred to using "a" and "b" , but the labeling is missing. Moreover the abbreviations in the box next to the graph are unclear (add a name to the box, are these model names? are models explained somewhere?)	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
26461	SPM	11				Further explanation is needed to understand Figure SPM.7. Figure 6.23 (the reference for Figure SPM.7) has more information in the legend, which helps understand the figure, but in addition it would be useful to note that the list in the legend is a list of models.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30631	SPM	11	1	11	8	Please clarify whether or not these projected increases in costs (of 4 times to orders of magnitude) are with respect to the 4% GDP cost projected under optimistic scenarios (reported on lines 1-7 page 10). Also, please clarify whether the reference to 'limited technology portfolios" is meant to refer only to the "450LimTech" case in left hand panel of Figure SPM.7 or to the whole panel.	Accepted. We have made this clear in the revised finding. There is only a single finding on costs in the revised version integrating the various insights.
33562	SPM	11	1	11	8	The main point remains a little hidden: The estimated costs of reaching a certain mitigation goal are very sensitive to the exclusion of certain technologies. Followed by an example (e.g. excluding BECCS, CCS, Nuclear, or whatever technology means higher expenses to reach the same goal).	Noted. There is only a single finding on costs in the revised version integrating the various insights. The limtech aspect is less stressed.
33563	SPM	11	1	11	8	please add confidence level	Accepted. We have done so far all findings unless "statement of facts"
27041	SPM	11	1	11	8	This paragraph describes how mitigation costs increase under pessimistic technology cost assumptions. Conversely, mitigation costs decline substantively if technology costs progress rapidly. This paragraph should be reframed to indicate the importance of technological change to mitigation costs, without bias towards the direction of impact.	Rejected. Technological progress is included in cost estimates and one reason why we see considerable differences in costs across models.
34699	SPM	11	1	11	8	Would be more accurate to say "by up to 4 times" of orders of magnitude, rather than "by four times". In addition, it doesn't seem justified to lump all the different cases into options with "broadly pessimistic assumptions about technology", given that there is one scenario that contains optimistic assumptions about renewables and energy efficiency - and the added costs of which remain on much more moderate level than that 4 times of orders of magnitude. Knowing that the cost estimation doesn't include co-benefits (of accelerated uptake of RE and EE and exclusion of CCS and nuclear), the the true cost increase, caused by exclusion of certain technologies, may be even much, much lower. The EERE case would merit to be considered in a separate paragraph.	Noted. There is only a single finding on costs in the revised version integrating the various insights. The limtech aspect is less stressed.
26724	SPM	11	1	11	8	Costs again why isn't this message given together with the text before	Accepted. We have merged all cost aspects in to a single finding.
25534	SPM	11	1	11	8	To balance this text with the following paragraphs, it would be useful to also include a statement of what energy efficiency measures can achieve in terms of reducing costs. The Global Energy Assessment (Riahi et al 2012) provides such estimates. Reference: Riahi, K., F. Dentener, D. Gielen, A. Grubler, J. Jewell, Z. Klimont, V. Krey, D. McCollum, S. Pachauri, S. Rao, B. van Ruijven, D. P. van Vuuren & C. Wilson. 2012. Chapter 17 - Energy Pathways for Sustainable Development. In Global Energy Assessment - Toward a Sustainable Future, 1203-1306. Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria, 9781 10700 5198 hardback 9780 52118 2935 paperback.	Rejected. We did not feel that this is so well reflected in the broader literature to be highlighted in the SPM.
38941	SPM	11	1	11	26	This discussion and the underlying chapter(s) should address the adequacy of current global R,D,D &D program to achieve the aggressive mitigation goals implied in this report. See the following references and their conclusions regarding current versus required investments: 1)International Energy Agency, Energy Technology Perspectives 2012, Organization for Eco-nomic Cooperation and Development, IEA, Paris, France, (2012), 2)Morgan, G., Apt, J., Lave L., The U.S, Electric Power Sector and Climate Change Mitigation, The Pew Center on Climate Change, Arlington, Virginia, (June 2005), 3)Massachusetts Institute of Technology, The Future of Coal, An Interdisciplinary MIT Study, MIT, Cambridge, MA (2007), 4)Stern, N., Stern Review on the Economics of Climate Change, The Stern Review, 2006 pre-publication version available at: www.hmtreasury.gov.uk/independent_reviews/stern_review_economics_climate... (2006), and 5)Princiotta, F.T., Global Climate Change and the Mitigation Challenge, Journal of the Air and Waste Management Association, Journal ID: ISSN 1047-3289; JAWAEB; TRN: 091200133, (October 2009).	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28454	SPM	11	1	11	2	It should be noted that new policy is not simply a question of costs; sometimes - as is the case in road freight transport - there is older legislation which limits or even completely disallows new policy to be written (example: weight/length limits for trucks).	Rejected. It is not quite clear how this relates to the finding at hand,
28455	SPM	11	1	11	8	Knowing how many models have not been able to produce low stabilization scenarios is important. Missing however is the information of how much the "feasibility frontier" moved in recent years. It can be assumed that with further development of the IAM models more mitigation options are built into the models (e.g. not all models had electric individual transport options in the time of AR4 and earlier intercomparisons) and hence mitigation costs are now projected to be lower than at the time of AR4. If that is correct, this information should be prominently included in the text and the underlying chapters.	Rejected. Mitigation costs are not lower than in AR4. Moreover, this finding is about less idealised scenarios with pessimistic assumptions on technology and international cooperation - something that has not been provided in AR4.
29050	SPM	11	1	11	8	The confidence level for this statement would be useful.	Accepted. We have done so far all findings unless "statement of facts"
20824	SPM	11	10	11	13	When we consider "with limited incremental net investment", improving the generation efficiency of coal power is effective. It should be added.	Rejected. This addition is not supported by the evidence from long-term integrated scenario models.
24387	SPM	11	10	11	11	"Climate policy is expected to induce a partial redirection of investments in 10 the energy sector from fossil fuel based" This is an extremely minimalist statement. Climate policy will need to focus on a rapid transition from carbon-emitting to carbon-free energy technologies. This is already occurring in many European countries and in many U.S. states.	Rejected. This finding is worded in a way that it can be supported by a broad literature.
29054	SPM	11	10	11	13	There is a gap between statement on page 11, that the energy sector can be decarbonised with "limited incremental net investment needs for energy supply", and the paragraph on lines 24-28 on page 17, which notes that many RE technologies, nuclear and CCS are not competitve with market energy prices. It would be helpful if either the Summarycould spell out the assumptions behind the statement on page 11 (higher market energy prices, fall in RE technology costs, other?) and/or the policy messages (eliminate fossil fuel subsidies, regulatory barriers) necessary to take us from the current situation on page 17 to the statement of future costs on page 11.	Rejected. In scenario results the institutional settings are very different than you find today. Scenarios commonly assume a world with a global carbon price.
22878	SPM	11	12	11	20	KEEP THESE SENTECES. As it is important to be explicit with the limt of models.	Noted.
34701	SPM	11	12	11	12	the redirection of investments in the energy sector could be expected to shift more to power plant & transmission efficiency & smart grid technology too.	Rejected. This is not an explicit part of the model evidence discussed in this finding.
25136	SPM	11	13	11	13	The paragraph should be restructured. Efficiency measures should not be considered as “in addition” to renewable energy and other low carbon sources. Rather, efficiency programs and measures by all accounts should be the foundation for the mitigation response effort in the energy sectors. In turn, this is not separate from the low carbon supply strategy but instead intimately bound to it.	Rejected. Energy supply and demand measure require different investments and need to be kept seperate.
22661	SPM	11	13	11	13	I could not find a determination in chapter 16 that incremental investment would be "limited". The chapter states in page 15 line 38 that it is "divergent". This is not surprising since there are compensating effects of lower energy demand Vs more expesive low emission supply. Of course, it is obvious that technologies like CCS cost of energy and this statement would otherwise strain credibility of the assessment. If there is data to base a divergent range, suggest including here and not refer to this as limited.	Accepted. We have removed this in our revisions of this finding.
28461	SPM	11	13	11	16	What does "with limited incremental net investment needs for energy supply" mean. Do you mean to say "with limited net additional costs"?	Noted. We revised this finding and removed this part.
26462	SPM	11	13	11	14	Does 'annual incremental investments' mean a one-off increase in annual spending or a year-on year increase in annual spending?	Noted. We revised this finding and removed this part.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21516	SPM	11	14	11	16	Absolute costs are presented. It would be good to have relative costs with respect to either current investments or GDP.	Taken into account - text revised.
28462	SPM	11	14	11	16	Compare these large cost numbers to other societal expenditures like for health systems, military spending, education, or fossil fuel subsidies.	Accepted. In the revised finding we compare these investment with the total annual energy system investment today.
25244	SPM	11	15	11	15	How sure are we about the risks of CDR? Better to replace "risks" with "uncertainties and risks"	Noted. We have revised this finding.
21517	SPM	11	16	10	16	Can similar information be provided for fuel savings achieved in those sectors that invest in energy efficiency or renewables?	Taken into account - text revised.
22662	SPM	11	16	11	16	Is this 450 CO2 or CO2eq?	Accepted. We have clarified this in the revised text.
26132	SPM	11	16	11	26	The figure is very difficult to understand.	Accepted. We have removed the figure and included a revised version only in the Technical Summary.
31318	SPM	11	17			The figure is inconsitent with the figure text: which stabilization target is presented first, 450 ppm CO2eq (as in the graph) or 550 ppm CO2eq (as in the figure text)? Probably the graph is correct and the figure text should read"… a 450 ppm (a) and a 550 ppm (b) CO2eq stabilization target..."	Noted. We have removed the figure and included a revised version only in the Technical Summary.
31319	SPM	11	17			The Figure is difficult to read. Very few policy makers are familiar with all the acronyms used on the x-axis of the figure(s) and in the explanation box.	Accepted. We have removed the figure and included a revised version only in the Technical Summary.
25835	SPM	11	17			I do not think that the results of individual models need to be included in the SPM. If they are kept, the abbreviations need to be explained.	Noted. We have removed the figure and included a revised version only in the Technical Summary.
23577	SPM	11	17	11	26	The SPM 7 figure caption is hardly understandable. a is relative to 450 ppm and b to 550 ppm, it should be entirely rewritten	Accepted. We have removed the figure and included a revised version only in the Technical Summary. Caption comprehensively revised.
22427	SPM	11	17	11	26	I suppose all the scenarios in the AR5 set some limitations on nuclear capacity and thus adverse effects of no-nuclear option becomes relatively small. This should be cleary indicated in the footnote.	Rejected. We do not talk about adverse effects of nuclear in this figure, but the effect of not having nuclear (and other technologies) on mitigation costs.
28465	SPM	11	17	11	17	For clarification the y-axis should be explained. E.g. 2 means that the costs are twice as high as in the AllTech-scenario.	Accepted. We have removed the figure and included a revised version only in the Technical Summary.
28466	SPM	11	17	11	17	Please add an explanation for the scenarios LowEI, NoCCS, NucOff, Lim SW and LimBio	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28463	SPM	11	17	11	17	Figure too small, letters are not readable. Abbreviations "AIM/CGE", "BET", "ECAM", etc. which are listed in the box at the right are not explained.	Accepted. We have removed the figure and included a revised version only in the Technical Summary.
28464	SPM	11	17	11	26	For a better balance, explain all scenarios instead of only the last three. Especially interesting: the large range of estimations as to the cost increase of "NoCCS" and the relatively low cost increase of "NucOff".	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure
28467	SPM	11	18	11	18	I think the order is mixed up. Doesn't 450ppm has to be (a) and 550ppm has to be (b)? And if (a) means the left part of Figure SPM.7 and (b) refers to the right part, then please add this in the titles of the figures.	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
30634	SPM	11	19	11	19	A reference and explanation is needed for the EMF27 study. What is this? Presumably it is discussed in the underlying chapter, but this information has not been carried through to the SPM.	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
33568	SPM	11	19	11	21	We think explanation of the numbers is unclear. We suggest: "The numbers at the bottom of the panel indicate the number of models that succeeded in keeping concentrations at 450/550 ppm respectively out of the total number that attempted this.	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
19748	SPM	11	2	11	5	What is "broadly pessimistic assumptions about technology"? Is this means slow development/improvement in current technologies or less than expected innovation realised, this shoule be stated as such to avoid mis-understanding.	Noted. We acknowledge that we have to be more precise. This refers to experiments where the availability of technologies has been fully or partially limited.
28469	SPM	11	21	11	26	It is difficult to separate the different scenarios. Please use shorter sentences to improve comprehensibility of the different scenarios.	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
30415	SPM	11	27	11	27	mention of Cancun is unclear it is presumed that pledges are what is referred to. This type of statement should be either clear or avoided.	Accepted. Text revised.
31320	SPM	11	27	11	35	Very informative finding.	Noted.
19977	SPM	11	27	11	29	I am familiair with the work of AMPERE, and I have difficulties with this, as we compare to my knowledge the pledges with scenarios that assume also the pledges, so it becomes very obvious that scenarios are consistent. I think this is self-fulling prophecy, as I can also make scenarios assume the pledges, that lead to 650 ppm CO2eq. More fundamental I think if we want to address questions like are the pledges consistent with a certain concentration level, we need to move from the 2010 emissions to the emissions resulting from the pledges in 2020, and than assume a extrapolated emission trend, and look to which emission levels we are heading. This leads to temperature increases in the order of 3-4 degrees, as has been done by many authors in the literature (check Rogelj et al. in Nature; ERL etc.; and also the many UNEP gap reports, see also climateactiontracker.org).	Rejected. This does consider the entire scenario database. Not only the AMPERE scenarios. Accompanying figure comprehensively revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30635	SPM	11	27	11	35	Suggest this paragraph would be better positioned between the paragraphs on lines 8-15 and lines 22-37 on page 10. Lines 8-15 on page 10 introduce the point that negative emissions may be required to meet lower stabilization targets. These lines, currently on page 11, make the point that the Cancun Agreements are consistent with a 450 ppm CO2-eq stabilization level only if negative emissions are widely achieved. Then lines 22-37 make the point that delays in international cooperation will make the use of negative emissions technologies increasingly essential.	Taken into account during revision. Complete section restructured.
30448	SPM	11	27	11	35	1) Suggestion: Include year for the United Nations Climate Conference in Cancun (especially important when the report will be published in 2014 and several climate conferences have taken place since the one in Cancun in 2010) 2) The sentence "Although near-term actions are only one step toward long-term stabilization, they can reduce the options for future decisions" is not neccesary in this paragraph. It only makes the reader question the importance of near-term actions since future options might be reduced (immediate action thereby appear as economically inefficient) 3) Information on the size of the emission-gap would be appropriate/informative and also a sentence highlighting that additional action is needed in order to close the gap between the GHG emmisions from the Cancun pledges and the scenario corresponding to a concentration of 450 ppm CO2eq in 2100.	Accepted. Text revised. We deliberatively do not comment on a emission gap as we believe that this is conceptually problematic.
22876	SPM	11	27	11	35	IT SHOULD BE NOTED that Cancun agreement is also compatible with much higher emission pathways.	Rejected. This is implicit in the finding.
34702	SPM	11	27	11	35	The message should be made very clearly here: if emission reductions by 2020 only meet the Cancun mitigation pledges and no more, negative emissions become necessary, in light of the 450 ppm stabilization scenarios assessed. This underlines the importance of more ambitious pre-2020 action, if forced reliance on negative emissions is to be avoided.	Noted. We have revised this finding.
27280	SPM	11	27	11	35	Reference to the Cancun Agreements should also include reference to quantified emissions and limitation reductions commitments under the second commitment period of the Kyoto Protocol.	Rejected. We are picking up results from the scientific literature here. Such emission reductions are not discussed in this context.
25535	SPM	11	27	11	29	This statement should not omit the robust insights (with what I think can be called high confidence) that Cancun agreements are only consistent with 450 ppm in the context of a substantial increase in relative mitigation efforts post-2020, and are only consistent if an overshoot of concentrations is accepted (as illustrated in figure SPM.8).	Noted.
30081	SPM	11	27	11	35	The climate pledges could be argued as being put forth individually by countries as they were submitted to the UNFCCC, in most cases preceeding Cancun. However, they were officially included in an INF document in Cancun.	Noted.
40817	SPM	11	27	11	29	These lines are interpreted as they mean the Cancun agreements are achievable by both 450ppm CO2eq and 550ppm CO2eq. If it is the intention of these lines, they should be rephrased as such, and both SPM and TS should include them.	Rejected. This is not quite what we are trying to say. We have carefully revised this finding for clarity.
28470	SPM	11	27	11	29	Please indicate also what you mean by CDR technologies. The glossary indicates that CCS or negative emissions from BECCS are not included. The text suggests that in case of delayed international cooperation CDR is the only option to meet the 450 ppm scenario. The underlying report mentions a lot of other options, including RE (see also SRREN), energy efficiency, and behavioral changes. Please include these options in this paragraph.	Noted. The glossary does not excluded BECCS as a CDR option.
28473	SPM	11	27	11	29	This sentence suggests that 450 ppm is only possible with negative emissions. This statement must be qualified with regard to the assumptions and the uncertainties in the IAMs. See also our comment on page 10, line 8-9.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28471	SPM	11	27	11	35	Revise this paragraph on the Cancun Agreement and expand substantially. Currently, it is too short, not related to 1.5C or 2C, not clear of whether simply cost-optimal pathways or delayed pathways are considered (the latter are unlikely to be appropriate in regard to the GAP question, but might be of interest, if the FEASIBILITY of 2C is considered).	Noted. We revised the paragraph. However, we do not discuss feasibility as a binary concept as often done in the literature as this is misleading the discussions. We included a table linking emission budgets to radiative forcing and temperature changes so that the interested reader can easily convert concentration into temperature information.
29055	SPM	11	27	11	28	Can you please define the "Cancun agreement"? Are you talking about 2oC which is 450ppm?	Noted. As highlighted further up in the section we use 450 as a proxy for 2 degree. We included a table linking emission budgets to radiative forcing and temperature changes so that the interested reader can easily convert concentration into temperature information.
29056	SPM	11	27	11	28	This needs to be confirmed in the light of comments on page 9. Line 27-29 above. ('We are surprised that the probability for staying below 2C for 550ppm is so close to that for 450ppm. It does not appear to align with work carried out in the UK's AVOID programme. Can this be checked for different models please.)	Noted. We included a table linking emission budgets to radiative forcing and temperature changes so that the interested reader can easily convert concentration into temperature information.
31321	SPM	11	29	11	31	Please provide information of the year (2010) for the Cancun meeting	Accepted.
30632	SPM	11	3			What does "pessimistic assumptions" mean? Suggest increasing precision of terms.	Accepted. We improved the clarity of the language. Note that we merged aspects on macroeconomic costs of mitigation scenarios in a single finding.
23494	SPM	11	30	11	30	add year of Cancun conference	Accepted.
33569	SPM	11	31	11	32	This sentence lacks clarity. We propose to rephrase it to: "Although near-term actions are only one step toward long-term stabilisation"	Noted. We have comprehensively revised the finding.
26113	SPM	11	31	11	32	What is the meaning of this sentence in the paragraph? ' Although near-term-actions are only one step…' Otherwise the message of the paragraph seems clear. Proposal to the beginning of the sentence: "..near term actions or non-actions are only…"	Noted. We have comprehensively revised the finding.
28474	SPM	11	31	11	32	For clarification please change the sentence to "Although near-term actions are only one step forward toward long term stabilization, the lack of which can reduce the options for future decisions".	Noted. We have comprehensively revised the finding.
28475	SPM	11	31	11	32	The meaning of " Although near-term actions…future decisions." is not clear. In fact, it is rather the absence of sufficient actions that render the goal of 450 ppm increasingly difficult.	Noted. We have comprehensively revised the finding.
31322	SPM	11	33	11	33	Should read: "… Cancun agreement renders a goal of 450 ppm CO2eq by the end of the century increasingly difficult…"?	Noted. We have comprehensively revised the finding.
40818	SPM	11	34	11	35	The "Cancun range" is vaguely used, but it should be clearly defined and its specific range should be explicitly given.	Noted. We have comprehensively revised the finding.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33564	SPM	11	4	11	4	The fact that cost can be "orders of magnitude" higher is not illustrated in fig SPM.7	Accepted. We have removed this expression.
28456	SPM	11	4		4	The statement "by four times to orders of magnitude" results from calculations of only one model (POLES) which produces several outliners shown in Figure SPM.7 and 6.23. Therefore there is only a very low confidence of this statement and it would be better to exchange it by "significantly". The reasons for the wide range of results shown in Figure SPM.7 remain unclear, not only the modeling approach but also different cost assumptions used are most probably responsible.	Taken into account in our revisions.
29051	SPM	11	4			…by four times to orders of magnitude…' awkward and a little unclear - are there figures that could be used instead of 'orders of magnitude'?	Accepted. We have removed this expression.
20872	SPM	11	5	11	7	The target based on introducing BECCS is seemed to be vulnerable.	Noted.
28457	SPM	11	5		7	"Indeed, many models in recent multi-model comparisons could not produce 450 ppm CO2eq scenarios with limited technology portfolios, particularly when assumptions preclude the use of BECCS." What is the conclusion from this statement, that BECCS is required to meet the targets? Or could this be a result of the models' approach of least-cost optimisation and limited flexibility for technology expansion as well as the investment cost assumptions led to this result? There should be a more comprehensive/profound scientific interpretation and assessment of the modelling results which also takes into account what the models can tell us and what they can not, i.e. which objective function they follow and which functions they neglect. Where is the evidence that all technologies including nuclear power plants, CCS/BECCS and unlimited biomass use are necessary for achieving the targets? If a real evidence can not be produced by the model approaches, renewables, nuclear power and fossils with CCS have to be treated as alternatives depending on national strategies (what they are for sure). In addition, the structural issues of load balancing - which are completely neglected in the IAM modells - results in the fact, that high shares of RE are not compatible with base load power plants without increasing costs and storage demand. This aspect also argues for alternative strategies than energy systems that include all available options with significant shares. To claim several times throughout the report that all options are required in general without being able to deliver a scientific profound basis for this conclusion is not acceptable.	Rejected. Model infeasibility induced by excluding a certain technology cannot the result of the fact that these are least cost models. The fact, that BECCS is important is related to the fact that models require an amount of negative emission that cannot be generated otherwise within these models. We cannot follow many of the other arguments provided here.
28458	SPM	11	6	11	6	What is meant with "limited technology"? Please give more information on the technologies included in these limited portfolios and explain the term or provide an example.	Accepted. We clarified the language, but note that Figure SPM.7 made this fairly clear, but we acknowledge that a cross-references should have been provided that points the reader to the figure.
30414	SPM	11	8	11	8	Only moderately to several fold is a useless statement for a SPM.	Accepted. Finding revised.
29052	SPM	11	8			could be increased' - slightly ambiguous (we're not trying to increase these costs ourselves); perhaps 'could increase' or 'could see increases'	Noted. Finding comprehensively revised.
31317	SPM	11	9	11	16	This is an important finding. The timing of the needed change in investment patterns should also be reflected. Please consider to include a word like e.g. "rapidly" after the word "change" in the bold text.	Noted. Finding moved to new section SPM.4.
30633	SPM	11	9	11	13	Suggest adding here the text from lines 3-4 on page 11 of the Technical Summary: "Scenarios stabilizing GHG concentration at 550 ppm CO2-eq or lower require improvements in carbon intensity at a pace that is unprecedented in human history." This is an important message to convey in terms of the scale of change in investment patterns in the energy sector that is require to achieve these stabilization levels. That said, this statement needs reconciling with the statement on line 13 that seems to suggest only limited additional investments in energy supply are needed. The messages to governments are not clear here.	Rejected. We agree with the importance of this finding, but we would not merge it with the investment finding, which was shifted to new section SPM.4.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33565	SPM	11	9	11	10	This conclusion does not have any direction. We suggest to rephrase it to: "Current investment in low carbon technology deployment needs to increase substantially to be compatible with most stabilisation scenarios."	Noted. Finding revised and moved to new section SPM.4.
33566	SPM	11	9	11	16	please add confidence level	Accepted. We made sure that confidence statement is always present unless a finidng is a statement of fact.
30447	SPM	11	9	11	16	The paragraph highlights that investments in energy efficiency are required in the building sector, transport sector and the industry sector. It would be very informative if further information could be provided e.g. regarding regions/countries where investments in the different sectors are most economically efficient.	Accepted. We added the new Figure SPM.12 which provides a split between world and non-OECD.
22877	SPM	11	9	11	10	Raplace "require" by "is possible only if"	Noted. Finding revised and moved to new section SPM.4.
34700	SPM	11	9	11	10	Why the word "most" in this bolded sentence? Are there stabilization scenarios that would be compatible with current investment patterns?	Accepted. We revised the finding and shifted it to the new section SPM.4.
28459	SPM	11	9	11	13	The statement is a generalization which should not stay like this and should be deleted . In this paragraph you also forget to explain, that a no-nuc-scenario would be possible for no extra investment costs as SPM.7 shows.	Accepted. We revised the key finding and moved the entire finding to the new section SPM.4. The no-nuc issue is a different matter and not related to investment, but mitigation costs.
28460	SPM	11	9	11	16	Why are there estimates for energy efficiency and not for investment in energy sector?	Rejected. There are estimates for energy supply technologies. We try to keep a good balance between supply and demand.
26402	SPM	11	9	11	16	The global investment risk-reward cost-curve needs to be bent deliberately to reward non-GHG emitting primary energy sources and energy efficiency over GHG emitting primary energy sources. Institutions must be encouraged to prudently invest in low-risk, non-GHG emitting primary energy sources and energy efficiency as fiduciary duty to their stakeholders and shareholders. Furthermore, climate change policies must catalyze commercial innovation to mitigate climate change through various economic means.	Noted. Such conditions are present in models underlying these estimates. We try to make underlying assumptions clear in a series of boxes in the Technical Summary.
29053	SPM	11	9	11	16	The confidence level for these statements would be useful.	Accepted. We made sure that confidence statement is always present unless a finidng is a statement of fact.
28468	SPM	11	21	11	26	"LimSW" is not explained. Subtext not clear: "....and nuclear and the higher energy intensity pathway and the energy efficiency and renewable energy (EERE) case combines optimistic bioenergy and other RE assumptions with a low energy intensity future and non-availability of CCS and nuclear. "	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
31276	SPM	11				(also page 13, 15, 18, 21, 23, 24)"developing countries" should be defined. In Figure SPM1 three types : indutrialized, developing, lesast developed. In pae 4 line 9 and in page 24 line 7 : developing, developed ; therefore ilmplicitly assuming that LDCs are developing countries and that developed equals industrialized	Taken into account.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34035	SPM	11	1	11	8	1) The box needs a title. 2) The letters appearing within the chart are presumably the models run. They however do not appear to correspond with the number noted at the bottom of the panels. Eg: 450NoCCS shows 2 letters (Q and N) but the feasible models are noted as 3 out of 11. 3) It is difficult to corelate the text with the supporting figure provided (SPM 7) 4) What do the bars and dotted lines represent?	Noted. Figure has been removed. A revisded version has been included in the TS.
28472	SPM	11	27	9	35	This para and related figures should be placed at the beginning of the chapter as this offers a link to the actual political decisions under the UN.	Rejected. The section follows a logic and requires some preceeding findings before this can be fully appreciated.
32709	SPM	11	12	11	12	As the paragraph does not contain any indication of “confidence” level, the mention of nuclear energy is questionable.	Accepted. We made sure that confidence statement is always present unless a finidng is a statement of fact.
32260	SPM	11				Difficult graphs to read the messages behind. The explanation is not easly to understand and without any quantitative information at all.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
41041	SPM	11	10	11	13	Climate policy to redirect partial investment from fossil fuel to renewable energy. This assumption needs support. The world is moving heavily towards renewable and energy, at the expense of investment in fossil fuel.	Rejected. This is not an assumption, but a result of a integrated modelling scenarios as can be found in the literature.
24235	SPM	11	10	11	13	"Partial redirection of investments…" by how much? An indication has to be given. Otherwise, the satement is vague and does not add value to the text.	Accepted. We have clarified this in the revised finding, which can be found in the new SPM.4 section. We added the Figure SPM.12 on this issue.
41040	SPM	11	2	11	5	Studied indicate that the cost of pessimistic assumption would four time in the future. These studies need to be verified and examined before being reported to policymakers.	Rejected. Relevant studies have been collected and carefully assessed before including them in the SPM.
24236	SPM	11	27	11	29	Misleading statement. If no 450 ppm targeted anymore and current pldges are in line with a 550 ppm trajectory, then this statement sort of suggests that we need no higher level of ambition as current mitigation efforts already takes us to the 550 ppm target. I suggest rephrasing the text so it is emphasize no how close we are from the 550 pathway but how far we are from the 450.	Accepted. We have clarified the language.
23109	SPM	11	27	11	35	Rephrase as "The national emission reduction pledges made at the UNFCCC conference in Cancun 2010 imply a near-term emission trajectory that makes it unlikely to reach a 450 ppm CO2 eq stabilization target by 2100 without using CDR technologies. A stabilization at 550 ppm CO2 eq would still be possible."	Noted. We have clarified the language.
33954	SPM	11	33			“centuries” ? is it “century” ?	Noted. We have comprehensively revised the finding.
26281	SPM	11	13	11	16	The sentence uses the verbal expression "are required" (line 14) before listing the sectors and then, "are needed" (line 16) after. I suggest to delete "are needed" because is redundant with "are required"	Noted. Text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32370	SPM	11	17	11	26	Figure SPM.7: we suggest to update the figure and to explain all the many details hidden in the figure. The x-axis is currently difficult to understand.	Accepted. We have removed the figure and included a revised version only in the Technical Summary.
32371	SPM	11	27	11	29	Suggest to briefly remind the reader about what the Cancun agreements are; year is missing for the conference.	Taken into account. Text revised.
32711	SPM	11	29	11	29	Instead of the “United Nations Climate Conference”, write: “the sixteenth Conference of the Parties to the UNFCCC”.	Noted.
26280	SPM	11	4	11	5	The expression "order of magnitude" is not necessarily known to lay people. I suggest to replace the sentence with: "(…) by four to ten or more times (…)" instead of "(…) by four times to orders of magnitude, (…)"	Accepted. We have removed this expression.
32243	SPM	12				The unit, Billion tons CO2 needs to be changed to Billion tons CO2eq. Categories 0-1 and 2-3 needs to be explained in the note. Explanation of the categories is given in the Table 6.1.	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
33571	SPM	12		12		This figure is complicated. We think it can be simplified without much loss of information. As the categories are not explained in the SPM, we suggest to delete "(Categories 0-1)" in the top panel and "(Categories 2-3)" in the bottom panel. We do not think it adds much value by specifying the number of modelruns, as this is already expressed by the density of dots in the graph, so we suggest to remove these. As the remaining legends are identical for both panel, we suggest to combine them, and make use of the space to write out the cat. We think "Kyoto Forcing" is not a known concept and we suggest to replace it by "Kyoto gases only".	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
25137	SPM	12				This chart is very difficult to comprehend. There are plenty of charts from the UNEP emissions gap reports and elsewhere that do a much better job of this same basic presentation.	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
21519	SPM	12				This figures seems complicated for policy makers. One would need the information for the period after 2030 for many of the delay and peaking scenarios to understand the implications. As such, maybe it is better to include some information on this.	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
34703	SPM	12				It should be clarified here that the numbers on left refer to energy sector CO2 emissions only.	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
23820	SPM	12				The range for the 450 in 220 is heavly dependent on the three outilners. It is also not possible to dell where the median or range is for the coloured dots as they overlap. I suggest the vertical dotted blue lines for the ranges be box plots. In fact, it is probably best to use box plots for all the ranges so one can see the 0-25-50-75-100 intervals and the outliners.	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
23578	SPM	12				What is the rationale for introducing the Kyoto gases, why for NTE only ? Is total CO2eq. used for OS ?	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
38943	SPM	12				Clarification is needed in the caption and titles of both panels in this figure. The values shows in the historical line (black) are clearly energy CO2 numbers and NOT all GHG numbers. So the panel titles should not be in units of CO2e (but rather CO2) and the caption should clearly state that this only reflects energy CO2 - 60.7% of global GHG emissions, according to Fig. 1.3	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38944	SPM	12				Great plot but probably hard to understand for policy makers - maybe explain a bit more in caption on how to read it, perhaps with a "for example"	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
29057	SPM	12				levels seem very low and not consistent with Figure SPM1. Are these graphs for fossil fuel CO2 alone? Would be best to have all gases and include land use too. (same point for SPM 6 on pg10)	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary. Ensured consistency with historic emission data.
25120	SPM	12				Make (a) and (b) in one figure so that readers can understand the difference between 450 and 550 ppmCO2e at a glance. Also I think notes such as “Range for 550 CO2e” and dotted lines are somewhat confusing. Is n't there any alternative way of explanation?	Noted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
31323	SPM	12	1			Please clarify what is meant by "CO2 emissions" in Figure SPM 8. Does it only include fossil emissions and biogenic carbon released by land use change (deforestation/forest degradation) or does it also include temporal CO2 emissions from forest management (where carbon stocks are maintained and carbon is reabsorbed by photosynthesis) as suggested in chapter 11? (Please see chapter 11 page 34 line 22) or Chapter 7 page 46, line 15.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
26133	SPM	12	1	12	10	The figure is very difficult to understand.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28482	SPM	12	1			The link between figures should be made clearer.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28480	SPM	12	1	12		The figure is unclear. First, it is not clear how the Cancun Agreement ranges are translated into CO2-only emission ranges. Secondly, the figure should relate to the policy-relevant targets of 1.5C and 2C (in terms of RCPs), not 450ppm CO2eq and 550ppm CO2 eq. Thirdly, the two questions of I) the GAP towards cost-optimal pathways and II) the feasibility of a climate target should be clearly separated. In other words, for the GAP question, only statistics in regard to the scenarios that assume FULL COOPERATION / COST-OPTIMAL PATHWAYS with a optimization start around 2010 should be shown. For the question of whether the delay could render a climate target unfeasible, the ratio of unsuccessful to successful model implementation has to be shown (possibly in a separate figure) for both the full and delayed scenario cases.	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28483	SPM	12	1	12		The green dots can be removed, as this information is not relevant for long term targets. Instead of points the emission pathways should be shown, as the trajectories are most interesting. Scenarios with a 66% probability to stay below a certain T-limit should be shown.	Rejected. The green dots cannot be removed. But we have taken up the T-limit suggestion in our revision. Figure only included in Technical Summary now.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28484	SPM	12	1	12	2	The titles of figure (a) and (b) say "CO2-e", but the title of the vertical axis says "CO2". This should be noted in the caption.	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28479	SPM	12	1	12	3	Figure SPM.8 is really hard to understand and should be significantly improved. Please delete the vertical dotted lines and the text "Ranges for XXX CO2-e (see panel x)", it is confusing. The distinction between Kyoto/Non-Kyoto is too much for this graph, and is only given for NTE scenarios, how about OS? (What does Kyoto-forcing mean (is it emissions from Kyoto-gases?) It would be more interesting to show the for 450 and 550 ppm CO2e for a given time in one graph, i.e. graph a) would show the situation for 2020 and graph b) for 2030. More information on the conditions of the scenarios is needed.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28481	SPM	12	1	12	9	The language of the caption must be improved to be understandable. Why "NTE vs. OS"? Why "total contributions to forcing"? What exactly does "availability of negative emissions technology" mean (R&D or deployment)? What does "delay" mean (how many years)? Why "delay" versus "full" - the contrary of would be "immediate"? Does the number of "reported results" come from different models or are these different realizations from a few models? What are the differences in the models and scenarios?	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
25556	SPM	12	10	13	8	There are lots of co-benefits opportunities between climate change mitigation and air pollution measures. For example, emission reduction of black carbon will cause co-benefit of climate change mitigation and health impacts mitigations. However, trade-off relationships also exist. For example, emission reduction of SOx will cause temperature increase while air pollution is mitigated. Energy security issues are also the same. Imported fossil fuel reductions will lead to climate change mitigation and increase energy security. However, the fuel shift from domestic coal to imported natural gas will cause climate change mitigation but will decrease energy security. There are complex relationships. Figure TS.9 is only one case study. For example, K. Akimoto, F. Sano, A. Hayashi, T. Homma, J. Oda, K. Wada, M. Nagashima, K. Tokushige and T. Tomoda, "Consistent assessments of pathways toward sustainable development and climate stabilization," Natural Resource Forum 36(4), 231-244 (2012) indicates such a complex trade-offs by country/region regarding energy security etc. IPCC should not depend on the conclusion drawn by a selected group of papers. Other estimates should also be touched upon.	Rejected. This is one line of evidence found in the literature on multi-objective studies in integrated models. This paragraphs summarizes the findings from this emerging branch. Later on other parts of the literature are treated. This seems appropriate.
20086	SPM	12	10	12	17	Could also the potential complementarities/contradictions with poverty alleviation be mentioned here ?The fact to mention only energy and air pollution is interesting in figure SPM9 which is fine, but unsufficient in the text which should mention other global policy goals (biodiversity conservation, poverty, employment....)	Rejected. However, we added a finding on poverty in the Technical Summary.
32588	SPM	12	10			"Climate policy could provide an entry point to achieve a broader set of non-climate objectives". This is a very climate-centric way of putting it; surely in most parts of the world it is the other way around (policies on energy security, local air pollution, resource efficiency, fuel poverty and innovation may generate climate benefits). This seems to be message in particular of Chapter 4 as well as some of the sectoral chapters. Because of status quo bias, myopia and impact of incumbent interests etc, in any real political decision-making system, one of the conclusions in our book Planetary Economics (Grubb et al., Chapter 12) is that climate change may be an additional motivator, helping to add to the coalition of forces for beneficial reforms and overcoming status quo bias and numerous other non-optimalities that are charted throughout the AR5.	Accepted. We have revised the headline finding comprehensively.
33570	SPM	12	10	12	10	We find the bolded section unclear and propose to rephase it to:"Mitigation measures often have cobenefits that assist in realising other policy goals that fit within sustainable development".	Accepted. We have revised the headline finding comprehensively.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22887	SPM	12	10	12	8	DELETE this para and figure as it is single sided. Adverse side effects, including ecomic costs of CC policy, must be mentioned and it is done well in p21 line 4-5 and p21 line 32-39.	Rejected. We mention risks throughout the section. But we comprehensively revised the finding.
26726	SPM	12	10	12	17	Important view, but another perspect of costs	Noted.
22413	SPM	12	10	12	17	Though climate policy could provide and entry point to achieve a broader set of non-climate objectives, overinvestment in climate change mitigation may cause a severe damage to well-beings of current and future generation if investments into such issues as epidemics, food, anti-terrorisms, etc would be reduced significantly as a result of applying climate policy. In this sense, these risks should be clearly indicated in this section and following sentence should be added at the end of this section: "However, exaggerated emphasis on climate policy would risk global sustainability."	Rejected. This is one line of evidence found in the literature on multi-objective studies in integrated models. This paragraphs summarizes the findings from this emerging branch. Later on other parts of the literature are treated as the comment indicates.
32094	SPM	12	10		17	Societal objectives are as diverse and controverse as climate policy, therefore complexity in being added by this proposition without referring to ist implications. Similarly, health policy does not equal to human development.	Noted.
25246	SPM	12	10	12	17	The conclusion provides a one-sided (positive) view of the implications of climate policy vis-à-vis non-climate policy. High reliance on technologies like BECCS for negative emissions could have significant negative welfare implications, e.g. arising from adverse impact on food secuirty espcially in developing countries. The conclusion needs to be reported with balance of pros and cons. A description of 'cons' on 'livelihood effect' does exists on SPM Page 20 line 23 to Page 21 line 2. This may be linked to the above mentioned conclusion on page 12.	Rejected. As highlighted by the reviewer, different parts of the SPM cover different aspects. We need to focus the paragraphs of particular aspects and braches of the literature.
30082	SPM	12	10	12	17	Excellent, make sure to keep this para. It could be further problematised as it is on p8, L16-25, and elsewhere in the report (eg water consumption of biofuels) but the general notion that other policy objectives may push mitigation and adaptation should be emphasised.	Noted.
26134	SPM	12	10	12	17	The text does not relate to figure SPM8 -> please reconcider placement of the figures (see also comment no 5)	Noted.
38942	SPM	12	10	12	17	This is an important section. It might benefit from adding in other benefits that were described in chapters, and include chapter 9 in reference at end [].	Accepted. We have revised the text and provided are broader finding on co-benefits.
40819	SPM	12	10	12	17	It is misleading to describe that "climate policy could provide an entry point to achieve a broader set of non-climate objectives", since only energy-security and air pollution are defined as non-climate objectives. Furthermore, energy security and climate change mitigation are not necessarily in a positive correlation with each other.	Accepted. Note that this is one line of evidence found in the literature on multi-objective studies in integrated models. This paragraphs summarizes the findings from this emerging literature. We have broadened ths finding in our revisions though.
28486	SPM	12	10	12	17	In this para, we would expect the keyword "co-benefit".	Accepted
28487	SPM	12	10	12	17	The aspect of co-benefits of climate policy is very important and it is well placed in section SPM.3 on long-term scenarios. However, Section 4.3 gives more details on co-benefits. Therefore, we suggest to highlight the aspect of co-benefits already in the first para of Section SPM.3 and to delete the para on page 13, line 1-8.	Rejected. This is a cross-cutting issue, which re-occurs alongside the topic of risks.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28488	SPM	12	10	12	17	The broader set of non-climate objectives could be more highlighted here, also covering the benefits of the deployment of renewable energies and energy efficiency.	Rejected. This finding is more on the scientific literature on mitigation pathways than on mitigation measures. However, we have broadened the finding pointing to the breadth of literature on co-benefits
30637	SPM	12	11	12	11	This is the first introduction of the phrase 'transformation scenario" in the SPM and it requires some explanation.	Accepted. Use "mitigation scenario" now.
30419	SPM	12	12	15	16	The added value of this is not clear	Noted. We have revised the finding comprehensively.
30638	SPM	12	12			Suggest clarifying what societal objectives are being referred to here.	Noted. We have revised the finding comprehensively.
23704	SPM	12	12	12	12	may have an impact "on (missing)" other societal objectives?	Noted. We have revised the finding comprehensively.
31694	SPM	12	12			What level of confidence/agreement on this statement.	Accepted. We have added a confidence statement to the revised finding.
28489	SPM	12	12		13	"However, mitigation choices may have an impact other societal objectives and…": wording should be more explicit: "…may have strong impacts to..." " some mitigation choices have impacts to other societal objectives..."	Noted. We have revised the finding comprehensively.
25365	SPM	12	13	12	16	This sentence should be removed from this report. As this sentence stands on the ground which is not clear, it should not be written in such an assertive way.	Rejected. But we have comprehensively revised the finding.
28490	SPM	12	13	12	17	Please, provide and explanation for this result and the respective uncertainty language.	Noted. We have comprehensively revised the finding.
25121	SPM	12	13	12	15	Here only synergy effect has been described. There should be tradeoffs, however, between (especially stringent) climate policy and its impacts to other globally urgent issues, including diseases, sustainable economic growth etc. as global resources are scarce. I agree climate policy has synergetic effect for human health. However, for the purpose of saving child's lives from Malaria for example, direct measures such as mosquito net with chemicals may be more effective. Under the situation, we need to allocate global resources efficiently among urgent issues. And there are many such issues including MDGs. These should be added even briefly in order not to mislead policy makers and readers. The important issue here is the LAW OF SCARCITY and EFFICIENT ALLOCATION OF GLOBAL RESOURCES.	Rejected. This is one line of evidence found in the literature on multi-objective studies in integrated models. This paragraphs summarizes the findings from this emerging literature. Later on other parts of the literature are treated as the comment indicates.
23705	SPM	12	14	12	17	How do you assess the degree of synergy?	Noted. We have comprehensively revised the finding.
25247	SPM	12	17	12	26	The caption should explain the various technology portfolio options that are listed on the x axix	Accepted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
25245	SPM	12	3	12	9	This is a very difficult figure to comprehend - can it be simplified?	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25557	SPM	12	33	12	37	Why does the SPM put an emphasis on scenarios of the 1.5 and 2 degrees targets? Wide ranges of scenarios should be discussed. This sentence should be revised.	We cannot clearly relate this comment to a finding based on the information provided.
25558	SPM	12	33	12	37	Many figures in the SPM treat 450 and 550 ppm CO2eq scenarios. Do you mean that the SPM focuses on 450 and 550 ppm CO2eq which correspond to 1.5 and 2.0 degrees C, respectively? They seem to be consistent according to Table 6.1, but inconsistent with the above sentences (Page 9, Line 22-32). Please make clear this point.	We cannot clearly relate this comment to a finding based on the information provided.
26725	SPM	12	5	12	6	It is not very clear what the difference between Kyoto and Total forcing is. Suggest to add a the end of the sentence: " including other climate forcing emissions" or similar.	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
28485	SPM	12	6			"forcing" needs to be explained.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
26463	SPM	12	6			Kyoto gas contributions to forcing are readily understood, but it would be useful for the reader to know what is included in "total contributions to forcing" i.e. what is included in the "total" that is not included in "Kyoto" contributions.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
26488	SPM	12	13			… after "mitigation efforts." include: "For example, the development of skills, human capital and employment in low carbon technologies has a positive mitigation impact. National and International employment assessments indicate that a positive net job and income effect is likely from a shift from high to low carbon technologies." Source: International Institute for Labour Studies (2012), Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy (Geneva, ILO, 2012)	Rejected. This is not a clear finding in the scientific literature to our knowledge.
41042	SPM	12	13	12	16	Synergy relationships between societal objectives tend to be stronger. This is true for developed country societies. While developing countries societies are less receptive to climate policies as they have other priorities to eradicate poverty and obtain a simple decent quality of live that developed country have enjoyed.	Noted. For this very reason it is important to highlight to what extent climate policies are interdependent with such additional objectives. Many of the co-benefits can be reaped in DCs like on human health.
26282	SPM	12	1	12	2	the same comment as for figure SPM.6 and page 3, line 35. The 2010's emissions of 50.1 Gtones do not match with the figure SPM.8. Needs to clarify	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
20023	SPM	12	1		9	Delete the descriptions and plotted points for Kyoto gas and forcing, as Kyoto gas concentrations and forcings are not comparable with the other description and points in GHG concentrations and forcings.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20024	SPM	12	1		9	Delete the descriptions and plotted points for Category 0 from panel (a) and those for Category 2 from panel (b) to avoid bias, as it seems 450ppm goal is out of Category 0 and 550ppm goal is out of Category 2 according to Table 6.1 of chapter 6 (p.19) .	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
32372	SPM	12	3	12	9	Figure SPM.8: Please change units to Gt CO2.	Accepted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
32373	SPM	12	3	12	9	Figure SPM.8: The approach of not showing individual lines for scenarios and rather using vertical bars for a particular set of scenarios and different time windows is misleading. It seems to imply that any scenario staying within, e.g., the green ranges at both time intervals is sufficient to not exceed the 450/550 CO2equivalent target. But that's not the case and where you are on the green bar in 2020 will determine where you have to be on the green bars later on. Or in other words, if you are at the upper end of the, e.g., green bar in 2020 you will need to end up at the lower end of the green bars later on to reach the target. It's the cumulative carbon emissions that are relevant here (see Chapter 12 of WGI AR5). The figure thus misses the important point that, for any given target, if you emit a lot early on you will need to reduce more later on (and vice versa) to stay within the (for this target) allowable cumulative carbon budget.	Noted. We have removed the figure and included a revised version only in the Technical Summary. We comprehensively revised the figure caption.
32846	SPM	12	10	12	17	Is there any indication of climate policies contradicting other policy objectives? How about economic competitiveness? How about the competition between food and biofuels? Also, the discussion is much more to the point in Section SPM.4.3. May be lines 10-17 could even be skipped or a references to SPM.4.3 provided.	Rejected. We belive that these multi-objective studies present an important new development in the literature.
40996	SPM	12	10	12	17	It shall also be stated that whether climate policy may will have any negative effects on economy or geo-physical settings.	Noted. We discuss the risks of mitigation throughout the section.
23706	SPM	13		13		What is the definition of "energy sustainability"?	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
33572	SPM	13		13		We find this figure very useful, but also too complicated. Since it is not explained what "a set of four distinct scenarios" contain, we suggest to delete the pink circles. The legenda at the right hand side of the figure seems biased and we propose to change the definitions to: "objectives fullfilled at 'weak' level" (dark blue), "objectives fullfilled at 'intermediate' level" (mdium blue) and "objectives fullfilled at 'stringent' level" (light blue). Lastly, the comment at the top of the 'Only climate change' column is fine, but we think putting the corresponding comment on top of the 'Only air pollution' column would even be more useful.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
31695	SPM	13				The figure should be labelled to make clear what the dots represent.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
31698	SPM	13		14		Lots of details from external modeling work on emission pathways and GDP costs (and that models are still poor at factoring in real world barriers and transaction costs).	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22853	SPM	13				this figure is too complicated. And the colors are not explained. What is ES and PH? I do not understand the message.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
34253	SPM	13				It could be advantageous to illustrate the portfolio effects: Looking at this graph it seems, that Climate change policies are rather expensive. The benefit of following all three goals in a combined approach vs. three one-target-only policies does not really show up here.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
23579	SPM	13				This figure lacks the bottom part of figure 6.32 that should be reproduced to explain the meaning of the three blues which cannot be understood from the present SPM.9 figure and its caption.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
40825	SPM	13				The Y axis of this graph indicates "cost", which have an impact to policy makers. However, this figure is based on a few papers from one institute. I recognize the paper was published in a highly reputed journal, however, the potential impact of "cost indication" would be large especially when the current result have any inconsistency with future trajectory. Therefore, it might be a little too hasty to put this picture with cost, and would be better to delete at least the scale in y axis. Even though Fig. SPM 7 treats costs, the graph is based on aggregate of reports of various researcher.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
40826	SPM	13				The intention of the figure should be made more explicit. For example, policy costs for just ES and health could be understood to be cheaper than CC.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
29058	SPM	13				What are the pink circles doing here exactly? Are they showing costs caluclated according to four (which?) scenarios, as a different approach to using the 600+ scenarios used for the coloured bars? And why?	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
29059	SPM	13				It would be very useful to understand the impact on economic growth of a given mitigation intervention. This is incidentally touched on in fig. SPM.9 (it isn't the main point of the figure) and yet I would have thought that it is a central issue, given that the objective of almost all nations is economic growth in the short term (sustainable or otherwise). I think that this issue deserves greater emphasis. How, for example, will different emission 'pathways' affect economic growth with time?	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
25122	SPM	13				Full spelling of ES, PH and CC should be shown in the Figure itself. This is reader friendly purpose.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
26464	SPM	13				Presentation of the figure needs to be improved. The abbreviations ES, PH and CC need to be placed underneath the appropraite descriptors along the x-axis	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26465	SPM	13				I don't understand the distinction between the blue bars and the pink circles - are these different data sets? Why are the two different data sets both of interest?	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
30639	SPM	13	1			The acronyms ES, PH and CC are not defined anywhere in the Figure or Figure caption. Suggest the acronyms be added along the x-axis under the relevant bars of the Figure.	Accepted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
25836	SPM	13	1			It is not clear in which overall scenario this results are included. Please specify.	Accepted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
26727	SPM	13	1	13	8	It is not clear what the difference between the different blue sections is. I assume that the describing text at the far right in Figure SPM.9 is for all bars but it could be useful to add that information also in the figure text	Accepted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
25248	SPM	13	1	13	1	Units on y-axis should be "billion tons of CO2 per year"	Accepted. We have removed the figure from the SPM. A revised version including the caption has been included in the Technical Summary.
28492	SPM	13	1			In general: useful figure! But: needs a lot of simplification. Please also include the lower part of the figure as in TS, page 18, line 13. Otherwise it is difficult to understand, what the different shades of blue actually mean. Moreover, the meaning of the pink circles is not totally clear. Does the pink circle on the "only climate change" ba mean that no policy on climate change would only lead to a GDP loss of less than 0.2%???	Noted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
28491	SPM	13	1	13	8	Abbreviations ES, PH, and CC should be explained in caption. See also comment on TS p.18, 14-19.	Accepted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
25249	SPM	13	10	13	11	"Unprecedented in human history" - Seems like subjective language	Noted. We have removed this finding and infused some crucial aspects throughout the section.
40820	SPM	13	10			The "Cancun range" is vaguely used, but it should be clearly defined and its specific range should be explicitly given.	We cannot clearly relate this comment to a finding based on the information provided.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33576	SPM	13	11	13	12	This sentence is filled with value judgements. We think it needs to be reformulated to: "Emission pathways that are projected by economic models assume a strict implementation of agreed emission reductions".	Rejected. The models assume a global carbon price in a way that particular concentration levels are hit in 2100 at minimum costs.
31278	SPM	13	12	13	13	sentence not very clear	Noted. We have removed this finding and infused some crucial aspects throughout the section.
20087	SPM	13	12	13	20	Thiis paragraph refers probably too much to concepts derived from economics (information, proprety rights, transaction costs), which lets the reader think that climate change policy are before all an economic problem, with some kind of equation to resolve. I would be more balance in term of vocabulary used : what about social and political consensus about the need to mitigate, social acceptance of modified lifestyles... No word about that here.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
25250	SPM	13	12	13	13	"The sets of property rights in all countries and in between all countries…." - the meaning of this is unclear	Noted. We have removed this finding and infused some crucial aspects throughout the section.
25042	SPM	13	12	13	20	These caveats to the line 9 to 11 are very important and should be kept as they are.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
40821	SPM	13	12	13	20	This part describes important threshold of a model. Therefore, please do not delete it.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
28495	SPM	13	12	13	13	The sentence is not comprehensible. What are "sets of property rights", how can they be "enforced", and "at zero costs". Are you referring to "intellectual property rights"?	Noted. We have removed this finding and infused some crucial aspects throughout the section.
29061	SPM	13	12	13	15	Are results available from models which have relaxed the assumption of no policy or transaction costs? If so, how do these change the results? Could this be reported in the SPM?	Rejected. The models relax some assumptions, but by far not all. We have made these cases clear throughout the summary.
33577	SPM	13	15	13	20	Assumptions (1) and (2) are unclear. We suggest to rephrasing to: … "(1) All large emittors recognize the mutual interest to reduce GHG emissions adequately; (2) International cooperation is able to create sufficient trust for all large emittors to act correspondingly; ...	Noted. We have removed this finding and infused some crucial aspects throughout the section.
32448	SPM	13	15	13	20	These are preconditions of the model thus should be remained.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
25252	SPM	13	16	13	17	The term 'Largest Emitters' should clearly specify whether the term referes to: i) 'per capita' or 'total' emissions of the emitter nation, and ii) why? Besides, it is unclear what is meant by 'credible incentive'.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
29062	SPM	13	16	13	20	Would be useful to say more on how realistic these assumptions are and what would be the impact if they are not met (e.g. market failures could lead to increased mitigation costs).	Noted. We have removed this finding and infused some crucial aspects throughout the section.
28496	SPM	13	19		20	"(5) Human preferences are exogenous and constant". Does this mean public acceptance of mitigation options has not been taken into account at all? This should be made clearer.	Noted. We have removed this finding and infused some crucial aspects throughout the section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33573	SPM	13	2	13	8	Caption of SPM.9 refers to paragraph 6.32 which does not exist.	Noted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
22664	SPM	13	2			Suggest that this figure also consider potential benificial aspects of low-cost energy. For example, effects on energy access as discussed in 6.6.2.3. This figure appears biased to only include co-benefits and not co-impacts	Rejected. There are limits to what can be done from the available scenario evidence.
40822	SPM	13	20	13	20	The end of the sentence needs a reference to corresponding chapters/sections in underlying report	Noted. We have removed this finding and infused some crucial aspects throughout the section.
25123	SPM	13	20			After "constant", add "These assumptions are quite unlikely and this means costs are much higher than those that economic models tell us".	Noted. We have removed this finding and infused some crucial aspects throughout the section.
23495	SPM	13	21	13	31	This paragraph assumes that it is clear how responsibility for emissions is determined (e.g. production/territory based) - but costs will also be distributed differently according to the way in which emission responsibility is determined, e.g. if consumption-based or per capita measures are used	Rejected. The finding talks about the distribution of mitigation costs in the absence of burden sharing institutions.
20088	SPM	13	21	13	31	Here again, excessive influence of economics: why should a climate poilicy be summarised in a carbon costs ? Should not other elements of the "policy mix", for instance "traditional" regulation (the fact to vorbi the most emitting fossil energy sources, or to limit the development of coal mines....) be mentioned ? The assumption that a carbon price and a market will solve the problem should at least be introduced	Rejected. This finding is based on model evidence. It talks about the distribution of mitigation costs in the absence of burden sharing institutions
33578	SPM	13	21	13	22	We think the bolded section is not carefully worded and we suggest to rephrase it to: "Without effort sharing, the cost of mitigation varies substantially across countries and regions ."	Accepted. We have comprehensively revised the finding on effort sharing for clarity.
33579	SPM	13	21	13	31	This paragraph lacks a confidence statement.	Noted.
30450	SPM	13	21	13	31	This is a very informative paragraph, however, it would be very useful if the potentials across regions could be pointed out. As it stands now only total abatement costs are refered to which depends on both potentials (Tonnes og GHG) and average costs. In the example of OECD the costs are lower than the global average, however, it is not clear whether this is due to a lower potential or lower average costs. At the same, time highlighting the potentials across regions should not be too sensitive as the next paragraph emphasizes that it is a different topic who should pay for the emission reductions.	Rejected. This is an interesting point, but we had to shorten text in this section, which provided less rather than more space for all findings.
22879	SPM	13	21	13	22	Replace "if effort sharing insttutuions are not available" (it is policy prescriptive) by "if borne by individual nations" (nuetral wording).	Noted. We have comprehensively revised the finding on effort sharing for clarity.
26729	SPM	13	21	14	16	Text could be more specific what does a fraction of todays emissions mean?	Noted. We have comprehensively revised the finding on effort sharing for clarity.
25253	SPM	13	21	13	22	"If effort sharing institutions not available" - What is the meaning of this?	Noted. We have comprehensively revised the finding on effort sharing for clarity.
25043	SPM	13	21	13	22	Replace "if effort sharing institutions" by "if marginal abatement cost equalization institutions".	Rejected. This is not a preferable wording. We have revised the finding comprehensively.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40823	SPM	13	21	13	22	Replace "if effort sharing institutions are not available " by "if borne by individual nations"[??]6.3	Rejected. This is not a preferable wording. We have revised the finding comprehensively.
28497	SPM	13	21	13	31	It is not clear what the exact metrics of the assessment of the mitigation costs varying by regions is. Is cost per capita? Or cost per t CO2 mitigated. Equally the AR5 Chap 6.3. Fig 6.26 does not clarify in this regard. Further explanation needed!	Noted. We have comprehensively revised the finding on effort sharing for clarity.
28498	SPM	13	21	13	31	Please define here or in the glossary what you exactly mean by "mitigation costs". Page 10 line 1-7 uses the term "macroecomonic costs". Is there a difference? And if so, please clarify.	Noted. We have comprehensively revised the finding on effort sharing for clarity.
28499	SPM	13	21	13	31	SPM.3 Does this relate to cost calculations made on p. 10, line 1-7?	This provides information about the regional distribution of mitigation costs in the absence of effort sharing institutions.
24412	SPM	13	21	13	22	It seems to me even if effort sharing institutions are available, the costs of mitigation vary substantially across countries and regions because there is no single absolutely correct criterion to share the efforts. Therefore,the latter half of this sentence seems unnecessary.	Accepted. We have revised the headline findin comprehensively.
32095	SPM	13	22			The term institution might imply the form on an international agency or alike only; however, institution can also mean a legal framework, a bi- or multiateral cooperation agreement and other means of exchange. The bureacratic meaning of institution should not be priviledged.	Noted.
20873	SPM	13	24	13	25	A universal carbon price cannot be said globally most effective, since carbon price market is not functioning well at this moment. I hope to delete this sentence.	Rejected. We summarize evidence from models, where the market functions well (as common in such models). We discuss why this may not be the case in the real world in new section SPM.4.
25044	SPM	13	24	13	24	Insert "most" before "idealized".	Noted. We have comprehensively revised the finding on effort sharing for clarity.
38946	SPM	13	24	13	25	This paragraph should note the feasibility of this idealized scenario in the near term is low. In addition, a carbon price, consistent with social and political realities, will not be sufficient. The "ideal scenario" should also include other measures, and policies at sub-global levels.	Rejected. This summarizes the evidence from integrated models on effort sharing. Described evidence is not available.
21521	SPM	13	25	13	27	The robust conclusion provided is not sufficient explained and as such is not substantiated. More information is necessary on how efforts and costs are defined in these assessments? How where targets set? Etc.	Noted. We have comprehensively revised the finding on effort sharing for clarity.
21522	SPM	13	25	14	21	These paragraphs are unclear as to whether we are speaking about absolute costs, per capita costs or share of GDP/capita costs. This needs to be made clear and presented neutrally in a way which allows policy makers to judge the different equity-relevant indicators. Currently the paragraph appears to be making an implicit argument for a certain vision of equity.	Noted. We have comprehensively revised the finding on effort sharing for clarity.
28500	SPM	13	25	13	28	The text describes an apparently robust result that "OECD costs would be lower than the global average" under a universal carbon price. The text is however unclear what "costs" exactly are referred to. If appropriate, please clarify as "costs, if measured relative to the respective countries' GDP" or similar. If the text refers to absolute costs, i.e. not as percentage of GDP, then please say so explicitly.	Noted. We have comprehensively revised the finding on effort sharing for clarity.
23707	SPM	13	26	13	28	By "OECD costs (of mitigation)",exactly what do you mean?	Noted. We have comprehensively revised the finding on effort sharing for clarity.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40824	SPM	13	26	13	28	Why “OECD costs would be lower than global average”?? Obviously, GHG mitigation/reduction potential is much higher in developing countries (especially, Asia) than OECD90.	Noted. We have comprehensively revised the finding on effort sharing for clarity.
29063	SPM	13	26	13	26	is the statement that "in the absence of transfer payments, OECD costs would be lower than the global average" correct? A justification for the CDM was that developing countries offered more cost-effective mitigation opportunities than were available in Annex 1 countries.	Noted. We have comprehensively revised the finding on effort sharing for clarity.
28501	SPM	13	27	13	28	Please give more details regarding mitigation costs for "other regions", especially for Africa and LDCs/SIDS.	Noted. We have comprehensively revised the finding on effort sharing for clarity.
28493	SPM	13	6	13	6	Caption: Explain what "baseline energy-system development " in line 6 means, at least in the glossary and give a ref. Is this the scenario usually referred to as "BAU scenario" or "reference scenario"? Please use one expression throughout the text. The label of the y-axis sould be explained in the caption. The second sentence contains to much inform, please separate the explanation on costs from the information on the color bars. Can costs and investments be summarized under policy costs? Are the costs for a given stringency of a policy indicated by height of the boxes in different shades of blue or is it the height from the bottom (0% costs) to the top of each of the blue boxes? This should be indicated with the black arrows at the right. It is unclear what the significance is of the pinned circles. Even the method description, i.e. that these are derived from a set of four distinct scenarios, is not very clariying. There are no ranges indicated in this figure. This suggests that there the numbers are highly certain. If this is not true, this must be indicated, e.g. by whiskers, in the figure.	Noted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
29649	SPM	13	9	13	20	This paragraph is an essential takeaway from the report, and should be placed earlier in the SPM to highlight its importance.	Noted. We have removed this finding and infused some crucial aspects elsewhere.
31277	SPM	13	9	13	20	models have their limitations, are based on assumptions ... ; what are the consequences	Noted. We have removed this finding and infused some crucial aspects elsewhere.
31324	SPM	13	9	13	11	Very informative finding.	Noted. We have removed this finding and infused some crucial aspects elsewhere.
31325	SPM	13	9	14	21	When discussing costs of mitigation, only financial costs are discussed, but other costs/consequenses such as consequenses for biodiversity, should be acknowledged here, ref. SPM 4.3.	Noted. As highlighted we discuss all sorts of risks throughout SPM section 3 and 4.
29316	SPM	13	9	13	20	This critical para should be placed higher in this section.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
30641	SPM	13	9	13	20	Is the text stating that the required institutional progress is of a scale and pace "unprecedented in human history" substantiated in the underlying chapter? No link was provided to a specific section of chapter 6 and we were not able to locate information that would have substantiated this statement in the chapter 6. Suggest focusing on the key message of the paragraph and replacing the text by: "Long-term mitigation pathways of 550 ppm CO2eq or lower can only be attained with ambitious assumptions on the scale and pace of institutional progress" or "Economic models predict that long-term mitigation pathways of 550 ppm CO2eq or lower can only be attained when ambitious assumptions on the scale and pace of institutional progress are made."	Noted. We have removed this finding and infused some crucial aspects throughout the section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33575	SPM	13	9	13	11	We think the bolded section is not carefully worded and we suggest to rephrase it to: "GHG concentralions of 550 ppm CO2-eq or lower, require the effective and sustained implementation of an adequate global agreement to realise mitigation measures at an unprecedented scale and pace".	Noted. We have removed this finding and infused some crucial aspects throughout the section.
33574	SPM	13	9	13	20	Both the source of this paragraph and the confidence statement are lacking.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
25138	SPM	13	9	13	11	The sentence reads: “Long-term mitigation pathways that are commensurate with GHG concentrations of 550 ppm CO2eq or lower require institutional progress of a scale and pace that is unprecedented in human history.” This and the following explanation have some of the most important insights in the WG III report. I would happily dispense with most of the FAQs and put this in one of them.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
30449	SPM	13	9	13	20	The paragraph states that economic models of long-term mitigation pathways that are commensurate with GHG concentrations of 550 pm CO2eq or lower rely upon a set of assumptions about the quality of institutions. These assumptions seem to be unrealistic in the real world and the consequence of more ambitious pledges ought to be highlighted.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
21520	SPM	13	9	13	20	The paragraph misses references to specific chapters, where does it come from, in which chapter is this analysed? As such it looks like an opinion that needs further substantiation. The reference to the need for zero costs to enforce property rights is unclear. While some assumptions may be correct on modelling, it would be informative to get information on why models do not assume behavioural change other than just price/cost induced?	Noted. We have removed this finding and infused some crucial aspects throughout the section.
22819	SPM	13	9		20	the whole paragraph seems to be rather an opinion of the authors than a scientific finding. Also a reference to a specific chapter is missing, where does it come from, in which chapter is this analysed? It also seems to be a bit displaced, what is the intention? Does it simply question the model results? And what is the conclusion of the paragraph? It ends nowhere.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
24388	SPM	13	9	13	11	"Long-term mitigation pathways that are commensurate with GHG concentrations of 550 ppm CO2eq or lower require institutional progress of a scale and pace that is unprecedented in human history." First, 550 ppm is much too high. Second, the energy transition that is needed in the U.S., for example, pales--in terms of both scale and speed--when compared to the enormous manufacturing transition that the U.S. underwent in 1942. So it is certainly not unprecedented. Third, it is not "progress" that is needed. Stating that suggests that we can wait for improved technologies to act. We have the technologies today that will produce carbon-free energy on the scale that is required. Fourth, numerous studies indicate that the cost to the world's economies of NOT making this transition is much greater than the cost of making it.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
26728	SPM	13	9	13	20	Complicating costs, modelling results etc. Can it be simplified?	Noted. We have removed this finding and infused some crucial aspects throughout the section.
23102	SPM	13	9	13	20	This outlook is made unnecessarily pessimistic through an implicit adoption of the (unrealistic) economic assumption that all individuals and nations are unrelentingly self-interested. This assumpion was invented by economists pursuing a narrow vision of methodology, and has no place in a summary of scientific findings. For an analysis of the damage done by this assumption, including in the context of climate change, see Nelson, J.A. 2012. Poisoning the Well, or How Economic Theory Damages Moral Imagination. INET Research Note #017 (forthcoming in The Oxford University Press Handbook on Professional Economic Ethics, ed. George DeMartino and Deirdre McCloskey). It does not make sense to waste space in the SPM detailing fine-point assumptions of the economic models while ignoring this very important but unstated one.	Noted. We have removed this finding and infused some crucial aspects throughout the section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25251	SPM	13	9	13	20	The conclusion is based on 'ideal' world assumptions, i.e. zero transaction costs and complete information. The model results thus depend vitally on these assumptions. A mandate of the AR5 was to consider model results which are based on real world assumptions which are alternately called 'second-best' world assumptions. The SPM should mention the comparaive assessment of resultsfrom studies relying on 'ideal' and 'real' i.e. the second-best world assumptions.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
25041	SPM	13	9	13	9	Replace "require" by "is barely possible provided".	Noted. We have removed this finding and infused some crucial aspects throughout the section.
38945	SPM	13	9	13	20	Forgot to add [] at the end to reference sections	Noted. We have removed this finding and infused some crucial aspects throughout the section.
28494	SPM	13	9	13	20	This paragraph reads a bit ironical. The listed assumptions that models are based on will not materialize in reality. That means that the "unprecedented institutional progress" will not happen. Why do you present is as a result then? Please be concise and unambiguous in your messages.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
19749	SPM	13	9	13	20	The fact that the ambitious assumptions stated here are very difficult to achieve and almost impossible to realise in real world should be stated here not to misleas the readers.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
26403	SPM	13	9	13	20	The attainability of stabilization goals in economic models relies on ambitious assumptions with regard to the quality of institutions, and the capacity of global public- and private-sector capital markets to scale-up efficient, effective and fair cross-sectoral capital investments to fund mitigation activites.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
29060	SPM	13	9	13	9	By fixing on 550 ppm IPCC appears to be endorsing this level. Would it not be better to refer to low stabilisation levels (such as 450 and 550 ppm)?	Rejected. Finding says 550 or lower.
22376	SPM	13	9	13	20	There should be a statement at the end of this paragraph that highlights the limitations of the models and assumptions used. It could be along the lines of: "However, the models and assumptions stated above should be considered with care given the inherent limitations of the scenario models used as discussed in Sections 6.2.1, 6.2.3, and 6.2.4 of Chapter 6."	Noted. We have removed this finding and infused some crucial aspects throughout the section.
32261	SPM	13				The reasons why the pink circles locate different positions in the bars (one on the top, 2 in the middle and one near the bottom) should be explained.	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
41043	SPM	13	15	13	20	Model results assumptions for institutional progress that is need to meet the 550ppm. This mitigation approach being proposed under the institutional arrangement that is required to meet the 550ppm emphasizes the top-down approach with international enforcement that does not take into account differentiation on the basis of equity and CBDR.	Noted. We have removed this finding and infused some crucial aspects throughout the section.
23036	SPM	13	15	13	20	The assumptions listed are very good but attempts need to be made to give strategies on how to adress them	Noted. We have removed this finding and infused some crucial aspects throughout the section.
23037	SPM	13	21	13	22	This statement is not clear and need further clarification	Accepted. We have comprehensively revised the finding on effort sharing for clarity.
26283	SPM	13	25	13	28	it could be desirable to have an explanation why costs of mitigation will be lower in OECD countries. In the "average" perception (and this is the assumption behind CDM mechanism), developing countries face lower mitigation costs because high industrialised countries have already made progress in efficiency.	Noted. We have comprehensively revised the finding on effort sharing for clarity.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30640	SPM	13	6	13	7	After the phrase “estimated at 2.1% of aggregated GDP”, it may be prudent to insert the actual level. The reason is that having a number such as 2.1% could be viewed as big or small. Having the actual $ level provides better context.	Noted. We have removed the figure from the SPM. We included a completely revised version in the Technical Summary, which considers a much broader evidence base.
32847	SPM	13		13		What is the set of four distinct scenarios?	Noted. We have removed this figure from the SPM. We have added a new figure on multiple ojectives in the Technical Summary with a comprehensive caption.
40998	SPM	13	21			Need more information on effort sharing institutions	Noted. We have comprehensively revised the finding on effort sharing for clarity.
40999	SPM	13	22	13	31	This section shall demonstrate real mitigation costs for identical technologies across regions	Noted.
40997	SPM	13	9	13	20	This section has blended with three types of messages – long-term mitigation pathways, institutions and human preferences. The argument is not clear as part of SPM.	Accepted. We have removed this finding and infused some crucial aspects elsewhere.
25559	SPM	14				This figure treats only a few criteria of equity, and should be deleted. Table TS.2 is better.	Noted. Figure has been removed from the report.
32250	SPM	14				The meaning of RNAI and RAI needs to be given. RNAI : Rest of Non-Annex I, RAI : Rest of Annex I.	Noted. Figure has been removed from the report.
30644	SPM	14				It would help the reader to have a short explanation of the different scenarios within the figure caption or the text, so that the reader does not have to refer to the chapter to understand the figure.	Noted. Figure has been removed from the report.
33583	SPM	14		14		Please explain why IMACLIM has such different outcome from both other models. Except for RNAI and RAI, regions can easily be written in full for clarity. This should at least be done in chapter 6.	Noted. Figure has been removed from the report.
33584	SPM	14		14		We think the allocation codes need to be defined in more detail in chapter 6.	Noted. Figure has been removed from the report.
23581	SPM	14				The horizontal axis labelling "consumptions losses " should be explianed " Is it not "Policy costs relative to the global average" ?	Noted. Figure has been removed from the report.
23950	SPM	14				figure SPM.10: The significant gains in GDP for India compared to losses for many/most other regions should be explained.	Noted. Figure has been removed from the report.
32849	SPM	14				The figure shows the results of just 3 models, which also have developed since the RECIPE project. How confident are you that the results would be the same if the experiment was repeated today?	Noted. Figure has been removed from the report.
38949	SPM	14				Please define stabilization somewhere	Noted. We avoid the term stabilization during our revisions.
28517	SPM	14				Please adapt the labels of the different allocation schemes as much as possible with Table 6.3.	Noted. Figure has been removed from the draft.
28518	SPM	14				The concepts C&C and CDC are not explain here, and do need explanation if the figure is maintained. However, this figure is not self-explanatory and would need further explanation as a whole.	Noted. Figure has been removed from the report.
24413	SPM	14				It would be ok to use this figure in the body, but it would be too limited information to show in the summary because this figure is based on limited allocation principles. For example, "potential (equal marginal cost)" principle is not covered. In addition, the estimates are made only by three modeling teams, which are all European.	Noted. Figure has been removed from the report.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29065	SPM	14				SPM.10. The caption states this is concerned with 'policy losses', the text that refers to it concerns 'policy costs' and 'mitigation costs', although it's not clear whether these are different. The horizontal axis of the graph is labelled a fourth thing, namely 'consumption' losses, expressed as a percentage of something that isn't defined. The legend explains the graph labelling, but not in a way that the non-expert would understand. (What, for example, does 'Common but differentiated Convergence' mean?) I could make similar comments about many of the figures	Noted. Figure has been removed from the report.
26466	SPM	14				Suggest using country groupings on the graph that match those used in the text	Noted. Figure has been removed from the report.
30416	SPM	14	1	14	16	This section is unclear e.g. what fraction? A table with numbers would be of value for informing this section which is otherwise of little value.	Noted. We have comprehensively revised the finding on effort sharing.
30642	SPM	14	1	14	3	Is there a difference between the meaning of effort-sharing and burden-sharing? The previous paragraph on page 13 using 'effort-sharing" in referring to institutions. Here both terms are used. If there is no difference in meaning, suggest selecting one term for consistency and clarity.	Accepted. We consistently refer to effort sharing in the revised version.
33580	SPM	14	1	14	4	We think the bolded section is not carefully worded and we suggest to rephrase it to: "Burden Sharing can redistribute the cost of application of mitigation technology. The choice of stabilization level and allocation code determine the regional distribution of costs, in particular in the near term (high confidence).".	Noted. We have comprehensively revised the finding on effort sharing.
25636	SPM	14	1	14	5	This part should explain that market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). In addition CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, do not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). <Reference> [1] Montgomery, W.D., and Smith, A.E.(2005). Price, Quantity and Technology Strategies for Climate Change Policy, CRA International. Available at: http://crai.ca/uploadedFiles/RELATING_MATERIALS/Publications/Consultant_publications/files/pub_4141.pdf [2] Baldursson et al. (2009). Price Volatility and Risk Exposure: On the Interaction of Quota and Product Markets. Available at: http://ssrn.com/abstract=1394342 or http://mpra.ub.uni-muenchen.de/14994/1/MPRA_paper_14994.pdf [3] Rosendahl, K.E. & J. Strand (2011). Carbon Leakage from the Clean Development Mechanism. Energy Journal, Volume 32, Number 4. [4] Aichele, R. & G. Felbermayr (2012). Kyoto and the carbon footprint of nations. Journal of Environmental Economics and Management, Volume 63, Issue 3, pp. 336-354. [5] Peters, G.P., J.C. Minx, C.L. Weber, & O. Edenhofer (2011). Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences. DOI: 10.1073/pnas.1006388108.	Rejected. This is not the purpose of this paragraph. Such issues are discussed in the new section SPM.4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25254	SPM	14	1	14	16	The conclusion that 'Mitigation cost' and 'who pays for costs' are separae issues is a welknown textbook result assuming ideal cooperative glbal regime. It deals with the issue of distribution of costs. The choice of 'stabilization level' is an issue of cost-benefit assessment among costs of mitigation, impacts and adaptation. The two issues are clubbed in this conclusion and this has disoriented the explanation of the conclusion. It is better to give separate treatment to the two issues. For instance, 'emissions trading' is an instrument and has no bearing on the policy decisions related to 'stabilization level' and 'who pays for costs'. The treatment of allocation of allowances and 'who pays for the costs' are connected but not separate issues. The explanation of this entire paragraph needs reconsider to communicate correctly and clearly the message of 'how much' and 'where to do' mitigation to minimize costs and who pays for the total costs of mitigation, adaptation and residual impacts.	Accepted. We have comprehensively revised the finding on effort sharing.
38947	SPM	14	1	14	16	The SPM seems to assume in many instances that there is an ideal policy toward which we should aim and that is a global price on carbon. Given institutional and political issues in many countries, but more importantly between countries, this is unrealistic in the near-term and may not be the the most appropriate policy approach in reality even long-term. There will be many policies at many levels, and they need public support to be implemented, so a single carbon price is not likely to be workable in the timeframe necessary for action to take place. Other parts of the report have more nuanced views on institutions and those should be reflected here.	Rejected. Models discussing the issue of effort sharing commonly are based on a global carbon price assumption. It is important to make this transparent. We discuss policy instruments in depth in the new section SPM.4.
38948	SPM	14	1	14	16	These approaches, when applied at a global scale, are purely theoretical. It is important to note that here. There is no experience to date on these approaches applied to stabilize GHG concentrations or temperature.	Rejected. Scenarios are undertaken to help us understand the consequences of potential policies. There is no experience with any approach for stabilizing GHG concentrations and temperature.
39175	SPM	14	1	14	16	Burden-sharing and distribution of policy costs and an issue where there is little agreement or certainty. This topic should not receive such prominence in the SPM.	Rejected. There is a large literature on the issue, which is policy relevant. It is important to synthesise this literature and point out the commonalities and differences across studies. We have comprehensively revised the finding.
28502	SPM	14	1	14	2	Please improve language of this sentence.	Accepted. We have comprehensively revised the finding on effort sharing.
29064	SPM	14	1	14	16	Most of the political discussions currently are focussing on the level of mitigation effort needed in various states to 2030 to ensure an economically efficient reduction of emissions that are consistent with delivering 2 degrees. In this context, the report does not indicate the level of reductions needed in OECD countries or other states to be consistent with a pathway to 2 degrees. More the report simply focusses on the end point - the levels needed in 2100. The political community (in particular in the EU) is looking for a steer as to what kind of reductions to take to 2030 so it would be helpful if this report could provide some analysis on this. Also text not overly accessable	Noted. We have added information on 2030 reductions at the global scale, but not at the regional scale - as this is more uncertain and there is very limited space in the SPM.
26467	SPM	14	1	14	6	Is a 'burden-sharing regime' the same as an "allocation scheme" - if so suggest sticking to one term	Noted.
28508	SPM	14	10	14	16	What is the message/result you want to convey here? Please be clear.	Noted. We have comprehensively revised the finding on effort sharing.
23708	SPM	14	11	14	15	What is AME? Not quoted in Figures SPM 2 or 5.	Noted. We have comprehensively revised the finding on effort sharing.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33586	SPM	14	14	14	25	We think jargon makes this paragraph difficult to understand, and we propose to rephrase it t: "It will take a long time to adapt the current built environment to realise the full potential for climate change mitigation". Human settlements and infrastructure not only limit the speed at which emissions occurring with use, but also will adaptation of the built environment use a lot of rsources that contribute to industial emissions. On the other hand, the material that can be recovered from the transformation of the built environment may be reused ('urban mining'), which provides an opportunity for saving on resources and energy use, and avoid waste and emissions.[12.2]".	Noted. We have comprehensively revised the finding on effort sharing.
25008	SPM	14	16	14	21	Please spell out regional acronyms	Accepted.
40828	SPM	14	17			Abbreviations of regions on Y-axis need full spellings and explanations. Otherwise, it is unclear which one Japan is included, for example.	Noted. Figure has been removed from the report.
28511	SPM	14	17			Please delete figure. If not: Not easy to understand for policymakers who are not scientists, in its current form, it is not useful. Information on the effects of different effort principles, but these principles explained. Why do models give so different results? Model diversity is so large that the information is not helpful for policy makers and the figure can be deleted.	Noted. Figure has been removed from the report.
28510	SPM	14	17	14		Please delete figure. If not: Abbreviations on y-axis are not explained. What does "RNAI" and "RAI" stand for? (if figure deleted)	Noted. Figure has been removed from the report.
23580	SPM	14	18	14	18	"Policy costs" should be replaced by "Policy costs relative to the global average"	Noted. We have comprehensively revised the finding on effort sharing.
25256	SPM	14	18	14	31	It is again difficult to comprehend, consumption losses for India seem to be abnormally negative.	Noted. Figure has been removed from the report.
28513	SPM	14	18	14	18	Please delete figure. If not: What is the timeframe for these costs. Are these cumulative costs? Also, what is the rationale behind "GDP shares" - why should rich countries be allowed to emit more?	Accepted. Figure has been removed from the report.
28512	SPM	14	18	14	21	Please delete figure. If not: The caption should be improved. Add title explaining what the figure shows (effect of different effort sharing principles). What kind of costs are referred to with the term "policy costs", and why is it shown in terms of "consumption losses" and not in terms of GDP as in Fig SPM.9? Are all data for the 450 ppm scenario, and for which year? What do the different colors of the dots mean?	Accepted. Figure has been removed from the report.
28503	SPM	14	2	14	7	The information that costs depend on the stabilization level is given twice.	Noted. We have comprehensively revised the finding on effort sharing.
31326	SPM	14	22	16	5	The main findings of Chapter 7.10.5 on lock-in in chapter 7 and TS page 30, line 8 to 15 should be reflected in this Section of the SPM.	Accepted. A specific paragraph on the risks of lock-in has been included early in the cross-sectoral section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33585	SPM	14	22			We would advocate adding a statement here or in the "Cross-sectoral strategies" section. We propose the following text: "The costs of mitigation vary substantially across sectors and between individual corporate ventures in the absence of a system to redistribute costs. A number of individual and groups of countries employ systems that assign or auction tradeable emission permits amongst production sectors to enable the selection of low cost emission reductions. In order to limit relative administrative cost, such systems generally are limited to larger emittors in certain sectors. Including all sectors in such a system however would increases the availability of lower cost mitigation options. The inclusion of in particular consumption domains would also increase the amount of finance available to the systems, particular where the willingness to pay is high. Including some sectors in the European Union Emissions Trading System (EU ETS), such as electicity production and leaving out others, like electricity use in households, has rendered energy saving and subsistence sustainable energy production in households ineffective to reduce overall national GHG emission reduction. Sectors that compeet outside the group of countries with cost distribution systems, are often exempted or compensated, in order to limited a negative impact on these sectors. This however introduces inefficiencies. Creating a global level playing field for such sectors in combination with emission standards commensurate with adequate global emission reduction pathways, would repair this inefficiency.	Noted. Emission trading systems are assessed in the policy part of the SPM.
28515	SPM	14	22	14	23	In introduction to the section would be very useful.	Rejected due to space limitations. SPM.1 provides a very brief introduction to the different sections of the SPM.
30417	SPM	14	23	14	23	It would be useful to start with sectors rather than with cross sectoral work. A table for each of the sectors would be useful from the outset.	Rejected. Cross-sectorl section provides insights into the interaction and interdependency of the different sectors. It is thought that this overview is an important prerequisite for then focusing on the diversity of mitigation options in the different sectors. A table displaying the full range of sectoral mitigation options is shown in the Technical Summary.
31327	SPM	14	23	14	31	We do not think the bold text quite catches the essence of this paragraph. Could it include the term "build environment structure"? We also believe that investments in infrastucture could devlop lock in situations, depending on the choices made in the near-future, which may limit the possibilities to acheive emission reductions targets.	Accepted. Paragraph has been re-focused and re-written to explicitely deal with the lock-in risk.
30643	SPM	14	24	14	24	What are boundary conditions? Can different terminology be used to explain this concept?	Accepted. Paragraph has been re-focused and re-written to explicitely deal with the lock-in risk.
33587	SPM	14	24	14	31	This paragraph is not so much cross-sectional, but concerns two sectors, which makes it difficult to place in section SPM.4.2. We suggest to move it to the end of section SPM.4.1.	Accepted. Paragraph has been re-focused and re-written to explicitely deal with the lock-in risk across the different sectors.
33588	SPM	14	24	14	31	This paragraph lacks a confidence statement.	Accepted. Confidence statement has been added to new lock-in paragraph.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40829	SPM	14	24	14	31	Please indicate that the behavior barrier can cause lock-in effect.	Rejected. Paragraph on behaviour has been included that more focuses on the oppotunitiy of behaviour to contribute to emisson reductions.
28516	SPM	14	24	14	31	In this paragraph it is mentioned, that human settlements and infrastructure pattern have an important influence on future greenhouse gas emissions. In chapter SPM 5.3 statements on this issue are missing.	Noted. However, section SPM.5.3 does not seem the right place to note this and this aspect has been included in the Chapter 12 based section SPM.3.2.5.
26468	SPM	14	24	14	24	"Boundary conditions" seems to be an unusual and overly technical term to use here.	Accepted. Paragraph has been re-focused and re-written.
23951	SPM	14	27			The term "primary resources" should be explained in the glossary.	Noted.
21524	SPM	14	29	14	29	Why this focus on "urban mining"? Would be interesting to have a quantitative assessment on how this contributes to mitigation effort.	Noted. Paragraph has been re-focused and re-written.
33581	SPM	14	4	14	5	It is unclear what "schemes" are ment here. We suggest to rephrase to: "Burden sharing can be effectuated through (1) global trade in regional emission allowances or (2) direct transfer of global carbon tax revenues.".	Noted. We have comprehensively revised the finding on effort sharing.
26161	SPM	14	4	14	5	Please change 'can' to 'will' and 'explicitly' to 'theoretically' as a global carbon market and a global carbon tax are now lack of reality.	Noted. We have comprehensively revised the finding on effort sharing.
20874	SPM	14	4	14	5	It is quite problematic to write a sentence which encourages to introduce a global carbon tax. The drawbacks of a global carbon tax should be also stated here.	Rejected. We simply point out what models underlying such evidence assume. Policy instruments are discussed in new section SPM.4
25255	SPM	14	4	14	5	This sentence seems subjective and prescriptive	Noted. We have comprehensively revised the finding on effort sharing.
40827	SPM	14	4	14	5	Meaning of “regional emissions allowances traded on a global carbon market” should be clearly written. Does it mean linking the two different domestic emissions trading schemes?? Furthermore, it is misleading to describe only emissions allowance scheme and global carbon tax for regional burden-sharing.	Noted. We have comprehensively revised the finding on effort sharing.
26404	SPM	14	4	14	5	Such schemes can be introduced explicitly via regional emissions allowances traded on a global carbon market and through direct transfer of revenues from a global carbon tax.	Noted. We have comprehensively revised the finding on effort sharing.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22377	SPM	14	4	14	5	The text here provides an uncritical acceptance of the concept of emissions trading. However, both the concept and practice of emissions trading has been critiqued substantively. There should also be text that indicates that there are critiques to emissions trading. Such text could be as follows: "However, it should be noted that both the theory and practice of emissions trading and carbon markets as applied to mitigation have also been viewed critically and with caution both academically and, in the context of the UNFCCC negotiations, politically." For published academic critiques, see, e.g., Larry Lohmann, Carbon Trading, Climate Justice and the Production of Ignorance: Ten examples, Development (2008) 51, pp. 359–365; Michael Hopkin, Emissions trading: The carbon game, Nature 432, 268-270 (18 November 2004); Heather Lovell et al., Carbon Offsetting: Sustaining Consumption?, Environment and Planning A 2009, volume 41, pages 2357-2379, at http://sciencepolicy.colorado.edu/students/envs_4100/lovell_2009.pdf; Steffen Bohm and Siddhartha Dabhi (eds), Upsetting the Offset: The Political Economy of Carbon Markets (MayFlyBooks, 2009), at http://www.libros.metabiblioteca.org/bitstream/001/314/8/978-1-906948-07-8.pdf. For political critiques in the context of the UNFCCC negotiations, see, e.g. Bolivia, at http://unfccc.int/files/bodies/awg-lca/application/pdf/20120518_bolivia_nmm_2100.pdf and at http://unfccc.int/resource/docs/2012/awglca15/eng/misc06a02.pdf; and Philippines on behalf of a group of like-minded developing countries, stating that "Another important lesson to take stock of is the current collapse of the carbon markets. In this light, the effectiveness, viability and environmental integrity of market mechanisms for mitigation need to be reviewed and considered with caution, especially proposals for their expansion", at page 8 of their submission (http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp_lmdc_workstream_1_201 30313.pdf).	Rejected. This finding is summarizing the evidence on this topic, which commonly use cap and trade systems under alternative allowance distributions. A comprehensive and critical discussion of policy instruments is provided in new section SPM.4
20089	SPM	14	7	14	8	"Different effort sharing principles can be applied in the design of transfer schemes ", even if its then refered to Figure SPM10, the text would be clearer if the guiding principles of these sharing principles were cited	Noted. Figure has been removed from the report.
28504	SPM	14	7	14	8	Please explain briefly the different effort sharing principles shown in Fig. SPM.10	Noted. Figure has been removed from the report.
33582	SPM	14	9	14	11	Please avoid unexplained abbreviations such as 'LAM' and 'AME'.	Accepted.
28506	SPM	14	9	13	11	SPM.3 This sentence is not clear and the actual message is not clear. How does this finding relate to effort sharing? The number in this para should be explained in different way.	Noted. We have comprehensively revised the finding on effort sharing.
28505	SPM	14	9	14	13	"under any effort sharing approach" doubles the sentence "this holds for all the fundamentally different effort sharing approaches". I suggest the following wording for clarification: "For the most ambitious stabilization levels, emission allowances in ..... This holds for all of the fundamentally different effort sharing approaches included in the analyzed studies."	Noted. We have comprehensively revised the finding on effort sharing.
28507	SPM	14	10	14	11	"allowances in OECD and EITs are a fraction of today's emissions" Emissions means here emission certificates? Other monetary costs? Budgetary support for other countries??	Noted. We have comprehensively revised the finding on effort sharing.
28509	SPM	14	17	14	21	Please delete figure. If not: The figure does not really underpin the text about mitigation costs above. The text does not use the same terminology as is used in the figure. To which time period or year does the figure relate?	Accepted. Figure removed from the report.
34037	SPM	14	7	14	8	Fig 10 should also include population share = equal right of emission/capita as an effort sharing principle. OR It should be stated in the text that the different effort sharing principles shown in Fig 10 does not include population share which presents another feasible option.	Noted. Figure has been removed from the report.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28519	SPM	14		21		The important statement "As a consequence, beyond those already existing, additional policies must be enacted and the coverage and stringency of the existing ones must be increased if the Cancun agreement is to be fulfilled." from chapter 7.12 is missing.	Rejected - the statement refers to policy aspects in general and is not to be discussed in the technical discussions of the sector chapters.
28520	SPM	14		21		There is a very good figure in Chapter 1, Figure 1.3 (Panel A: Allocation of GHG emissions in 2010 across the five sectors examined in detail 4 in this report. Panel B: Allocation of emissions due to electricity consumption as “indirect” emissions to the main end-use sectors discussed in this report.) which should be added to the SPM in section 4. Currently there is no information on past and present emissions per sector, this needs to be added as a basis for discussion for sectoral mitigation options.	Accepted. Figure has been updated and included in SPM in sectin SPM.2.
28514	SPM	14	22	16	10	A specific paragraph on Renewable Energy is missing. REs are discussed as part of other cross sectoral aspects, but they should be addressed in a specific paragraph, given their outstanding significance for mitigation climate change. In addition, behavioral changes should be mentioned.	Rejected. REs are discussed in specific paragraph in the section on energy supply; this section has a cross-sectoral focus and identifies the interaction between sectors. Comment on behaviour is accepted and a paragraph has been introduced.
26489	SPM	14	5			…after "global carbon tax." include: "If the global carbon tax is designed in a fiscal neutral way for enterprises such that resulting revenues were used to cut labor costs (payroll taxes, social protection levies, pension constributions etc.) then employment could rise and other societal objetives could be achieved. Depending on the policy choice a double dividend of mitigation and job creation can be achieved." Source: International Insitute for Labor Studies (2009): Green policies and jobs: A double dividend?	Rejected. This is not a main finding in our assessment even though effects on employment have been considered.
20995	SPM	14				Please rework figure. It is neither given what WITCH, REMIND or IMACLIM stands for, nor are the regions clearly identifiable (RNAI = ?, RAI = ?, …). Please also clarify whether "negative consumption losses" are increases in consumption.	Noted. Figure has been removed from the report.
32262	SPM	14				Please add explanation why the cost estimates widely differ, in particular between China and India.	Noted. Figure has been removed from the report.
24237	SPM	14	1	14	16	It would be useful to define what is meant with mitigation costs as consumption losses (see RECIPE project).	Noted. We have removed this figure from the report.
32374	SPM	14	18	14	21	Figure SPM.10: Please consider to provide more information on C&C as well as CDC in the caption. At least the abbreviations need to be spelled out once.	Noted. Figure has been removed from the report.
26284	SPM	14	9	14	11	the sentence states that allocation for OECD countries will be a fraction of current emission. As 999/1000 and 1/1000 are both fractions, it would be better to say a "small fraction" or other adjective to qualify this "fraction", if it is wanted to mean this.	Noted. We have comprehensively revised the finding on effort sharing.
21523	SPM	14				This chapter contains a lot of information based on bottom up studies. It would be informative to explain how they related to the previous chapters that include top down results. Which type of studies are better at capturing which kind of findings.	Accepted. Figure showing the comparability of results from sectoral studies and mitigation scenarios has been included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35203	SPM	14	23	21	2	Key messages from Chapter 7, 8, 9, 10, 11 and 12 are not fully reflected in the SPM. Take Chapter 12 for example, it is suggested to add the following paragraph in the SPM Section 4.1: “Urban form, design, and connectivity are important in shaping the levels of urban GHG emissions. Urban form is responsible directly for a large proportion of consumed energy and indirectly influences the patterns and modes of energy consumed in everyday activities. Estimates of future emissions under different urbanization scenarios show that the type of urban development will have a larger impact on emissions than the amount of urban population growth. Human settlements could meet low carbon targets by attaining and sustaining the following spatial characteristics: (1) high population and employment densities that are co-located; (2) compact urban form; (3) mixed land uses; (4) high connectivity; (5) destination accessibility terms of job accessibility by auto, by transit and by distance to downtown, often referred to as regional accessibility; and (6) integrating multiple transport modes. [12.3, 12.4]”	Accepted. Key findings have been intensively re-worked to better reflect the material in the underlying chapters. With regard to Chapter 12, a paragraph highlighting similar points as those suggested is included.
41000	SPM	14	1	14	16	This section largely explain the regional approaches however, it shall explicitly state which region shall focus for more mitigation initiative without impeding economic growth and development	Rejected.The literature on this topic is very diverse so that it is not possible to derive such a finding.
41003	SPM	14	23	14	30	Cross sectoral mitigation – human settlement Urban mining is due to consumption trends. Consumption based accounting of GHG emission and thus mitigation shall also be mentioned here.	Rejected. Consumption based accounting results are shown in section SPM.2 on trends in flows and stocks of GHG.
31328	SPM	15	1	15	6	We think this paragraph is very clear and important.	Noted.
30646	SPM	15	1		2	Recommend re-ordering the bolded heading to this paragraph to better emphasize its key point. Suggested rewording: "The adoption of substantial mitigation actions in all economic sectors is ultimately required to limit the cost of stabilization."	Noted. Paragraph has been re-focused and re-written.
30645	SPM	15	1	15	6	The reference to Figure SPM.11 should be moved to the end of this paragraph since the Figure provides information about the required reductions in GHGs emissions from different sectors (i.e. supports text on lines 4-6 not 2-4).	Noted. Paragraph supporting this figure has been re-written, also with a view to better integrate the findings of the figure.
40830	SPM	15	1	15	2	Important point. Do not delete this sentence.	Noted. Paragraph has been re-focused and re-written.
28521	SPM	15	1	15	1	Delete the word "ultimately".	Noted. Paragraph has been re-focused and re-written.
28522	SPM	15	1	15	6	SPM.4 This para should move to beginning of SPM.4 chapter. In front of p.14, line 24	Noted. Paragraph has been re-focused and re-written.
29067	SPM	15	1	15	2	The sentence at the top of page 15 about ambitious climate goals should be in the introduction/page one.	Rejected. Finding has been split and the aspect about the aggregate economic costs of different mitigation pathways are now dealth with in section SPM.3.1., whereas the need of the cross-sectoral and systemic perspective has been retained in section SPM.3.2

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29066	SPM	15	1	15	6	It would good if the paragraph on page 15 lines 1-6 starting "Limiting the cost of stabilization ultimately requires the adoption of substantial mitigation actions in all economic sectors (high confidence)." were moved to page 1.	Rejected. Finding has been split and the aspect about the aggregate economic costs of different mitigation pathways are now dealth with in section SPM.3.1., whereas the need of the cross-sectoral and systemic perspective has been retained in section SPM.3.2
34704	SPM	15	11			Could complement the para with: The large number of available low-carbon electricity supply options generally allows substitution of each other. (Ref: Ch6, 42, lines 6-7)	Taken into account - comment is obsolete as the text has been revised considerably.
25257	SPM	15	11	15	11	This sentence states that reducing emissions in electricity generation is easier than energy efficiency, say in buildings or industrial sectors. Is it really true? Generally energy efficiency for buildings and industries are easiest to implement.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
33589	SPM	15	12	15	38	We think paragraps on lines 12 to 16 and 30 to 38 should directly follow each other.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
22882	SPM	15	12	15	13	DELETE, as it is wrong. Many scenarios point to energy efficincy as th near term option (-2030), and then decarbonization of electricty (-2070), and CCS etc later. See, for example, Global Envrionemntal Asssessment chater 17 has a sceanrio "GEA-efficiency" in which effficiency improvement is near term actions and power secto actions come later. Generally speaking, IAMs does not have precision to predict the timing of measures with confidence. SUGGESTION: Replace this para by much more robust finding that "Less GHG pathways are compatible with more electrifiaion in end use sectors"of Chapter 7 Fig 7.18.and p61 line 28-33. Also, move the para "TS 29 line 16-22 (a phased strategy must account for interactions between sectors to prevenet unintended consequence" to here in SPM.	Rejected. The statement exactly says that near-term benefits of energy demand reductions are greatest while in the longer term decarbonization of energy supply reduces the emissions benefits from demand reduction. However, the statement has been rewritten and hopefully leaves less room for misinterpretations in its final version.
34705	SPM	15	12	15	16	Could add: So far, while energy efficiency and demand side management measures continue to offer significant lowest cost mitigation benefits and substantial co-benefits, the rate of market uptake has been below its economic potential. (REF: Ch1, p 24, lines 6-8)	Accepted in parts. Paragraph on the diverse benefits of energy demand reductions has been included.
25367	SPM	15	13	15	15	Gas should be added in this sentence, as it is included in energy carriers which are associated with GHG emissions.	Text has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22449	SPM	15	13	15	13	Please add "and gaseous" after the wording "liquid " so as to read "such as liquied and gaseous fuels and electricity today".	Text has been revised.
21525	SPM	15	16	15	15	End-use reductions will remain important to limit the necessary power generation to be met through low- or zero-carbon production technologies. As such, it remains important for decarbonisation. Can this sentence be reworded accordingly?	Accepted. New paragraph has been inserted to specifically outline the importance and benefits of energy demand reductions.
31330	SPM	15	17	15	22	This is an informative finding. However some of the points in the second and third sentence could be moved to the bold text.	Noted.
30650	SPM	15	17	15	17	Given all the co-benefits of energy efficiency, which are referenced well in the report and which are well understood, the sentence could be more assertive. Suggest replacing "There may be incentives […]" with "There are many incentives […]".	Accepted. Paragraph has been re-written to more clearly outline co-benefits of energy demand reductions.
25009	SPM	15	17	15	22	Suggest that the claim regarding incentives to adopt energy efficiency is made more conclusive (currently language used is more tentative compared to other claims). We know these incentives exist and are being captured. The challenge is that serious market failures undermine capture of these benefits.	Accepted, paragraph has been fully revised.
24389	SPM	15	17	15	17	Regarding energy efficiency, it should be pointed out right up front (although it appears to be covered later) that energy efficiency actually saves money. In fact, it can be shown that bundling energy efficiency with carbon-free energy can have a net negative cost on the economy.	Accepted, paragraph has been fully revised, including a clear reference to the cost-effectiveness of energy efficiency measures.
28524	SPM	15	17	15	22	The table TS.5 could be referred to here in more detail. What about other incentives (of e.g. deploying RE) despite their mitigation potential? (see also comment on TS. Table 5 on REs and fossil fuels subsidies.)	Rejected. Focus of paragraph has been revised so the suggested linkage does not work anymore.
25258	SPM	15	18	15	19	These lines which state demand side options are easier than supply side options - this contradicts the earlier para which states electricity supply sector is easier to implement	Accepted. Text has been revised.
25259	SPM	15	18	15	21	Caption of Figure SPM 10: what do the different colour on circles and the horizontal lines mean?	Figure has been removed from SPM.
30647	SPM	15	2	15	2	There is reference to a climate goal of 450 ppm CO2-eq. Where is it stated that this is a climate goal? Suggest clarifying.	Noted. Paragraph has been re-focused and re-written.
25260	SPM	15	20	15	20	"Manage risks" - This is unclear	Text has been revised.
31331	SPM	15	21	15	21	The "other societal objectives" might be exemplified.	Text has been revised.
33590	SPM	15	21	15	22	Paragraph 10.8 is referenced twice here.	Noted - editorial.
29650	SPM	15	23	15	29	This paragraph should be updated to reflect the range of literature cited in Chapters 5 and 15 (e.g. 5.6, 15.5). In particular, the current language omits discussion of indirect or macroeconomic rebound effects.	Accepted - text revised. Please note that details on this aspect are provided by box TS.13.
30420	SPM	15	23	15	29	Which elements are limited evidence, low confidence?	Text has been revised to more clearly explain the reason for the uncertainty qualifiers given.
31332	SPM	15	23	15	29	This paragraph might be easier to comprehend for readers not familiar with the rebound effect if some explanations or examples were added.	Accepted. Text has been revised to more clearly explain the reason for the uncertainty qualifiers given.
30651	SPM	15	23	15	23	The phrase "rebound effects" requires an explanation/definition.	Accepted. Text has been revised accordingly.
33591	SPM	15	23	15	23	We think the bolded section is not fully clear and we propose to rephrase it to: "Energy saving appliances can sometimes lead to higher energy use (rebound effect). Literature documents examples of new energy saving technology that did not substitute as intended, but instead were used in new applications."	Rejected. SPM has limited space to provide such concrete examples but text has been revised, giving now a more general explanation.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27038	SPM	15	23	15	29	This paragraph should be updated to reflect the full range of literature surveyed in Chapters 5 and 15, inclusive of the comments and additional citations above. In particular, the current language here in SPM does not discuss indirect or macroeconomic rebound effects at al. See comment below for recommended revision of this paragraph.	Accepted - text revised. Please note that details on this aspect are provided by box TS.13.
27039	SPM	15	23	15	29	Rebound effects can offset some of the emission reductions from energy efficiency improvements. Direct rebound effects [for end-use energy services such as residential heating and lighting or personal transportation] are [generally] in the range of 10-30% of projected technical energy savings in developed countries [(strong evidence, high agreement)]. Direct rebound effects will tend to be greater in developing economies [(limited evidence, high agreement)] and also appear to be more significant in the productive sectors of economy, where direct rebound may range from 20-60% or higher, particularly for energy intensive sectors where energy services are easily substituted for other factors of production [(moderate evidence, moderate agreement)]. [Indirect rebound effects result in additional reductions in expected technical energy savings and can frequently range from 10-40% (moderate evidence, high agreement).] of Some argue that macro-economic rebound effects [result in even larger total economy-wide rebound effects that] can exceed 100% (called backfire) in some cases (limited evidence, low agreement). [5.6, 15.5]	Noted. Text has been revised.
25010	SPM	15	23	15	29	The discussion on rebound effects lacks context. While this issue is complex, the main claimed drivers of rebound are that energy efficiency makes the cost of an activity cheaper, making a rational actor more likely to do more, and that the net financial savings must be spent or invested, driving higher energy use where the money goes. However, if there is a net saving, the beneficiary can be encouraged to spend that saving on more energy efficiency or, through regulation, forced to invest in long-payback energy efficiency measures they would not normally invest in: this leads to an amplification of the initial energy savings, not a rebound. In most activities, energy is cost is a small component of total cost and perceived value, so the impact on behaviour for a rational actor should be small, and often there are saturation effects. Where energy efficient products capture increased market share, manufacturers are more likely to drive innovation in that direction to capture more sales. Therefore while it could be said that in the past rebound has occurred, effective policy could shift this to neutral or even amplification of savings.	Accepted - text revised. Please note that details on this aspect are provided by box TS.13.
30451	SPM	15	23	15	29	This paragraph should be removed: There is low agreement and limited evidence for this and the mentioned ranges in the para are very wide.	Accepted. Paragraph has been completely re-written.
22883	SPM	15	23	15	29	rebound need coordination with ch5, 9, and 15.	Accepted. Paragraph has been completely re-written.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29531	SPM	15	23			The paragraph on the rebound effect is an inaccurate summary of our current understanding (and if, as is stated here, there is limited evidence and low agreement, the best course would be to not include this paragraph on rebound in the SPM). the 10-30% for direct rebound only applies only to a subset of end-uses, but the text implies that it is a general phenomenon for all end-uses. For example, about one quarter of residential primary energy in developed economies is subject to the principal-agent problem, so energy users don't see the cost of their actions, so rebound can't be an issue for those uses (IEA. 2007. Mind the Gap: Quantifying Principal-Agent Problems in Energy Efficiency. Paris, France: International Energy Agency.) Devices like cable boxes, refrigerators, and others that have nearly constant loads that aren't affected by user behavior, so they are immune to rebound as well. The inclusion of the idea of "backfire" (more than 100% rebound) is simply wrong (and highly misleading), as there is absolutely no empirical evidence for this phenomenon occurring. In terms of the macroeconomic studies of rebound that are of relatively recent vintage, there is still substantial controversy as to whether they are measuring actual rebound or something else associated with buried assumptions and structural failings of the models themselves. The disctinction between rebound in developed and developing economies is an important one, but the discussion lacks context about where rebound is a problem and where it isn't (it is NOT a problem in all enduses)	Accepted. Paragraph has been completely re-written.
19422	SPM	15	23	15	29	While I find myself perversely satisfied in some odd way that the authors have designated, for the record no less, that there is "limited evidence, low agreement" on the likelihood that rebound effects "can exceed 100% (called backfire) in some cases," I believe this sets you up for considerable embarrassment down the road. For one thing, this seems an industrialized-world-centric view. I cite again, likewise for the record, the work of Li and Yonglei (2012), Lin and Liu (2013), and Tsao et al. (2010): Li, L. and H. Yonglei, “The energy efficiency rebound effect in China from three industries perspective.” Energy Procedia 14 (2012): 1105-1110. Lin, B. and X. Liu (2013), Refined oil pricing mechanism reform and energy rebound for passenger transportation in China, Energy Policy (in press). Tsao, J.Y., Saunders, H.D., Creighton, J.R., Coltrin, M.E., Simmons, J.A., 2010. "Solid state lighting: an energy-economics perspective." Journal of Physics D: Applied Physics 43 (35), 354001 also Saunders, H.D. and Tsao, J.Y. "Rebound effects for lighting," Energy Policy, 49(2012): 477-478	Accepted. Paragraph has been completely re-written.
39161	SPM	15	23	15	29	There are several problems with this piece on the "rebound effect" being in the SPM: 1) the 10-30% for direct rebound only applies only to a subset of end-uses, but the text implies that it is a general phenomenon; 2) the ill-defined concept of "productive sectors of the economy" implies that this is a large and important phenomenon that is well substantiated in the literature - which it is not; 3) Even mentioning the idea of backfire in a summary for policy makers is a real step backwards. There's really no evidence for an effect as large as this (even the macro modelers seem to agree on this) nd, as such, it does not deserve such prominence in such an important document; 4) The distinction between developed and developing economies is an important one, but the discussion lacks important context about where rebound might be a problem and where it isn't. One article to consider including would be Gillingham, Kenneth, Matthew J. Kotchen, David S. Rapson, and Gernot Wagner. 2013. "Energy policy: The rebound effect is overplayed." Nature. vol. 493, no. 7433. 01/24/print. pp. 475-476. [http://dx.doi.org/10.1038/493475a]	Accepted. Paragraph has been completely re-written.
40833	SPM	15	23	15	23	It is not appropriate to put the fuzzy topic with "limited evidence, low agreements"into SPM without any special reasons, because there would be some risk that the contents can be changed in the future, maybe after the policy makers make decisions. So, this sentence should be deleted.	Accepted. Paragraph has been completely re-written.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28525	SPM	15	23	15	29	The texts in Chapter 5 and Chapter 15 on rebound effects seem to be much more balanced than the text in the SPM. Please also include Chapter 15, page 30, line 46ff: "All of the studies above acknowledge that the estimates of rebound effects are associated with considerable uncertainty and depend on assumptions and models used.". Please also include Chapter 15, page 31, lines 13-14: "The existence of a rebound effect clearly does not mean that efficiency policies are useless. Efficiency policies enable economic growth with less energy intensity."	Accepted. Paragraph has been completely re-written and an explanation for the underlying uncertainty is provided.
19750	SPM	15	23	15	29	Rebound effects occur as a result of higher energy usage because of relatively cheeper energy cost brought by energy saving (or efficiency improvement). At the same time, rebound effects also bring higher economic growth (=higher energy usage). In other words, rebound effects are necessary side-effects of faster economic growth as the results of efficiency improvement.This is in line with Sustainable Development goals stated from page 8 line 16-page 9 line 3. Therefore, following phrase should be inserted here: Even though rebound effects discount the net effects of energy savings, it brings higher economic welfare to the people who achieve those. It only accelarate the economic growth, which whould have been anyway achieved a few years later.	Rejected. Paragraph has been completely re-written.
30161	SPM	15	23	15	29	Negative rebound effects should be discussed at the same time as backfire, as both effects are theoretically possible (and both have limited evidence). See WGIII, Ch 9, p 41. Reference: Turner (2009). Text revision: "Macro-economic rebound effects are more uncertain and could theoretically be negative or exceed 100% (called backfire) in some cases (limited evidence, low agreement). Climate policies such as a global cap on emissions or pricing instruments could mitigate rebound effects [5.6, 9.7, 9.10, 15.5, 15.6, 15.8]"	Rejected. Paragraph has been completely re-written.
29069	SPM	15	23			An example of what a 'rebound effect' is would be useful for non-technical readers.	Accepted. Paragraph has been re-written and general explanation of a 'rebound effect' is provided.
25261	SPM	15	25	15	25	Besides stating that rebound effects are higher in developing economies , it is important to communicate the reasons and also the measures and means to reduce the rebounds. Since this is a summary of policymakers, the report should communicate the policy relevant alternatives which are propsed by the sceintific literature.	Taken into account - text revised.
33592	SPM	15	29	15	29	The confidence statement suggests it is determined fully by the last sentence. If this is correct we like to suggest to insert a confidence statement about all other sentences. We wouldn't object to deleting the statement at the end of this para.	Accepted. Uncertainty qualifier should indeed refer to entire paragraph. As a consequence, text has been completely rewritten and now clearly states the reason for the underlying uncertainty.
26730	SPM	15	29			Backfire theory, relevant for todays economies in OECD?	Noted. Text has been completely revised.
31333	SPM	15	30	15	38	We think that the fluorinated gases (e.g.. HFCs, PCFs and SF6) should be dealt with specifically in this paragraph, since the mitigation characteristics for this group of gases are very different from those of CH4 and N2O.	Accepted. Text has been revised.
30652	SPM	15	30		38	The points in this paragraph are a bit mixed up (e.g., transport vs. non-CO2), and neither is particularly well explained. Recommend considering splitting into two distinct paragraphs.	Accepted. Text has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25139	SPM	15	30	15	38	One of the things now missing from the SPM and other parts of the WG III report is consideration of differing strategies and purposes for CO2 and non-CO2 (including black carbon) mitigation. As Shindell and others have observed, reduction in short-lived forcing (SLF) greenhouse gases is important not only in itself but to help deal with the reduction in negative aerosol forcing as CO2 emissions from combustion are reduced. This dual strategy will help reduce negative spillovers (as expressed in climate impacts and immediate adaptation needs and responses) from the necessary mitigation effort overall.	Accepted. Text has been revised.
25011	SPM	15	30	15	38	Two critical challenges to longer-term emission reductions are outlined, however the challenges associated with reducing emissions from land use lacks sufficient detail. A small amount of additional text would be beneficial. Relevant text should be sourced from sections cited in the SPM (6.8, 8.7, 8.9 and 11.9).	Accepted. Text has been revised.
26731	SPM	15	30			Why is the transportation sector highlighted as one of sectors that may provide the greatest challenges for deep emission reductions when there are several studies that reach at a more positive conclusions regarding this sector? And why isn't the energy intensive industries highlighted instead (see p 19 r 17-32)?	Accepted and text has been fully revised.
25262	SPM	15	30	15	31	It is suggested to have a separate para for non CO2 gasses.	Accepted. Text has been revised.
26116	SPM	15	30	15	39	Other factors than high density fuels should also be discussed in the SPM.	Disagree. These other factors are already discussed in different parts of the SPM.
38950	SPM	15	30	15	38	The SPM does not include nealry enough information on HFCs, the signficant potential for their global growth, and the associated mitigation options for addressing HFCs.	Accepted. Text has been revised.
38951	SPM	15	30	15	38	Air travel should be mentioned as a particularly important transportation challenge due to increasing passenger miles and its complete dependence on fossil fuels (currently). Also although not a GHG, Black Carbon should be mentioned as an important mitigation forcer given its significant yet uncertain forcing function and the many remaining scientific questions regarding sources and mitigation effectiveness for key combustion sources.	Noted. Paragraph has been completely revised, focusing on the general increase in transport sector emissions, i.e. not just air travel in particular. Black carbon is mentioned explicitely in context of its relevance for health but detailed discussion regarding mitigation effectiveness is omitted due to space constraints.
28526	SPM	15	30			The current wording is misleading. Obviously it is meant that the CURRENT transport sector is highly dependent on fuels with high energy density. The challenge would be to change that system towards a system where not the energy density but the energy source with the lowest associated CO2-emissions is chosen. This is a key challenge indeed. However, the ultimate key challenge is to drive the transport sector towards a low CO2-sector. This is only possible with low CO2-options, like e. g. electric mobility with renewable energy via hybrid solutions as intermediate step. Given the current and predicted price situation with fossil energy sources that is also from the economic perspective very difficult, another key challenge.	Accepted, paragraph has been fullly revised.
29070	SPM	15	30	15	38	It would be clearer and more helpful to treat transportation and non-CO2 emissions separately.	Accepted. Text has been revised.
26469	SPM	15	30	15	38	Non-CO2 gases are mentioned three times in this paragraph (lines 30, 34 and 38). Are these non-CO2 greenhouse gases or a larger group of non-CO2 gases? Would be very useful to know what is included.	Accepted. Text has been clarified.
30421	SPM	15	32	15	32	Use of fraction is not clear a % value should be used	Noted, wording has been revised.
28527	SPM	15	33	15	35	This is a very important result and should be highlighted and printed in bold.	Noted.
31334	SPM	15	35	15	36	Please consider to include also biofuels as an option.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20091	SPM	15	35	15	36	"The primary challenge in the transport sector is the need for high density fuels". Is there an agreement of authors on this statement ? I would cite "demande management"as the main challenge, since most technlogical options will not offset the growth of emissions due to the growth of demand (air transport is an obvious example, but so is road transport)	Noted. Text has been revised.
40834	SPM	15	35	15	38	Very intrinsic and reasonable description on the fuel and cell. Please maintain this sentence.	Accepted, but text has been completely revised and now more focuses on the short and long term options to reduce fuel carbon intensities.
20876	SPM	15	36	15	37	When and How is the feasibility of fuel cell and hydrogen storage technologies anticipated? Could it actually lead to one of the epoch-making improvements of the transportation sector?	Cannot answer so no date included
31696	SPM	15	36		37	Suggest re-worded to remove word “envision” and be factual about what scientifically is known versus preferred.	Accepted. Text has been revised.
38952	SPM	15	36	15	37	This sentence is somewhat misleading, and it is recommended that the authors remove it. There is significant literature that suggests major advances could come from incremental or hybrid technologies, and even many of the technological opportunities in batteries and hydrogen face significant barriers to reduction of life-cycle emissions (particularly related to the production of hydrogen or electricity). It does not seem appropriate to offer such as statement in the SPM unless is can be appropriately balanced with alternative views or caveats. If the sentence remains in the text, it is suggested to include advanced, low carbon biofuels on the list of prospective alternative fuels.	Accepted, sentence has been removed.
28528	SPM	15	37	15	38	Message not clear, context?	Accepted, sentence has been removed.
29071	SPM	15	37	15	38	Infromation about other challenging reductions of non-CO2 gases in addition to land use process would be useful to policy makers here. Plus a ranking and scale of difficulty if possible. Would be useful to see emissions trends for non-CO2 gases.	Accepted, informatin on the mitigation of non-CO2 gases in the industry sector has been added in the respective section
30653	SPM	15	38	15	38	Suggest identifying " methane and nitrous oxide" as important non-CO2 gases from land-use processes (predominantly agriculture) here. That is, "Challenging emission reductions of non-CO2 gases include emissions of methane and nitrous oxide from agriculture."	Rejected, sentence has been removed.
33594	SPM	15	39	16	2	A confidence statement is lacking.	Accepted.
25140	SPM	15	39	16	2	This is a well rounded paragraph describing the varying perspectives of “top down” and “bottom up” modeling. But given that empirical evidence from four decades of effort to implement energy efficiency and low carbon/renewable energy resources has definitively shown that there are real market barriers, shouldn't AR5 recommend that top down modeling, at last, incorporate market inefficiency?	Rejected. The objective of the SPM is to provide policy relevant insights. Due to space constraints the paragraph was shortened by integrating it into another finding.
25012	SPM	15	39	15	48	The discussion about the conflict between the broad models and the bottom up analysis could be more balanced in the SPM. The assumptions underlying the macro models are crude and clearly inconsistent with real world behaviour regarding the level of ‘efficiency’ achieved. It is important that the SPM puts more emphasis on the bottom up work and strongly calls for more work to resolve and validate the differences between the top down and bottom up models. Suggested further reference that could assist in this: Denniss, R. (2012). The use and abuse of economic modelling in Australia. The Australia Institute, Technical Brief No. 12, January 2012, ISSN 1836-9014 (https://www.tai.org.au/index.php?q=node%2F19&pubid=950&act=display)	Noted. Due to space constraints the paragraph had to be shortened by integrating it into another finding.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25013	SPM	15	39	16	2	The different outcomes of bottom up and top down modelling exercises create a serious problem for policy makers. Suggest the SPM propose options for research or analysis that could clarify the extent to which each has value and under what circumstances so that they can usefully guide policy development.	Rejected. The objective of the SPM is to provide policy relevant insights. Due to space constraints the paragraph was shortened by integrating it into another finding.
22884	SPM	15	39	16	2	issue of hidden costs and negative cost policies need summary in ch15 and SPM.	Noted.
25263	SPM	15	39	16	2	This conclusion is welknown since the IPCC WGIII SAR. Since then gap is 'bridged' tp some extent. SPM should provide the policy relevance of this conclusion and means and measures of overcoming shortcomings, rather than repeating a welknown scientific result which is oft reported by IPCC since two decades.	Accepted. The paragraph was significantly shortened by integrating it into another finding.
38953	SPM	15	39	15	48	Please define "integrated" and "bottom-up" studies somehwere	Accepted, wording has been revised and clear glossary definition for integrated models in provided.
28529	SPM	15	39	16	2	The paragraph does not reflect the enormous importance of energy efficiency measures. Instead, the long discussion of differences in estimating the potential of energy use reductions tends to create doubts as to the interest of energy efficiency measures. The paragraph should therefore be much shortened. On the contrary, the need for energy use reductions and the cost efficiency of such measures should be stressed.	Accepted. Paragraph has been fully revised and cost-effectiveness of energy efficiency measures is specifically emphasized.
24415	SPM	15	39	15	40	It is true that there are large differences exist among studies regarding the potential for energy use reductions, but bottom-up type estimate does not necessarily lead to large mitigation potential. See M. Sugiyama, O. Akashi, K. Wada, A. Kanudia, J. Li, J. Weyant. “Energy-efficiency potentials for global climate change mitigation,” Climatic Change (forthcoming) .	Noted. Due to space constraints the paragraph had to be shortened by integrating it into another finding.
23103	SPM	15	45	15	47	This flaw in IAMs (about assuming efficiency) should be stressed, and the results of IAMS in Chapter 6 removed due to this and other model flaws.	Rejected. The objective of the SPM is to provide policy relevant insights, relying on different streams of the peer-reviewed literature. Due to space constraints the paragraph was shortened by integrating it into another finding.
33593	SPM	15	46	15	46	We think the barriers are "non-market" rather than "market".	Noted, paragraph has been fully revised.
26405	SPM	15	6	15	6	These ambitious goals require successful cross-sectoral global public- and private-sector capital markets investments to favor prudent low-risk climate change mitigation activities over risky GHG emitting activities.	Noted.
25560	SPM	15	7	15	11	I do not think this sentence is correct. I believe the major consensus is that energy efficiency improvements including higher efficiency of coal power plants are near-term options with cost effectiveness, that the decarbonization of electricity, such as fuel switch from coal to gas, renewables, CCS, is a middle-term option or an option for deeper emission reductions, and finally that many revolutions of whole energy systems, such as FCVs in transportation sectors with hydrogen supply systems and/or EVs with low/zero emission electricity supplies, are required for long-term or much deeper emission reductions. Therefore, the sentence should be revised.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The text has been revised accordingly.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30418	SPM	15	7	15	11	The key message on electricity should be clearer and not notional it is cost effective and doable	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
31329	SPM	15	7	15	7	It may discussed whether "decarbonisation" is the best term to use? Or if it could be said that the report talks about non fossil fuel electricity?	Rejected - decarbonization includes CCS which is based on fossil fuel usage.
30649	SPM	15	7		11	In addition to mentioning the low-carbon electricity options that are available, this paragraph should also note that many existing electricity sources currently have very high carbon intensity (i.e., coal) and that the use of these sources predominates the energy mix of several of the world's largest emitters.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
30648	SPM	15	7	15	8	There is a reference to "transformation scenarios". What is meant by this?	Accepted - text revised.
26162	SPM	15	7	15	8	A good comment.	Thanks.
24465	SPM	15	7	15	11	For decarbonization of electricity with limiting the costs of mitigation, in the real viewpoint of recent best avilable technology, it's very important to promote nuclear power generation based on the premise of safty assurance.	Taken into account - 4.1. is constrained to cross sector aspects, but the importance of nuclear is discussed in the chapter 7 part of the SPM.
22880	SPM	15	7	15	11	DELETE, as it is wrong. Many scenarios point to energy efficincy as th near term option (-2030), and then decarbonization of electricty (-2070), and CCS etc later. See, for example, Global Envrionemntal Asssessment chater 17 has a sceanrio "GEA-efficiency" in which effficiency improvement is near term actions and power secto actions come later. Generally speaking, IAMs do not have precision to predict the timing of measures with confidence. SUGGESTION: Replace this para by much more robust finding that "Less GHG pathways are compatible with more electrifiaion in end use sectors"of Chapter 7 Fig 7.18.and p61 line 28-33. Also, move the para "TS 29 line 16-22 (a phased strategy must account for interactions between sectors to prevent unintended consequence" to here in SPM.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22881	SPM	15	7	15	11	DELETE, as it is wrong and provides bad messages to policy makers. Too much focus on near term decarbonization of electricity may results in biased policy making of diffusion of immature and costly technologies by regulations and subsidies, resulting in high power price and hinder the electrification that is necessary for long term deep emission cuts.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
23952	SPM	15	7			It is suggested to use a more specific language and insert "mitigation" before "strategies".	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
32096	SPM	15	7		11	This does not differentiate the different costs of energy production as well as the microeconomic diversity of demand	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
25045	SPM	15	7	15	11	Replace "a near-term element" by "an element of all-seasons" and change the following sentences accordingly. Some decarbonization options such as CCS may take more time than currently anticipated, and other options such as PV may not be fiscally sustainable as demonstrated in Europe. Decarbonization of electricity should be consistently seeked as new technology develops and electricity demand increases.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40831	SPM	15	7	15	11	DELETE, as it is wrong. Many scenarios point to energy efficiency as the near term option (-2030), and then decarbonization of electricity (-2070), and CCS etc. later. See, for example, Global Environmental Assessment Chapter 17 has a scenario "GEA-efficiency" in which efficiency improvement is near term actions and power sector actions come later. Generally speaking, IAMs does not have precision to predict the timing of measures with confidence. SUGGESTION: Replace this paragraph by much more robust findings that "Less GHG pathways are compatible with more electrification in end use sectors" of Chapter 7 Fig 7.18.and p61 line 28-33. Also, move the paragraph "TS 29 line 16-22 (a phased strategy must account for interactions between sectors to prevent unintended consequence" to here in SPM.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
40832	SPM	15	7	15	11	DELETE, as it is wrong and provides misleading messages to policy makers. Too much focus on near term decarbonization of electricity may result in biased policy making of diffusion of immature and costly technologies by regulations and subsidies, resulting in high power price and hinder the electrification that is necessary for long term deep emission cuts.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
24414	SPM	15	7	15	11	Decarbonization of electricity is an important element of the strategy, but the timeframe of the sentence sounds wrong. Consensus of the near term strategy would be improving energy efficiency, including the demand sectors as well as energy supply sector. Decarbonization of electricity takes time because it involves CCS deployment, which are not commercialized for a time.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
29068	SPM	15	8	15	8	Suggest change "goals" to "levels"	Taken into account - comment is obsolete as the text has been revised considerably.
20825	SPM	15	9	15	11	When it comes to energy supply, "environment conservation", "energy-security", "economy" what we call "3E" should be considered. From this standpoint, it is not clear that reducing GHG in electricity sector is relatively easier. Moreover, in industrialized countries, many technologies are too matured to improve easily. However, some technologies of industrialized countries could be transferred to developing countries with relatively low cost This point should be noticed.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25366	SPM	15	9	15	11	This sentence should be removed from this report. It is true that there are multiple options for power generation. However, when power generation methods are selected, energy security and economic efficiency also need to be taken into account. Therefore, it should not be mentioned in such an assertive way that “it will be relatively easier to reduce emissions in the electricity sector”.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
20875	SPM	15	9	15	11	Even if there are multiple viable options to produce low-carbon electricity, it is unclear whether such options can be substantially effective to reduce emissions in the electricity sector in the near future. Therefore, the sentence of "so it will be relatively easier to reduce emissions in the electricity sector relative to the demand sectors" should be deleted.	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
22448	SPM	15	9	15	11	Please add "However, increase in electricity price due to mitigation actions will cause adverse effects as increase in other , more carbonaceous fuels such as natural gas."[6.8]	Taken into account - comment is obsolete as the text has been revised considerably.
32450	SPM	15	9	15	11	Energy security should be considered when choosing options thus should be deleted not to lead misunderstanding that electricity sector is easy to reduce emissions.	Taken into account - comment is obsolete as the text has been revised considerably.
20798	SPM	15	9	15	11	DELETE. Deletion of the entire sentence is needed. The part of "it will be relatively easier to reduce emissions in the electricity sector relative to the demand sectors." is wrong, and different from the reality. For example, construction of low-carbon power plants is needed several years, and has difficulties of public consensus. Many years are needed. On the other hand, the demand sectors are relatively easier to reduce emissions in near term(e.g. demand sector movement of saving electricity.). Please refer the following reference. <Reference> [1]Mitsutsune Yamaguchi et al."Climate Change Mitigation A Balanced Approach to Climate Change" . Springer. ISBN: 978-1-4471-4227-0 (Print) 978-1-4471-4228-7 (Online). Please refer chapter 4 (balance between energy security and mitigation responses).	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The emphasis now is led on integrated approaches combining demand reduction and decarbonization. The text has been revised accordingly.
24013	SPM	15	7	15	9	SPM.4.1 Cross-sectorial strategies. ‘Decarbonization of electricity is a near-term element of strategy in virtually all transformation scenarios that meet 450 ppm or 550 ppm goals while limiting the costs of mitigation (high confidence).’ Question: Is electricity the best element of strategy that meets those goals?	Taken into account - decarbonizing the power system is an important element of least-cost low stabilization profiles, but it is not necessarily the dominating one in the short term. The text has been revised accordingly.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31697	SPM	15				Interesting angle around “focus on the electricity sector first”. Transport will be very tough and it could benefit from breakthroughs in the electricity sector.	Agreed. Decarbonization of energy suppply and electricity generation in particular, accompanied by increasing electrification of end-use sectors has been described in a more integrated way in the final draft. In addition, the accompanying figure more clearly illustrates the difficulties of decarbonization of transport.
28523	SPM	15	12	15	13	SPM.4.2.1 - Information on the amount of fossil fuels, remaining hydrocarbon reserves, and the mitigation options in the field of fuel extraction should be included in this section. This information can be found in section TS.4.2, p.31 line 9 to 16.	Rejected - space constraints do not allow to repeat this well known statement. A discussion of the risks of energy technologies seems more important.
24238	SPM	15	1	15	6	Very important! As my comments No. 3 and 5, I also think this paragraph should be mentioned in advance in the text. I would suggest re ordering the findings at least in the SPM; this paragraph should come before.	Rejected. Aggregate economic mitigation costs are dealt with in SPM.3.1 and the importance of a systemic perspective for cost-efficiency is then only briefly re-iterated in the cross-sectoral section.
24239	SPM	15	12	15	16	I don't see this paragraph adding value to the summary.	Accepted. Paragraph has been removed.
41044	SPM	15	13	15	15	Energy carriers such as liquid fuel and electricity. This is bias against oil. It should also include Methane and Nitrous Oxide that has much greater impact in the short term given their GPW compared to CO2.	Accepted, N2O and CH4 are mentioned explicitely in several sections of the SPM.
24240	SPM	15	17	15	22	I think lot's of emphasis has been given to mitigation technologies and less to mitigation measures such as energy efficiency; this paragraph seems to be the very first time energy efficiency is highlighted.	Noted. Section has been rewritten with the aim to resolve this imbalance.
41045	SPM	15	23	15	29	Rebound effect to offset emission reduction. Since this paragraph has “limited evidence” and “low agreement”, it should not be reported under the SPM.	Rejected. The rebound effect has remained a focus of research since AR4 and thus deserves attention in SPM. However, newly drafted text makes uncertainty regarding the agreement in the literature clearer.
24241	SPM	15	23	15	24	About the rebound effect, no level of confidence nor agreement mentioned.	Uncertainty finding is given at the end of the paragraph. However, text has been revised to clarify the reason for the 'limited evidence, low agreement' uncertainty qualifier.
23111	SPM	15	28	15	29	Delete "… and can exceed 100%... some cases". There is no empirical evidence for backfire, and the casual reader could think that there is some evidence for it.	Accepted. Paragraph has been completely rewritten.
23113	SPM	15	30	15	30	Delete "and of non-CO2 gases"; this issue should be treated in an own paragraph	Accepted. Text has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
41046	SPM	15	37	15	38	Challenging emissions reduction from non CO2 gases. This needs to be properly addressed in greater detail in the SPM. The reference to non-CO2 land use process is improper and clear avoidance to clearly say agriculture activities and livestock industry driven emission.	Accepted, sentence has been removed.
23112	SPM	15	37	15	38	Make a specific paragraph and rephrase: "Harnessing of the substantial emission reduction potential of non-CO2 gases requires an integrated approach covering agriculture and the chemical industry".	Sentence has been removed.
24242	SPM	15	39	16	2	Very nice paragraph and very useful.	Noted. Due to space constraints the paragraph was significantly shortened by integrating it into another finding.
32375	SPM	15	14	15	14	Please clarify "upstream emissions" -- it's not clear to us what this is referring to.	Text has been revised.
32376	SPM	15	23	15	29	Please explain direct rebound effects as opposed to rebound effects in general.	Accepted - text revised. Please note that details on this aspect are provided by box TS.13.
26285	SPM	15	3	15	3	same comment as above	Comment unclear.
26286	SPM	15	32	15	32	same comment as above	Comment unclear.
34542	SPM	15	38	15	38	The following is proposed to be added after "use process. [6.8, 8.7, 8.9, 11.9]": "In addition, it is essential to address how to avoid unfavorable modal shift among different transport sub-sectors regarding long-term mitigation policy, i.e., from waterborne transport or rail to road transport, especially for freight movements [executive summary in Chapter 8, 8.1, 8.3], and balance the policies among these sub-sectors based on their CO2 contribution proportion of the global emissions [8.1.1] without impairing world trade.". The reason is as follows: considering "over three quarters of transport sector increase is coming from road vehicles" [FAQ 8.1], "Freight transport consumed almost 45% of total transport energy fuels[8.1.2]" and "Freight movement is dominated by road transport [Figure 8.1.5]", "rail's biggest CO2 reduction may come from a significant modal shift from road to rail" [8.3.2.4] and "waterborne transport is a comparatively efficient means in terms of g CO2/ton*km compared to other transport modes" (IMO, Second IMO GHG Study 2009, section 8.3.2.5 of chapter 8) while around 80% of world merchandise trade by volume is carried by seaborne transport (UNCTAD, 2012), but the fact is that "GHG emissions from the transport sector have more than doubled since 1971... Over three quarters of this increase has come from road vehicles [8.1]" and "over the past few decades, air and road freight have increased their share of the market at the expense of rail and waterborne transport [8.4.2.2]", In addition, in Kyoto Protocol it is required that the International Civil Aviation Organization and the International Maritime Organization to limit or reduce emissions of GHG respectively, so it is vital to identify this long-term mitigation policy in transport sector as a whole in order to avoid unfavorable modal shift.	Accept the points listed are important but space for Transport chapter 8 text was made very limited so no details possible.
41004	SPM	15	1	15	6	However, SPM as well as AR5 is mainly focusing on electricity and transport leaving other sectors untouched.	Accepted. This imbalance has been addressed and the coverage of other sectors has been improved, e.g. the role of land-use sector - in particular when combined with CCS technologies - is emphasized.
41006	SPM	15	12	15	16	While it's claim that decarbonisation is possible in fossil fuel and electricity, the associated risks are extensive use of nuclear power in coming decades in non-electrified region/countries and a global shift towards nuclear when addressing GHG mitigation from electricity generation. Examples are nuclear electricity rich countries – Sweden, Finland, France, Japan and US etc.	Accepted. The risks related to the use of nuclear power are explicitely noted in the energy supply section.
20751	SPM	15	30	15	30	pls greenhouse to non-CO2 gases	Accepted. Text has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
41005	SPM	15	7	15	11	Low-carbon electricity This will enhance risks of using more nuclear as base-load power plants and unsustainable renewable in peak-load power plants.	Rejected - low carbon power might include nuclear and unstainable RE, but need not.
25460	SPM	16				delete parantheses from "also in combination with bioenergy"	Accepted - text revised.
33597	SPM	16		16		We do not think the exact number of models per sector for 450 ppm and 550 ppm are that interesting, so we propose to delete them from both panels.	Accepted - text revised.
33599	SPM	16	11	21	2	We think a graph with per sector emission pathways could be very informative, although we do not know if literature allows for this.	Agreed - Figure has been reworked to better display projected sectoral emission pathways.
28534	SPM	16	11	17	28	The order of options that are presented here give the impression that you prioritize or that it shows decreasing/increasing importance. Make sure, that your intention is unambiguous.	Accepted - text revised.
38956	SPM	16	12	17	28	Section 4.2.1 covers decarbonization of the generation mix (the text steps through CCS, nuclear, and RE options) without, however, explicitly linking the full realization of associated abatement potential to tandem electrification of the energy system. As Chapter 7, other chapters, and numerous modeling exercises underline, stringent mitigation scenarios combine those elements.	Accepted - text revised.
25368	SPM	16	13	16	18	It should be added that improvement of thermal efficiency of coal thermal power plants also contributes to GHG emission reduction.	Rejected - the specific emissions reduction potential of moving to efficient coal fired power plants is small compared to gas usage and low carbon power systems. Space constraints do not allow to discuss options with a rather limited potential.
26920	SPM	16	13	16	18	This paragraph fails to note that the replacement of coal with natural gas plants is a short or medium-, but not long-, term solution to climate change for a stringent CO2e atmospheric concentration, e.g. 450 ppm (Levi . Replacing coal plants with natural gas will net emissions reductions, but other near-zero-carbon technologies (CCS, wind, solar, etc.) will be necessary to achieve low atmospheric CO2 concentrations. See: Levi, Michael. "Climate consequences of natural gas as a bridge fuel." Climatic Change. January 2013.	Accepted - the intermediate role of gas now is revealed.
25596	SPM	16	13	16	18	Delete this para as this option is not included in table 7.4 in Chapter 7 as one of main mitigation options. Or add the sentence of "the degree to which low carbon options may or may not contribute to energy securitiy is depndent on the local resource situation and specific national economic circumastances and social priorities"(Chapter 7) somewhere in this para. SPM simply mentions "many mitigation options result in co-benefits for energy security"(P21 L24) otherwise readers could misunderstand that fuel swiching is easy to take.	Accepted - the availability of gas now is mentioned.
27044	SPM	16	13	16	18	This paragraph needs to note that while significant GHG reductions can be achieved by switching coal plants for natural gas plants, this mitigation strategy may not be consistent in the long-term with 450 ppm stabilization targets or more stringent goals (while it may be consistent with 550ppm or less stringent). See Levi, Michael. "Climate consequences of natural gas as a bridge fuel," Climatic Change, January 2013.	Accepted - the intermediate role of gas now is revealed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25637	SPM	16	13	16	15	This part should be revised to explain that it is important to use coal power efficiently from a viewpoint of energy security and economic efficiency. IGCC (Integrated Gasification Combined Cycle) technology is developing and has potential to reduce CO2 emission in the future, as described in (IEA, 2011, page7, page42 Fig14) and (Janos, 2009, page5, page7 Figure1 and Table 1). <Reference> [1] IEA (2011). Power Generation from Coal Ongoing Developments and Outlook, IEA Information Paper. Available at: http://www.iea.org/publications/freepublications/publication/name,4009,en.html [2] Janos M Beer (2009). Higher Efficiency Power Generation Reduces Emissions, National Coal Council Issue Paper. Available at: http://mitei.mit.edu/system/files/beer-emissions.pdf	Rejected - although more efficient coal fired power plants might reduce emissions, the specific emission reduction from moving to efficient coal power plants is small compared to other options like moving to gas or low carbon power plants. Space constraints do not allow to discuss options with a rather limited potential.
24390	SPM	16	13	16	18	It should be pointed out that the 50% reduction in carbon emissions in switching from pulverized coal plants to NGCC does not account for fugitive methane emissions (with 25 times the global warming potential of CO2), about which there are widely divergent estimates. Water consumption and pollution are also significant environmental concerns with hydrofracking of gas shale.Note that in the next paragraph on nuclear power, you cite potential disadvantages, but you do not do the same here. So the SPM is inconsistent in this regard.	Accepted - the fugitive emissions of gas usage now are considered.
21092	SPM	16	13	16	18	What we need is not significant reduction in GHG emissions, but emissions levels that are low enough to reach targets. It means that NGCC plants emissions, even significantly lower than coal plants, might not be low enough to be a valid solution (except maybe in the very very short term). In coherence with figure SPM.6., decarbonization of electricity is said to be a near-term element of strategy (SPM p. 15 line 7)	Accepted - the intermediate role of gas now is revealed.
26734	SPM	16	13	16	18	To what extent does the LCA:s for natural gas plants include methane emission leakages and what Global warming potentials for methane are used in the assessments (20 years as well?)	Accepted - the fugitive emissions of gas usage now are considered.
22416	SPM	16	13	16	18	Although coal emits lots more CO2 than other fossil fuels, coal will play significant roll in energy sector because of its characteristics - cheap and widely distributed - that helps provide affordable electricity in developing and developed countries. Thus following sentence should be added at the end of this paragraph: "Despite the adverse effects in climate change, coal plays an important role in achieving SD because it can provide affordable electricity worldwide."	Rejected - although more efficient coal fired power plants might reduce emissions, the specific emission reduction from moving to efficient coal power plants is small compared to other options like moving to gas or low carbon power plants. Space constraints do not allow to discuss options with a rather limited potential.
25264	SPM	16	13	16	18	Is it possible to give comparative costs of NGCC compared to normal coal fired power plants	Taken into account - this cannot be done on the SPM level, but there is a figure on that in the TS:
40835	SPM	16	13	16	18	This expression should be changed with "More modest emissions reductions can be achieved when going to best available coal technology or less advanced gas power plants" to avoid any misunderstandings. Furthermore, from realistic and economic point of view, it would be better to encourage to obtain higher efficiency of coal power plant, because of ubiquitous distribution of coal.	Rejected - although more efficient coal fired power plants might reduce emissions, the specific emission reduction from moving to efficient coal power plants is small compared to other options like moving to gas or low carbon power plants. Space constraints do not allow to discuss options with a rather limited potential.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28536	SPM	16	13	16	18	Add (as stated in Chapter 7) that in the long run, even emissions from NGCC for baseload power demand are too high to meet stringent emissions targets.	Accepted - the intermediate role of gas now is revealed.
28537	SPM	16	13	16	18	To give a more precise picture, the importance of the gas source with regards to the accompanied emissions in the extraction process should be discussed (conventional vs. unconventional gas)	Accepted - the fugitive emissions of gas usage now are considered.
20826	SPM	16	15	16	18	We can reduce large amounts of GHG emission by popularizing the best available technology of coal power. Effectiveness of it should be noticed.	Rejected - although more efficient coal fired power plants might reduce emissions, the specific emission reduction from moving to efficient coal power plants is small compared to other options like moving to gas or low carbon power plants. Space constraints do not allow to discuss options with a rather limited potential.
22665	SPM	16	16	16	16	A modern NGCC emits roughly 50%, not "up to 50%", less lifecycle CO2eq emissions as an average coal plant. Chapter 7, page 4 line 28 only states 50%, not up to 50%. The literature includes a range of results around 50%.	Taken into account- comment is obsolete as the specific number is not shown anymore.
28538	SPM	16	17	16	18	How much smaller is the difference?	Taken into account - comment is obsolete as the text has been revised considerably.
28539	SPM	16	18	16	18	The massive upcoming of shale gas tends to increase the GHG emissions per kWh of natural gas. The fact is also stated in the Technical Summary. Therefore, as in the Technical Summary, add a sentence about the "downward adjustment of the estimated benefit from fuel switching" due to the advent of shale gas.	Accepted - the fugitive emissions of gas usage now are considered.
20866	SPM	16	19	16	27	In order to introduce CCS, there are several problems to solve, such as technologies, environmental concerns, acceptability by local people. These problems should be identified as well.	Accepted - the concerns and risks of CCS now are discussed.
29651	SPM	16	19	16	27	CCS is not yet a mature technology. This paragraph should thus not be listed second in a section of long-term mitigation options, ahead of proven, scalable energy technologies like nuclear and renewable energy, not to mention energy efficiency. Without a single commercial-scale CCS project, it is not appropriate to implicitly promote this technology by listing it ahead of these others.	Accepted - CCS now are discussed at the end of the list of options.
25369	SPM	16	19	16	27	This part lacks good balance, listing only effectiveness and potential of installing CCS. Issues of CCS, including economic and technical issues and impact to the surrounding environment, such as under the soil or under the sea, should also be described.	Accepted - text revised.
31339	SPM	16	19	16	26	Please consider to better reflect the way this finding is formulated in TS p.32, line 1-8 and Chapter 7.5.5. Although CCS has not been applied to a large commercial fossil-fired electricity generation facility, CCS has been commercialy deployed to other related sectors such as gas processing (Global CCS Institute, table 1 in http://www.globalccsinstitute.com/publications/global-status-ccs-2012/online/47981).	Taken into account- text revised.
29321	SPM	16	19	16	27	Given the immaturity of CCS technology, this paragraph should not be #2 in a section long-term mitigation options. As commercial-scale projects are still forthcoming, it is necessary to put this option in context with other more certain reduction options, in particular renewable energy, nuclear and energy efficiency. A greater discussion of cost estimates from currently operating pilot plants is warranted.	Accepted - CCS now are discussed at the end of the list of options. Cost aspects now are discussed.
33600	SPM	16	19	16	27	Given the large amount of resistance against CCS, it would help to add a sentence on the safety (emissions, earthquakes) of underground CO2-storage, possibly taken from the IPCC Special Report.	Accepted - text revised.
24466	SPM	16	19	16	27	For CCS utillization, there are many issues that should be solved from the cost of investment, safty utillization, the aspect of environmental influence, and the viewpoint of social acceptance, as well as technical issues.	Accepted - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30452	SPM	16	19	16	19	Include the word "potentially" in the sentence: "CCS technologies can potentially significally reduce the carbon dioxide emissions of fossil-fired power plants". In order to significantly reduce the emissions of fossil-fired power plants it requires that CCS is being applied to large, commercial fossil-fired generation facilities. The paragraph (line 19-27) highlights that this has not yet been the case, and therefore the importance of including the word "potentially".	Accepted - "can" is replaced by "could".
34708	SPM	16	19	16	27	This paragraph should be more representative of what is said in the underlying chapter, about developments on CCS since AR4: "The implementation of large-scale CCS systems generally requires extensive funding and an array of complementary institutional arrangements such as legal frameworks for assigning liability for long-term storage of CO2. Since AR4, studies have underscored a growing number of practical challenges to commercial investment in CCS. (Ch1, p 10, lines 42-46.)	Accepted - text revised.
21093	SPM	16	19	16	27	It should be clearly mentionned that CCS implies more fuel (coal, gas, biomass) for the same result, so some negative impacts (mining, drilling, land use and deforestation) are increased by CCS or BECCS. Also uncertainties on CCS are strong as already mentionned in my remarks concerning Chapter 7. Last but not least, remaining emissions from CCS plants might be to high when considering that decarbonization of electricity is said to be a near-term element of strategy (SPM p. 15 line 7).	Taken into account - the additional operational costs of CCS plants now are discussed. Operational safety issues are discussed as well.
30083	SPM	16	19	16	27	Arguably not falling exactly under this para, the increased water consumptino of CCS needs to be emphasised to policymakers. China is typically emplying air cooling at coal fired power plants due to water scarcity and CCS adds some 35-90 % of water consumption compared to a reference plant. See, eg, http://live.belfercenter.org/files/ETIP-DP-2010-15-final-2.pdf	Rejected - this remark is very specific and cannot be addressed at the SPM level due to space constraints.
38958	SPM	16	19	16	27	This section describes the importance of CCS technology and implies it is ready for wide scale use, which is not accurate. This section should be augmented to acknowledge remaining problems and inadequacy of relevant CCS R,D,D&D program especially for natural gas and industrial sources, where there is little research activity. Such problems include substantial parasitic power generation loss, retrofit challenges, major water requirements and sequestration uncertainties, both scientific, legal, and political. Although the components of CCS systems have been evaluated, there has been considerably less effort to understand the dynamic responses and potential problems of an integrated system.	Taken into account - the text has been revised to address most of the issues mentioned here. Those which are not discussed are too specific to be discussed at the SPM level.
40836	SPM	16	19	16	27	BECCS is counted as an important element to achieve 450 and 550 ppm scenarios, therefore, the feasibility of BECCS should be carefully assessed. From this view point, it is better to add these facts for balanced expression. Table 6.5 summarizes uncertainty of CCS from view point of economy and environmental risk.	Accepted - BECCS and the related risks now are discussed.
28540	SPM	16	19	16	27	The paragraph is biased and, therefore, not consistent with IPCC's mandate: CCS technology is too much highlighted, and duplications occur (see p. 11, l. 27; p.10, l. 22) , especially in view of the little practical success CCS has seen today and the consequent losses in the efficiency of power generation it causes. Please be balanced. See comment under p. 10, l.22. The paragraph should be shortened. Delete "All of the components of integrated CCS systems exist and are in use today in various parts of the fossil energy chain". The evidence of demonstration projects is sufficient for comprehension.	Taken into account - CCS now is placed after RE and nuclear. CCS risks are highlighted. The sentence on "All of the components of integrated CCS systems exist and are in use today in various parts of the fossil energy chain", however, is true and therefore not deleted. The sentence however is expanded to emphasize that CCS has not been applied to large power plants.
19751	SPM	16	19	16	27	Importance of CCS is clear here, but there is not only technical immaturity in this technology but a severe social barrier exists. CCS (and Nuclear paowe station) is now regarded as a trouble equipment, which is called NIMBY. There must be a serious social debate necessary to introduce CCS widely.	Taken into account - the risks and concerns related to CCS now are discussed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26471	SPM	16	19			Insert "fuel" after "fossil".	Rejected - the term "fossil power plants" is often used in the literature.
31340	SPM	16	20	16	22	Please consider replacing "also in combination with bioenergy" with "also for bioenergy power-plants".	Taken into account - comment is obsolete as the text has been revised considerably.
25638	SPM	16	20	16	22	The part of "(also in combination with bioenergy)" should be deleted completely because it is uncertain whether BECCS can be utilized in the future, as described in the section TS.3.3 (page 21, line 37). Safety confirmation, affordability and public acceptance are indispensable in CCS site selection. There is a much higher barrier to adopt BECCS than CCS. BECCS requires stable biomass supply for generation at reasonable cost. Since feasibility for BECCS has not been established so far, it is not appropriate to expect huge potential for BECCS in the future, as described in (Rhodes, 2008, page323). This literature is listed in the No7 line of this table.	Taken into account - the role of BECCS and the associated problems now are discussed in an own statement.
28541	SPM	16	21			"CCS… is a key technology in current long-term scenarios…" Consistent to Chapter 6 it should be written "CCS… is a key technology in a number of long-term scenarios…"	Taken into account - comment is obsolete as the text has been revised considerably.
25639	SPM	16	22	16	26	This part should be kept in the final version report and also explain that there are many concerns about CCS such as safety confirmation, storage potential, high cost or public acceptance, as described in (Finkenrath, 2011, page7), (Rubin, 2007, page4447, Table3), (Lohwasser, 2012, Abstract), and (Zoback, 2012, Abstract). CCS cost depends on a number of conditions such as concentration of CO2 in the exhaust gases, capture technology, access to storage site, storage potential, and CO2 monitoring. <Reference> [1] Finkenrath, M (2011). Cost and Performance of Carbon Dioxide Capture from Power Generation, International Energy Agency. [2] Rubin, E.S., C. Chen & A.B. Rao (2007). Cost and performance of fossil fuel power plants with CO2 capture and storage. Energy Policy 35, 4444–4454. [3] Lohwasser, R. and Madlener, R. (2012). Economics of CCS for coal plants: Impact of investment costs and efficiency on market diffusion in Europe. Energy Economics, Volume 34, Issue 3, May 2012, Pages 850–863. Available at: http://dx.doi.org/10.1016/j.eneco.2011.07.030 [4] Zoback, M.D. & S.M. Gorelick (2012). Earthquake triggering and large-scale geologic storage of carbon dioxide. Available at: http://www.pnas.org/content/early/2012/06/13/1202473109.abstract	Taken into account - the text has been revised to address most of the issues mentioned here. Those which are not discussed are too specific to be discussed at the SPM level.
22414	SPM	16	22	16	27	Add ", due to such barriers as social and environmental acceptances and economical burdens" at the end of the sentense " However … facility" .	Taken into account - the text has been revised to address most of the issues mentioned here. Those which are not discussed are too specific to be discussed at the SPM level.
26117	SPM	16	22	16	23	The reasons why there are no large scale CCS applications in commercial use yet should be discussed in the SPM.	Rejected - the topic is too specific for being discussed at the SPM level.
20877	SPM	16	23	16	27	The sentence of "the estimated global practical storage capacity is larger than the storage demand for 450 ppm scenarios." should be deleted. Although the fact might be that, CCS systems do not become effective promptly.	Accepted - text revised.
26472	SPM	16	23			Insert "fuel" after "fossil".	Rejected - the term "fossil power plants" is often used in the literature.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23953	SPM	16	24			What are "critical advances"? Perhaps "significant improvements" might better describe the progress?	Taken into account - comment is obsolete as the text has been revised considerably.
38959	SPM	16	25	16	26	In the current text, which states: "All of the components of integrated CCS systems exist and 25 are in use today in various parts of the fossil energy chain," the authors have discounted the component of liability and legal framework as well as the development of the storage performance assessment models that are needed to address liability and legal issues. The cost of implementing the legal and liability framework needs to be considered and represents a significant barrier to obtaining capital financing for CCS. The performance assessment models are an active research program within the Department of Energy Office of Fossil Energy. These models have not been sufficiently developed for use in a commercial project. Thus, these "paper" components of CCS systems do not currently exist and represent a significant barrier to full implementation.	Taken into account - text revised.
28542	SPM	16	25	16	26	It should be noted that all the components exist, but most of them do not work on the scale that would be necessary. There is a difference between storing a few million t per year and several hundred.	Taken into account - it is now emphasized that CCS has not been "applied at scale to a large, commercial fossil fuelled power plant.
25014	SPM	16	26	16	27	The statement omits the caveat (included in Chapter 7 and the Technical Summary) that practical geologic storage capacity 'is unevenly distributed'. This qualifier should be included in the SPM, given implications for future policy. Suggest the statement should be reworded to: "The estimated global practical storage capacity is larger than the storage demand for 450 ppm scenarios during this century; however this capacity is unevenly distributed [6.3, 7.5.5, 7.8.1]." Suggest that this should also note that storage demand is likely to be met 'during this century' (as noted in Chapter 7) - an important qualifier as it underscores, for policymakers, the potentially transitional nature of carbon dioxide capture and storage technology.	Taken into account - comment is obsolete as the text has been revised considerably.
25640	SPM	16	26	16	27	This part should also explain economically feasible potential for CO2 storage capacity because "practical storage capacity" looks technically feasible capacity and is overestimated. Considering the storage cost, economically feasible potential for CO2 storage capacity is limited and geographically unevenly distributed, as described in (Finkenrath, 2011, page7), (Rubin, 2007, page4447, Table3), and (Lohwasser, 2012, Abstract). These literatures are listed in the No12 line of this table.	Taken into account - comment is obsolete as the text has been revised considerably.
25265	SPM	16	26	16	27	The statement that 'global practical storage capacity is larger than storage demand..' does not mean adequate storage capacity in all regions. This should be clarified.	Taken into account - comment is obsolete as the text has been revised considerably.
28543	SPM	16	26	16	27	It should be noted that total storage capacity is only one part of the equation, the other is the necessary adjacency to the emission sources.	Taken into account - comment is obsolete as the text has been revised considerably.
28544	SPM	16	26	16	27	Please explain what is meant by "global practical storage capacity" - e.g. what is the expected lifetime of storage in these sites?	Taken into account - comment is obsolete as the text has been revised considerably.
23821	SPM	16	27			Are the storage sights collacated with emission sources or is there a need for transport? Does "practical" include these sorts of considerations?	Taken into account - comment is obsolete as the text has been revised considerably.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28545	SPM	16	27			At the end of this paragraph some aspects connected with CCS should be added: Regional storage capacity could be limited due to geological conditions and use for natural gas or hydrogen storage. Besides efficiency losses, costs and public acceptance most severe obstacle for CCS is the fact that there can not be a guarantee for long-term disposal for hundreds of years. Besides its renewed climate change impact, a major release of CO2 from a storage facility could have impacts on ecosystems and even cause asphyxiation in the surrounding area.	Taken into account - the text has been revised to address most of the issues mentioned here. Those which are not discussed are too specific to be discussed at the SPM level.
25370	SPM	16	28	16	29	This sentence should be left in this report, as it is a correct description about effectiveness of nuclear power in GHG emission reduction.	Taken into account - although the text was changed the underlying theme (nuclear being a mitigation option with low GHG emissions) has been conserved.
33601	SPM	16	28	17	4	This para seems to be concerned with nuclear fission only, perhaps this could be specified.	Rejected - as nuclear fusion is not commercially used today there is no need to emphasize that.
21526	SPM	16	28	16	29	Is similar information on life-cycle emissions from Renewables and Carbon Capture and Storage available?	Taken into account - yes the information is displayed in the TS.
22820	SPM	16	28		31	The first sentence of this paragraph should be skipped. The important message is in the second sentence: "Long-term scenarios consistent with 450 ppm stabilization and their associated macro-economic costs are largely independent from the availability of nuclear power." The first sentence is not important in that context or otherwise it should be compared, how the life-cycle basis is for RES and CCS.	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore. The risks are now pronounced.
34709	SPM	16	28	17	4	Could add (from Ch2, p 57, lines 7-9): "In the period between the publication of AR4 and the accident at the Fukushima power plant in Japan in March 2011, the riskiness of nuclear power as a climate mitigation option has received increasing attention."	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore. The risks are now pronounced.
30514	SPM	16	28	17	4	Nuclear power is the most proven and readily available no-carbon energy. Much more discussion is needed on "barrier" for promotion of nuclear power.	Taken into account - the barriers to an increasing use of nuclear energy now are discussed explicitly.
25266	SPM	16	28	16	28	"At the plant site" - Why only at the plant site?	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore. The risks are now pronounced.
26135	SPM	16	28	16	29	The sentence is confusing, especially the phrase "close to that" which lets the reader to think that nuclear energy provides carbon-free energy close to the plant site, which is obviously not the meaning of the sentence.	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore. The risks are now pronounced.
28546	SPM	16	28	16	29	The aspect of significant risk must be reflected in the first sentence: "Nuclear power is not a practible mitigation option given the significant risks of large scale accidents and subsequent economic, social and environmental disasters." Alternatively the words "is a mitigation option" must be deleted.	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore. The risks are now pronounced.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28547	SPM	16	28	17	4	The role nuclear energy could play is too much emphasized. It is doubtful that nuclear energy could play a leading part in power generation worldwide. Sentence 2 should state more clearly that nuclear energy is not significant in terms of macro-economic costs. The risk of large scale accidents and subsequent economic, social and environmental disasters should be mentioned.	Taken into account - RE now are put before nuclear energy. In addtion, it is emphasized that the share of nuclear is declining since 2 decades. The risks of nuclear now are expressed more clearly.
20799	SPM	16	28	16	29	KEEP. This sentence should be kept. This sentence is important description, and represents the truth.	Taken into account - although the text was changed to respond to other comments the underlying message (describing nuclear as a low GHG technology) has been conserved.
25371	SPM	16	29	17	2	I have a doubt that 450 ppm scenario is independent from availability of nuclear power, as nuclear power is effective for GHG emission reduction. In this part, economics of nuclear power is regarded as one of the issues. . It needs to be examined adequately, as it seems to be one-sided aspect.	Taken into account - the text on nuclear has been considerably revised. The scenario discussion has been deleted.
30423	SPM	16	29	16	30	Clarify why 450 stabilisation is not dependant on nuclear power	Taken into account - the text on nuclear has been considerably revised. The scenario discussion has been deleted.
26034	SPM	16	29	16	31	"Long-term scenarios consistent with 450 ppm stabilization and their associated macro-economic costs are largely independent from the availability of nuclear power." RECOMMEND: "Some long-term scenarios consistent with 450 ppm stabilization and their associated macro-economic costs are largely independent from the availability of nuclear power." JUSTIFICATION: There are a wide range of scenarios, some of which include nuclear energy, some don't. It is therefore not correct to generalise that all long-term scenarios are independant of the availability of nuclear power.	Taken into account - the text on nuclear has been considerably revised. The scenario discussion has been deleted.
24467	SPM	16	29	16	31	Nuclear power will continue to be a very important energy source in mitigation global warming since it does not emit CO2 in the procces of power generation, giving in a central role in global warming. So it's very important to promote nuclear power generation based on the premise of safty assurance.	Taken into account - the text on nuclear has been considerably revised. The scenario discussion has been deleted. Promoting specific technologies is beyond the mandate of the IPCC.
25641	SPM	16	29	16	31	This part should explain the reason why the policy cost increases of nuclear power generation are same in the 550 ppm case and the 450 ppm case. It seems that the capacity and/or generation of the nuclear is intentionally limited and set as the same in both cases. Many assessment models assume the limitation of nuclear power capacity and/or generations considering the public acceptability. If the results were based on this assumption, the results underestimate the contribution of nuclear power in terms of mitigation costs.	Taken into account - the text on nuclear has been considerably revised. The scenario discussion has been deleted.
26118	SPM	16	29	16	31	This sentence is somewhat unclear; Please clarify. The sentence starts with: Long term scenarios consistent with 450 ppm…	Taken into account - the text on nuclear has been considerably revised. The scenario discussion has been deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28548	SPM	16	29		31	"and their associated macro-economic costs...". Again this statement could be misleading, if modeling approaches neglect cost factors that in reality could significantly increase the macro-economic costs. This has to be mentioned here. E.g. write "and estimated macro-economic costs..." and in the next sentence: "Unresolved issues which could increase macro-economic costs and which are not adequately considered in today's integrated assessment models remain for a future worldwide expansion of nuclear energy"	Taken into account - the text on nuclear has been considerably revised. The scenario discussion has been deleted.
23496	SPM	16	3	16	5	But do these scenarios include increased demand for bio-fuels which might compete with re/afforestation targets?	Many integrated assessment models include an endogenous land-use model that explicitly represents compitition over land and the trade-offs between bioenergy prduction and re-/afforestation.
30422	SPM	16	3	16	3	This is a requirement of the model rather than a fact/prediction of the future.	Accepted. The statement has been rewritten.
33595	SPM	16	3	16	5	We think this paragraph is better placed under section SPM.4.2.3.	Accepted and paragraph moved.
33596	SPM	16	3	16	5	We propose to rephrase to: "At substantial rates of afforestation and reforestation, the land use sector may become a carbon sink by mid-century. The majority of transformation pathways make this assumption. Many drivers exist however (such as population growth, productivity losses - erosion, new diseases -, growing scarcity of nutrients, growing per capita use of biomass), that could jeopardize the realisation of this assumption and hence limit the necessary negative emissions to BECCS. [6.3, 11.9]".	Accepted. The statement has been rewritten to be consistent with the underlying chapters.
34706	SPM	16	3	16	5	Halting deforestation as late as mid-century doesn't sound transformational, but business as usual. What explains such a late date, and how representative is this for the underlying scenarios?	Statement has been rewritten.
26732	SPM	16	3	16	6	Suggest to refer to “Land use and land use change” instead of “Land use” since the reductions described only refer to changes in land use.	Accepted and used clearer and more consistent terminology.
38954	SPM	16	3	16	5	Please define "transformation pathways" somewhere	Accepted and transformation pathway included as specific entry in glossary.
29072	SPM	16	3	16	10	Is this realistic? Please state problems associated with halting deforestation. Really useful for policy makers to have more infromation about this.	Noted. This development is related to assumptions about increasing agricultural productivity, increasing affluence and slowing population growth which reduces pressure on land.
26035	SPM	16	31	17	2	"Unresolved issues remain for a future worldwide expansion of nuclear energy. The related barriers include operational safety, proliferation risks, waste management and the economics of power plants." RECOMMEND: "Public acceptance of nuclear power is affected by perceived concerns relating to safety, waste management and proliferation. " JUSTIFICATION: The expression "Unresolved issues remain for a future worldwide expansion of..." could be written for other generation technologies, but has not been. For example, in the following section on renewables there is no reference to the unresolved issues of intermittency. Nuclear energy, supplying 13% of global electricity and in existance for over 50 years is a more proven technology than many other low carbon options.	Taken into account - the part "Unresolved issues remain for a future worldwide expansion of.." has been deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28549	SPM	16	31	17	2	Among these "unresolved issues" are risks of nuclear accidents (which are played down by calling this an issue) and the lack of permanent storage depots. The word "worldwide" has to be deleted, because it suggests an intention for large scale expansion which does not exist. Please change to "Unresolved issues remain for a continuation or expansion of nuclear energy as considerable risks exist at all stages (extraction, use and waste management)."	Taken into account - the text on nuclear has been considerably revised. The risks and related barriers are now pronounced.
40837	SPM	16	39	16	40	Please connect hidden cost with policy and discuss in chapt.15.	Rejected - there is no line 39 and 40 on page 16.
26470	SPM	16	4	16	5	To make this paragraph clearer, suggest the addition of "global" before "land" and "net" before "carbon" such that the sentence reads: Many scenarios focus on afforestation and reforestation, in which case the global land use sector can become a net carbon sink by mid-century.	Accepted and sentence revised using clearer terminology.
31335	SPM	16	6			This is a farily complicated figure. Would it be possible to clarify what is meant in the Y-axis? - for instance to absolute values in CO2-eq? A very illustrative figure is TS 17, which is easy to grasp. Replace?	Accepted, figure has been fully revised.
25837	SPM	16	6			Instead of repeating the same information for the different sectors on the horizontal axes I suggest to include a legend explaining the colour coding.	Accepted, figure has been fully revised.
26733	SPM	16	6			Suggest using percent in the figure instead of “fraction of”.	Noted, figure has been fully revised.
38955	SPM	16	6			It woud be helpful to clarify what the "N" values along the x-axis mean in Figure SPM.11.	Accepted, figure has been fully revised.
31336	SPM	16	7			Please check for consistency: in the figure it seems like land use sector will increase as a sink towards 2100 in both the 450 and 550 ppm scenario even with a significant deployment of bioenergy to displace fossil emissions in other sectors. However, chapter 11 leaves doubt whether bioenergy systems mitigate climate change or not? (Chapter 11, Page 90 line 37)	Noted. Integrated models moslty include land models to capture these effects. However, there is no consensus in hte literature to which extent negative emissions can be achieved. Negative emissions shown in the land use sector follow from re- and afforestation; negative emissions from bioenergy with carbon capture and storage is accounted for in the energy supply sector while the corresponding land emissions from bioenergy production are accounted for in the land-use sector.
31337	SPM	16	7			Please consider including the top panel of figure TS17 in the SPM. This will illustrate the SPM.11 figure better.	Accepted, figure has been fully revised.
33598	SPM	16	7	16	10	If our suggestion for SPM.11 is followed, we suggest to add to the caption: "All outcomes are based on between 6 and 14 models.".	Noted, figure has been fully revised.
29073	SPM	16	7			These graphs would be more accessible to non-analysts if they showed absolute emissions rather than percentage of 2010 emissions.	Accepted, figure has been fully revised.
31338	SPM	16	12			We propose one additional finding point in bold related to the potential for increase deployment of renewable energy. The SRREN could also give valuable information about this. Furthemore we feel that it gives a better flow in this section to start with the findings related to reneable energy, which we believe may give the most signficant contribution in the long-term reduction of GHG emissions related to energy supply.	Taken into account - RE now are at the beginning. Space constraints however do not allow for a detailed discussion of the RE potentials. This has been done already in the SRREN and can be found there.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28533	SPM	16	6			Labeling of x-axis must be improved, or - better - be removed and given as a legend referring to the colors of the boxes. What does "N=?" mean (number of scenarios?)? This information should be less prominent. The red line at y=1 is obvious and should be removed or at least be colored black. It would be better to use percentages than fractions. Is it CO2 or CO2e? Whiskers and median should be colored black. Vertical lines separating the different years could be added. How can fractions be negative (and smaller than -1?). Caption should include complete information on the graphs.	Accepted, figure has been fully revised.
24014	SPM	16	28	16	29	SPM.4.2.1 Energy supply. 'Nuclear is a mitigation option can provide carbon free electricity at the plant site and close to that on a life-cycle basis (robust evidence, high agreement)'. Question: Taking into consideration the several unresolved issues that remain for a future worldwide expansion of nuclear energy, would you recommend such a mitigation option?	Taken into account - the barriers to a future expansion of nuclear usage are shown in a more prominent way in the new version. The mandate of the IPCC, however, does not allow to give a normative recommendation in favour or against any of the mitigation options.
29074	SPM	16	11			It would be useful to include in this section some information on mitigation options for HFCs and international bunkers.	Accepted, HFCs are discussed in context of industry sector section.
29318	SPM	16				The energy section of the SPM does not accurately reflect the challenge of decarbonizing the energy sector. In particular, there should be a distinction between long- and short-term mitigation options. Natural gas conversion can only be thought of as an intermediate mitigation step (or "bridge fuel"). In the long-term, natural gas would need to phased out to achieve climate stabilization goals. Citation: Levi, M. "Climate consequences of natural gas as a bridge fuel." Climatic Change. January 2013.	Taken into account - the intermediate role of gas now is pronounced
28550	SPM	16				Given the high mitigation potential of RE this technical option and the recent developments (also shown in IPCC SRREN) should be highlighted more prominently in this chapter. Please start the chapter with RE technologies as mitigation option and then continue with fossil and nuclear technologies. Please cite SRREN here: RE play a major role.	Accepted - text now starts with RE.
28551	SPM	16				The field of action to link power generation and demand in order to integrate fluctuating renewable energies should be mentioned. Creating flexible energy systems and in the long run power storages is a vital step to decarbonising the energy sector. This aspect of systems integration is discussed in chapter 7, section 7.6.1, p 31: "Reducing GHG emissions from the electric power sector will require infrastructure investments and changes in the operations of power systems. Studies of high variable RE penetration scenarios and the broader literature suggest that integrating significant GHG mitigation technology is technically feasible." (text shortened)	Taken into account - although space constraints do not allow for a detailed discussion of the intermittency issue, the integration of RE into future energy systems now is discussed.
28552	SPM	16				The order of listing of mitigation options in the energy sector is somewhat misleading: One may read NGCC as the most important technology. However, NGCC is associated with higher emissions than other techniques (see e.g. fig 7.9 in WG III AR5). The same applies for CCS. The order of technologies in section 4.2.1 differs from the order of technologies in AR 5 Sect 7.5.1. In Chap 7.8.1 AR 5 it is stated that "..., average emissions from power generation need to be reduced to below 100 gCO2e per kWh by 2050 to meet a 2°C mitigation goal (IEA, 2010b) and would eventually need to go to or below zero (chapter 6 and 7.11), so that the employment of technologies with even lower emissions is called for if these goals are to be achieved." In this regard, NGCC and CCS can hardly be seen as an appropriate mitigation technology as they feature specific emissions beyond 100g per kWh. At least, the ordering of technologies should reflect the specific mitigation potential. At least follow the order of technologies as in AR 5 section 7.5.1.	Accepted - the text now starts with RE. Fugitive emissions of natural gas are discussed. CCS is placed at the end of the list.
28530	SPM	16	0			Start the section with Renewable energy technologies.	Accepted. RE are now discussed as the first specific mitigation option in energy supply.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28531	SPM	16	0			The role of renewable energies should be much more brought forward. Renewable energies have proven feasibility and as of today at mostly lower costs than CCS (see figure 7.10.) Also example of the energy transition in Germany with a substantial increase of renewables in power generation in comparatively few years.	Taken into account. The recent development of RE have been pronounced by moving them to the first specific supply sude options discussed. Specific lessons learnt from Germany, however, cannot be brought to the SPM level.
28532	SPM	16	0			The vital importance of reducing emissions in the energy sector should be brought forward. Add an introductory sentence "The energy sector is the largest and fastest growing contributor to greenhouse gas emissions." (as in the Executive Summary of chapter 7).	Accepted - text revised.
26919	SPM	16	12			The energy section of the SPM fails to discuss the energy technology pathways necessary to achieve various climate stabilization targets. There is one passage in the SPM that addresses vaguely what kind of transformation in the energy sector is necessary to combat climate change (page 15, lines 7-11, SPM), but there are two problems with this passage. One, it is separate from the energy section, so people reading the energy section may miss this passage. Second, it does not say to what extent decarbonization in the electricity sector is required. These points are crucial to make given that the energy section points out that natural gas promises GHG emissions savings by substituting for coal, but fails to point out that natural gas displacing coal would not be enough to hit stringent climate change targets, e.g. 450 ppm, as it is a short- or medium-term mitigation option but not a long-term one in the context of a 450 ppm stabilization target.	Taken into account - the role of gas as a bridging technology now is pronounced.
26921	SPM	16	12			The SPM refers to CCS far too sanguinely. CCS is an immature technology that has yet to be demonstrated as commercially viable, let alone effectively demonstrated at a commercial scale. Yet it is the second highest mitigation option discussed in the SPM section on Energy, which is meant to be a long-term mitigation option. Given its immaturity and the numerable challenges facing the yet-to-be-proven technology, CCS should be moved lower in the Energy chapter.	Accepted - the oder of mitigation technolgies has been changed accordingly.
28535	SPM	16	12	17	28	Please move paragraphs on RE to the beginning of the section, as these is the most important option for low carbon energy supply.	Accepted - text revised.
20025	SPM	16	17		18	Replace the last sentence of this block with "More modest emissions reductions are achievable by applying best available coal technologies or less advanced gas power plants." of chapter 7 (p.4 line30-32) to be more clear.	Taken into account - comment is obsolete as the text has been revised considerably.
23114	SPM	16	23	16	23	Add after "facility": "due to high costs and public resistance"	Taken into account - costs and concerns now are discussed explicitly.
20997	SPM	16	28			First, the sentence is not complete ("is a .. option to / that ..." or "as a .. option"), second, there is no carbon free electricity from nuclear power. The facilities need to be built, maintenanced, the waste needs to be stored and / or recycled, all of which have associated emissions. The whole system was only carbon free if all energy needed and used by this system was created from nuclear facilities. This is, up to now, science fiction. Else: provide the example / study.	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore.
32263	SPM	16	28	16	31	Nuclear does play an important role to decarbonize electricity, however, thourought the WGIII reports the range of nuclear capacity assumed in the future is not clearly explained. Since the costs can change dramatically depend on the assumed capacity of nuclear discussion need to be presented on the assumptions.	Taken into account - various mitigation paths are now discussed in chapter 7.11. Space constraints in the SPM however do not allow for an extended discussion of the role of different mitigation options beyond the discussion given in the (new) SPM 3 section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34707	SPM	16				The order in which mitigation options in this section are presented seems biased. Renewables come only after fuel switch (gas), CCS and nuclear. This doesn't seem justified, in light of the developments since AR4, and the broader "sustainability development approach" the WG III report is supposed to contain. Since AR4 the global deployment and cost reductions of renewables have been faster than anticipated, and they represent an inspiring story at a time when international climate policy has been stalling. In contrast, the developments for CCS and nuclear have faced significant challenges since AR4. So I would strongly argue in favor of starting the energy supply section with renewables. The current order reflects the old march order, where renewables were seen as "nice to have" but not a priority. That should have changed by now.	Accepted - the text now starts with RE. Fugitive emissions of natural gas are discussed. CCS is placed at the end of the list.
32377	SPM	16	7	16	7	Figure SPM.11: Adding a legend would help to clean up the rather cluttered x-axes.	Accepted, figure has been fully revised.
26287	SPM	16	5	16	6	If I understand correctly, 1 is the same level of emissions of 2010; a fraction less than 1 implies a net reduction of emissions. A fraction less than zero, a net sink of CO2. In this context, I don't understand what can mean that the energy supply sector is deemed to be less than zero fraction in the 2100 scenarios for both 450 and 550 stabilisation levels.	Noted. Figure has been reworked to be clearer. Energy supply sector can become negative if the availabilty of bioenergy with CCS to achieve negative emissions is assumed.
23038	SPM	16	13	16	16	Natural Gas Comnined Ctcle(NGCC) power plants also release some amounts of GHGs despite their relative efficiencies. Hence emphasis should be given to Renewable Energy Technologies	Accepted - the fugitive emissions of gas usage now are considered. The role of RE is pronounced.
26288	SPM	16	28	16	29	The sentence is not well read: "Nuclear is a mitigation option can provide (…)". Maybe it is: "Nuclear is a mitigation option and can provide (…)" or "Nuclear, as a mitigation option, can provide (…)"	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore.
22522	SPM	16	28	20	23	Nuclear energy and Bioenergy, beeing address under different sections (Nuclear page 16 line 20 onwards, Bioenergy page 20 line 23 onwards), positive and negative considerations are not well balanced, with a more positive approach on Nuclear and a negative on Bioenergy. These messages are dangerously undermining Bioenergy and encouraging Nuclear.	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore. The risks are now pronounced.
40838	SPM	16				Mitigation options are given in the order of NGCC, CHP, CCS, nuclear power and renewable energy, but the significance of this order of discussion is unclear. Please reorder NGCC, CHP, renewable energy, nuclear power and CCS.	Accepted - the text now starts with RE. Fugitive emissions of natural gas are discussed. CCS is placed at the end of the list.
20752	SPM	16	28	16	29	pls rewrite: it seems some words are missing	Taken into account - the text on nuclear has been considerably revised. The wording "carbon free" is not used anymore. The risks are now pronounced.
41007	SPM	16	3	16	5	Missing Agriculture and Livestock Assessments on two cross sectoral areas agriculture and livestock in regard to mitigation potentials are missing.	Noted. AFOLU related mitigation potentials are discussed in detail in related AFOLU section.
41008	SPM	16	5	16	6	practical constraint of RE It's also obvious that RE is location-based option although assessments were carried out on large-scale biomass trade but appears unsustainable.	Rejected. Regional RE potentials are the basis for the scenarios analyzed in AR5.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35204	SPM	16	11	21	39	The SPM lacks discussion on the barriers to large-scale application of many key low carbon technologies (e.g. risks of the technology itself, high cost, and barriers to technology transfer). Some conclusions in the SPM are not consistent with that in each chapter. For instances: 1) On page 17 line 5-6, it is said that “The global technical potential of all available RE does not pose a practical constraint on their contribution to mitigate climate change during this century”, which can be misleading since the real application potential of RE is constrained by factors including cost. In addition, according to Chapter 7 page 24 lines 15-17, some RE may even have very high cost. It is not appropriate to draw such a conclusion without further elaboration on cost and technical feasibility. 2) On page 19 lines 23-32, the description on barriers is unbalanced. Many barriers, including high investment cost and lack of financial means to increase energy efficiency, are mentioned in Chapter 10 page 6 lines 1-7, but not reflected in the SPM at all. Additionally, emission reductions in the industrial sector face many other challenges; especially barriers to technology transfer which is one of the major obstacles for developing countries to increase their mitigation ambition level. Such barriers are not mentioned either here or in Chapter 10. It is suggested to provide an overview of all barriers and highlight the major ones to ensure the balance and comprehensiveness of conclusions presented in the SPM.	1) Accepted - text has been revised to clearer outline the role of cost as a barrier to more extensive deployment; 2) Noted - range of barriers in the industry sector, in particular in relation to initial investment costs, has been included.
38957	SPM	16	12	17	28	We believe there is an omission in this section, namely, the failure to treat the implications on unconventional oil and gas. The most significant current trend in the energy supply sector is the development of horizontal drilling and hydraulic fracturing (or "fracking"). This is a transformative change which is inadequately handled in the underlying chapter 7, but is not covered in the SPM. It is essential this be redressed.	Accepted - the fugitive emissions of gas usage now are considered.
29746	SPM	16	19	16	27	This part is a brief summary about CCS. The extra energy demand of CCS, in terms of %, and costs of CCS shall be added here.	Accepted - their increased operational costs now are discussed.
25141	SPM	17				It is important to indicate to the reader that the costs depicted in this chart are not static. A companion chart showing reasonable estimates at a future date, for example 2030 or 2050, based on material from SRREN and elsewhere, should be added. Otherwise readers may be led into thinking that the differential between nuclear and solar PV, for example, will persist indefinitely. And actually, the numbers for both even at the present are debatable, but that is not something to resolve here.	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.
26163	SPM	17				Nuclear doesn't have a sign for Q42012.	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.
25643	SPM	17				The estimated cost for CCS in this figure should be revised to show the range of possible CCS cost because CCS cost depends on a number of conditions such as concentration of CO2 in the exhaust gases, capture technology, access to storage site, storage potential, and CO2 monitoring, as described in (Finkenrath, 2011, page7), (Rubin, 2007, page4447, Table3), and (Lohwasser, 2012, Abstract). These literatures are listed in the No12 line of this table. In addition, the estimated cost for onshore wind in this figure should be revised to extend the range to the estimated cost of 180US$/MWh, that is assessed by verification committee for generation cost of Japanese government in December 2011.	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.
34710	SPM	17				The source for the LCOE of nuclear is IEA report from 2010. That's pre-Fukushima. After Fukushima extra risk control measures have increased costs of nuclear. In this light, the data use here and in the underlying chapter 7 is outdated and the low estimations of the range seem too low. The U.S. Energy Information Administration estimates in its Annual Energy Outlook 2012 the LCOE for advanced nuclear in the US to be 111 $ / MWh. That's a national assessment, and the discount rates might not be comparable, but it's indicative.	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38962	SPM	17				These technologies all seem to be related specifically to electricity generation. Either mention this constraint or add liquid fuels (and others?). Also not clear why this figure is used here when it includes nuclear, in the middle of a discussion on Renewable energy.	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.
28570	SPM	17				Abbreviations on y-axis are not explained. What does "STEG", "CCS IGCC", "PV-c-Si" and "CCS Natural Gas CCGT" stand for?	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.
28571	SPM	17				Clarify what "projected costs" refer to in regard to nuclear. In line with "onshore Wind" and other shown technologies, the currently running different generations of technology of nuclear should be included in the horizontal bar in order to make the elements on the graph comparable.	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.
28572	SPM	17				For nuclear and CCS, ranges of costs should be displayed to reflect the lack of certainty of projected costs.	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.
20827	SPM	17	1	17	3	Seeing "Figure SPM.12.", it is confirmed that the nuclear cost is not higher than other sources. We should delete "the economics of power plants" from the barriers of nuclear energy.	Accepted - "issues related to the economics of power plants" were deleted.
25597	SPM	17	1	17	3	Delete "economics" from this sentence as the figrure SPM.12. shows nuclear still has competitiveness.	Accepted - "issues related to the economics of power plants" were deleted.
28553	SPM	17	1	17	4	The mining for Uranium is accompanied by significant social and environmental costs. Shouldn't this be discussed as an important associated effect?	Rejected - although uranium mininig is a concern related to nuclear energy usage the literature on this issue only shows a low agreement.
29652	SPM	17	10			The point cost estimates of CCS presented in this graph should be revised, as they are based on a single study from a self-proclaimed advocacy organization (from the Global CCS Institute's "About" page: "The Institute advocates for CCS as one of the options required to reduce greenhouse gas emissions,..."). Using a reference from such an organization is not acceptable for the IPCC and would cast significant doubt on the information presented in this figure and beyond. If a peer-reviewed estimate cannot be found, CCS should not be included in this figure, though an explanation for its absence may be included in the legend. Further, the complete lack of commercial scale CCS projects makes this low point estimate for CCS highly suspect. While costs will surely come down in the future, they have not been demonstrated at this level. A potentially useful study to consider for citation would be: "Cost and Performance of PC and IGCC Plants for a Range of Carbon Dioxide Capture." U.S. National Energy Technology Laboratory. 27 May 2011.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
29653	SPM	17	10			This figure only indicates costs and thus has no direct link to climate change or climate targets. Either instead or in addition, a more important figure would compare the life cycle GHG emissions of energy technologies (including both low-carbon and fossil fuel technologies), or perhaps depict potential energy pathways that enable meeting emissions targets. Such figures would better contextualize the fundamental challenge facing the energy sector in the face of climate change, and would be of more utility to policy makers evaluating their choices with respect to the energy sector. If this figure remains, it should also include LCOE of conventional/fossil fuel generation technologies for purposes of comparison and context.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26894	SPM	17	10			This figure should not be the only figure presented in the SPM from the Energy chapter, as it only portrays costs and has no direct link to climate change or climate targets. Rather, a better figure would be one comparing the life-cycle GHG emissions of energy technologies, or a figure depicting various energy pathways that are necessary to achieve a selection of climate targets. These two figures would be much more helpful in understanding the challenge facing the energy sector in addressing climate change, and would also be much more useful to governments grappling with how they can address climate change through their energy sectors.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
26895	SPM	17	10			If this figure is left in the SPM (see above comment), it must include the LCOE of conventional generation technologies, e.g. coal and gas without CCS. While I understand the idea behind having a graph devoted solely to low carbon technologies, the reality is the costs of these technologies must be contextualized by the cost of conventional generation in order to understand the challenge of deploying these low carbon technologies.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
26896	SPM	17	10			The point cost estimates of CCS presented in this graph should be revised, as they are based on a single study from an self-proclaimed advocacy organization (from the Global CCS Institute's "About" page: "The Institute advocates for CCS as one of the options required to reduce greenhouse gas emissions,..."). Using a reference from such an organization is not acceptable within the IPCC, even if it were one of many citations for a given point. Yet, egregiously, this study is the only study upon which the presented CCS cost estimates are based, which casts significant doubt on the validity of the CCS cost estimate. As such, a different reference for CCS cost estimates should be used; there are some pilot projects for CCS from which cost estimates can be derived, as well as other, peer-reviewed studies with cost estimates (see reference at end of comment). The fact that no commercial scale CCS projects are in operation despite numerous attempts makes the low point estimate (that is competitive even with onshore wind) for CCS highly suspect. A better study would be: "Cost and Performance of PC and IGCC Plants for a Range of Carbon Dioxide Capture." U.S. National Energy Technology Laboratory. 27 May 2011.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
29319	SPM	17	10			This figure has a number of questionable aspects. The CCS data points are not represented in a range (despite the large uncertainties in this technology, and the availability of cost data from operating pilot projects). The point cost estimates of CCS are also based on a single study from a self-proclaimed advocacy organization (from the Global CCS Institute's "About" page: "The Institute advocates for CCS as one of the options required to reduce greenhouse gas emissions,...").	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
29320	SPM	17	10			The figure should also include costs of conventional electricity options for comparison. Also, the choice of 4th quarter 2012 is probably an inappropriate basis, given the long assessment time.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
27047	SPM	17	10			This figure should provide a range rather than a point estimate for the cost of CCS (which would be consisten with every other technology cited in this figure). Furthermore, the particular cost estimates of CCS presented in this graph should be revised or removed, as they are based on a single study from an self-proclaimed advocacy organization (from the Global CCS Institute's "About" page: "The Institute advocates for CCS as one of the options required to reduce greenhouse gas emissions,..."). Using a reference from such an organization is not appropriate for the IPCC process. Furthermore, as this study is the only study upon which the presented CCS cost estimates are based, the advocacy nature of the cited organization casts significant doubt on the validity of the CCS cost estimate. As such, a different reference for CCS cost estimates should be used; if no such unbiased cost estimate can be found, CCS should not be included in the graph, and an explanation inserted in the legend explaining no acceptable cost estimate for commercial scale CCS could be found. One possible citation: "Cost and Performance of PC and IGCC Plants for a Range of Carbon Dioxide Capture." U.S. National Energy Technology Laboratory. 27 May 2011.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25015	SPM	17	10	17	11	Suggest the caption of this Figure and the text should explain clearly that some of the options shown compete with retail energy prices, not wholesale, so they can be cost-effective at much higher prices than large centralised generation options, which require transmission and distribution infrastructure, which adds significantly to delivered cost.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
28559	SPM	17	10			The figure might be interesting, but is not very useful in its current form. It is hard to read and too small, and the caption should be improved. Please explain levelised cost in $/MWh. What is the time considered, 2012 or 2009? And to which timeframe does the projection refer? What do the bars, the filled/empty triangles and squares mean? The percentages (in different colors)? The abbreviations at the y-axis (STEG, CCGT etc.?)	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
28560	SPM	17	10			There are very strong and relevant dynamics in the development of levelized cost of electricity, especially in the field of Renewable Energy. These should be captured in the SPM. Figure TS 20. right panel should be included into the SPM.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
21095	SPM	17	11			the carbon content per unit energy produced should be mentioned on the figure, not just the price	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26384	SPM	17	11	17	13	SPECIFIC COMMENT. I suggest to include fuel cells technology in Figure SPM.12. In particular I suggest to include: the Fuel Cells ENE-Farm LCOE data as provided by the Japan National Policy Unit (NPU) Energy and Environment Council's Cost Review Committee in "Cost Review Committee Report"; the Fuel Cells plant LCOE data (referred to the US context) as provided by OECD-IEA-NEA in "Projected Costs of Generating Electricity" (2010 Edition); the H2FC Powertrain LCOE 2017 data target as indicated in M.V. Romeri analyses. So, it is necessary to integrate consequently the text: "Figure SPM.12. Levelised cost in $/MWh of electricity for commercially available energy technologies as observed for the fourth quarter of 2012 (and for the second quarter of 2009). For nuclear, fuel cells, and CCS projected costs are shown [Figure 7.10]". REFERENCES. ENE-Farm LCOE, see: Japan National Policy Unit (NPU) Energy and Environment Council's Cost Review Committee, "Cost Review Committee Report" (コスト等検証委員会報告書 平成23年12月19日), Tokyo 2011 (p. 62), <http://web.archive.org/web/20130221042347/http://npu.go.jp/policy/ policy09/pdf/20111221/hokoku.pdf > or, "Electricity Generation Cost by Source" (主な電源の発電コスト) <http://web.archive.org/web/20130221042625/http://npu.go.jp/policy/policy09/pdf/20111221/hokoku_kosutohikaku.pdf >. Fuel Cells plant LCOE, see: OECD-IEA-NEA "Projected Costs of Generating Electricity", 2010 Edition, <http://www.oecdbookshop.org/oecd/display.asp?lang=EN&sf1=identifiers&st1=978-92-64-08430-8 > or <http://www.debateco.fr/sites/default/files/2010%20IEA%2BOECD%20on%20Costs%20 Electricity%20.pdf>. H2FC Powertrain LCOE, see M.V. Romeri analyses: "Considering Hydrogen Fuel Cells Powertrain as Power Generation Plant" presented at EVS25, 2010, Shenzhen, Guangdong, China, published in World Electric Vehicle Journal Volume 4 (2011), <http://www.evs24.org/wevajournal/php/download.php?f=vol4/WEVA4-4131.pdf >; "Hydrogen Fuel Cell Powertrain Levelized Cost of Electricity" presented at the 30th USAEE/IAEE North American Conference, 2011, Washington DC USA, published by USAEE & IAEE Research Paper Series, <http://ssrn.com/abstract=2006758>; "The Hydrogen Fuel Cell Vehicles Powertrain Roles in the Copenhagen Accord and Cancun Agreement Perspective" presented at 2011 Fuel Cell Seminar & Exposition, Orlando FL USA, and published by ECS The Electrochemical Society, ECS Transaction, Volume 42 < http://ecst.ecsdl.org/content/42/1/59.abstract >; "Consideration about the Hydrogen Fuel Cell Powertrain LCOE" presented at the 3rd IAEE Asian Conference, Kyoto, Japan, 2012, <http://eneken.ieej.or.jp/3rd_IAEE_Asia/pdf/paper/025p.pdf >; "Consideration about Hydrogen Fuel Cell Powertrain Levelized Cost of Electricity" presented at CARS 21 Public Hearing 2012, European Commission, DG Enterprise and Industry, Automotive Industry Unit. Brussels Belgium, <http://circa.europa.eu/Public/irc/enterprise/automotive/library?l=/cars_working_groups/cars_hearing_2012/romeri_cars21_defpdf/_EN_1.0_&a=d >.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
23582	SPM	17	12	17	13	The last sentence of the caption is strange and differs from the clear one in Figure 7,10 caption which reads "Source: For renewables and fossil fuels: Bloomberg New Energy Finance (2012); 18 for nuclear: IEA (2010c); for CCS: Global CCS Institute (2011)."	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
28561	SPM	17	13			Please add after "[Figure 7.10]": (calculations include investments, variable costs and costs for operation and maintenance)	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
21398	SPM	17	14	17	15	The phrase "Some tehcnologies are already economically competitive in various settings" is not always collect. Renewable energy technology itself might be getting affordable but it is now causing the higher energy prices in some countries (Germany, Spain etc.).	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21527	SPM	17	14	17	23	Is information available what the impact will be of continued learning curves. At what point in time may additional technologies become competitive?	Taken into account - comment is obsolete as the underlying sentence has been deleted.
34711	SPM	17	14	17	28	These paragraphs on renewables would benefit from some concrete figures that would help to understand the speed and scale of which the renewables growth (and cost reductions) have achieved in recent years. Chapter 6 provides examples.	Taken into account - comment is obsolete as the underlying sentence has been deleted.
34712	SPM	17	14	17	28	These paragraphs on renewables would benefit from some concrete figures that would help to understand the speed and scale of which the renewables growth (and cost reductions) have achieved in recent years. Chapter 6 provides examples.	Rejected - space constraints do not allow to go into such details at the level of the SPM.
39176	SPM	17	14	17	16	There is very robust evidence and high agreement that renewable technologies have advanced since AR4 and that some are economically competitive in various settings. Suggest reconsidering classification of this statement.	Accepted - the rating of the RE statement has been changed.
40839	SPM	17	14	17	23	Regarding renewable energies, it is misleading to describe that "some technologies are already economically competitive". While it is true that price of some modules are lowering, competitiveness of renewable energy should be calculated by considering such elements as i) cost for power system stabilization and ii) cost for load fluctuation.	Taken into account - comment is obsolete as the underlying sentence has been deleted.
28563	SPM	17	14	17	23	Please, indicate/quantify the price decrease in order to convey the magnitude of the price development.	Rejected - space constraints do not allow to go into such details at the level of the SPM.
28562	SPM	17	14	17	28	It comes with some surprise that wind power is hardly mentioned even though technology advancements (plant sizes, offshore, cost reductions) as well as market deployment has been substantial. This is deficit of AR 5 Chapt 7.5.3	Taken into account - comment is obsolete as the underlying paragraph has been deleted due to space constraints.
19752	SPM	17	14	17	18	It is worth to mentioning here that not only price of PV modules are declined, but also the profit of it sharply deteriorated. Many PV module manufactureres went buncrupt not only in developing world(Q-Cells) but in China (Suntec) also.	Taken into account - comment is obsolete as the underlying paragraph has been deleted due to space constraints.
25155	SPM	17	14	17	23	See Comment on Chapter 7 entitled: **PV cost data inadequate to support claims and inappropriate for policymaking (includes internal conflict and affects Technical Summary p32 and Summary for Policymakers pg 17)	Taken into account - comment is obsolete as the underlying paragraph has been deleted due to space constraints.
22447	SPM	17	2			Cost competitiveness of nuclear power varies by country, and thus "and the economics of power plants" should be deleted.	Accepted - "issues related to the economics of power plants" were deleted.
24392	SPM	17	20	17	20	You refer to CSP here but STEG in Figure SPM.12	Taken into account - comment is obsolete as the underlying paragraph has been deleted due to space constraints.
38961	SPM	17	21	17	21	"...CSP were built in a couple of countries." Do you really mean in only two (2)?	Taken into account - comment is obsolete as the underlying paragraph has been deleted due to space constraints.
31342	SPM	17	24	17	24	What is "market energy prices" - does it take into account direct and indirect subsidies (and taxes)? Would "current energy prices" be a better wording?	Taken into account - comment is obsolete as the underlying sentence has been deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31343	SPM	17	24	17	28	Some considerations as regards to possible limitations related to the availability of (mineral) resources, land-use issues and other environmental concerns might be included. The development of renewable energy can also have adverse effects on biodiversity.	Taken into account - comment is obsolete as the underlying sentence has been deleted.
30655	SPM	17	24		28	Suggest making this a full stand-alone paragraph with a bolded summary heading.	Taken into account - comment is obsolete as the underlying sentence has been deleted.
24468	SPM	17	24	17	28	I agree this desciption. It is very important.	Taken into account - although the discussion of the policy need has been transferred to the various technologies the content remained.
20879	SPM	17	24	17	27	Could you please add a sentence which can grasp the scale of indirect financial support?	Rejected - space constraints do not allow to go into such details at the level of the SPM.
25642	SPM	17	24	17	28	This part should explain that the need for system balancing caused by variable RE resources, as described in the section 7.6.1 (page 32, line 3). The higher planning reserve margin will result in more costly structure as a whole power system. This is because it is necessary to install additional equipments for power grid stabilization if variable power sources such as wind power or photovoltaic were installed into power grid, as described in (DeCarolis, 2006, page 395 and 403). <Reference> [1] J.F. DeCarolis and D.W. Keith (2006). The economics of large-scale wind power in a carbon constrained world, Energy Policy 34	Taken into account - space constraints do not allow to go into such details at the level of the SPM. Nevertheless, the integration issue itself now is mentioned.
21528	SPM	17	24	17	25	It is incorrect that certain Renewables can only come to market through support. Other mechanisms exist that can ensure market penetration, including renewable obligations or carbon pricing for instance through emission trading. If 'indirect financial support' refers to such types of examples please specify.	Accepted - text revised.
21529	SPM	17	24	17	28	To what extent would it be correct to state that also present Nuclear investment require government interventions for instance in the form of certain guaranteed minimum prices ?	Taken into account - comment is obsolete as the underlying sentence has been deleted.
22821	SPM	17	24		28	If you mention subsidies for RES it should be noted, that today in Europa no nuclear plants are built without government subsidies, the latest example is UK with a FIT floor price for nuclear (!): http://uk.reuters.com/article/2013/03/11/uk-edf-britain-idUKBRE92A01E20130311	Taken into account - comment is obsolete as the underlying sentence has been deleted.
22822	SPM	17	24		28	also the massive subsidies for fossil fuels should be mentioned, see e.g. IEA WEO 2012	Taken into account - comment is obsolete as the underlying sentence has been deleted.
24393	SPM	17	24	17	24	In stating that RE technologies are not cost-competitive in the energy market, you are ignoring the fact that fossil fuels still receive both overt and hidden subsidies. There are many studies on this, although the numbers they come up with vary quite widely. Also, in 2010 the U.S. National Academies published a report, Hidden Cost of Energy (http://www.nap.edu/catalog.php?record_id=12794), in which they concluded that today's energy system costs the U.S. $120 billion per year in hidden costs. The cost of carbon-free energy needs to be compared to the total cost of fossil fuel including the hidden costs.	Taken into account - comment is obsolete as the underlying sentence has been deleted.
23954	SPM	17	24	17	28	This paragraph should be rewritten, based on a fair comparison of costs of various technologies - taking into consideration the significant incentives, e.g. for exploration of fossil fuels, etc. following a life-cycle approach. Market prices also reflect the market conditions that might change rapidly and are therefore a poor basis for such a comparison.	Taken into account - comment is obsolete as the underlying sentence has been deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22446	SPM	17	24	17	25	It would be better to indicate the estimated volume of financial support for RE and CCS.	Rejected - space constraints do not allow to go into such details at the level of the SPM.
40840	SPM	17	24	17	28	This paragraph reasonably indicates the current stand point of RE and new technologies. Therefore, please maintain it.	Taken into account - although the paragraph has been deleted its content broadly has been conserved. The barriers and the need for support are now discussed directly where the technologies are discussed in the sector chapter part of the SPM.
28565	SPM	17	24	17	24	Please insert ‘partly due to the lack of internalization of external effects’	Taken into account - comment is obsolete as the underlying sentence has been deleted.
28564	SPM	17	24	17	25	Right now this sentence implies that the mitigation options are associated with additional costs in comparison to a Business-as-usual scenario. This is not necessarily true. The issue could also be framed as follows: Direct and indirect subsidies for fossil fuels need to be abolished and external costs of conventional energy conversion technologies need to be internalized.	Taken into account - comment is obsolete as the underlying sentence has been deleted.
28566	SPM	17	24	17	25	The sentence "As many RE technologies… market share." does not reflect the substantial progress RE have made in terms of competitiveness. Suggestion: Replace the sentence "A growing number of RE technologies have achieved a level of technical and economic maturity to enable deployment at significant scale, while others are less mature and not yet widely deployed." (as in Chapter 7, p24, l 15,16). "In cases where RE technologies are still not competitive, there is a need...further increase their market share and decrease their costs"	Accepted - text revised similar to the suggestion.
24061	SPM	17	24			Pleas add after 'As many RE technologies are still not competitive with market energy prices' "- partly due to lack of internalisation -"	Taken into account - comment is obsolete as the underlying sentence has been deleted.
26473	SPM	17	24	17	25	Is there anything the authors can add to this sentence that covers the role of the price of carbon?	Accepted - text revised accordingly.
25598	SPM	17	25	17	28	Keep this sentence as it shows reality.	Taken into account - although the paragraph has been deleted its content broadly has been conserved. The barriers are now discussed directly where the technologies are discussed in the sector chapter part of the SPM.
28567	SPM	17	25	17	27	Please delete the sentence on CCS, as this is not the subject of the para. The SPM is not balanced as it overemphasizes CCS.	Accepted - CCS discussion is deleted.
29076	SPM	17	27	17	27	"decreased efficiency" add "of the power plant". Otherwise confusing as to what decreases in efficiency.	Accepted - text revised.
29077	SPM	17	27	17	28	Please clarify if these barriers are for CCS or renewable technologies or both and what the barriers relate to - deployment?.	Taken into account - comment is obsolete as the underlying sentence has been deleted.
25269	SPM	17	28	17	28	change "option can provide" to "option that can provide"?	Rejected - comment seems to be misplaced.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20802	SPM	17	28	17	29	ADD. Please add a paragraph of "the renewable energy by subsidies"debates. In many countries, there are many heated debates over "the renewable energy by subsidies ". However, there are no paragraphs of these in this SPM. For example, there are many themes of energy cost-up by FIT(feed-in tariff), innovation barriers, associated back-up costs, etc. Please refer the following reference. <Reference> [1]Mitsutsune Yamaguchi et al. "Climate Change Mitigation A Balanced Approach to Climate Change". Springer. ISBN: 978-1-4471-4227-0 (Print) 978-1-4471-4228-7 (Online) . Please refer chapter 5 (cost of mitigation), and chapter 7(policies and measures).	Rejected - a detailed discussion of support schemes for specific mitigation options such as FIT for RE or the support provided to nuclear, e.g., in Great Britain cannot be carried out in the energy chapter part of the SPM - due to space constraints. Policy issues are to be discussed in those parts that are related to policies.
19976	SPM	17	3	17	4	The pledges of the Cancun Agreements represent a wide range from BAU emissions till emissions as low as possible consistent with 550 ppm CO2eq. I think it is not a robust statement that the Cancun Agreement is consistent with 550 ppm CO2eq, as this would imply that BAU emissions are consistent with 550 ppm CO2eq. In general I think it all depends on the assumptions made beyond 2020, to make a statement like this, and therefore I would avoid this in the TS	Taken into account - there is no discussion of Cancun Agreements in page 17 of the SPM.
19970	SPM	17	3	17	5	I am familiair with the work of AMPERE, and I have difficulties with this, as we compare to my knowledge the pledges with scenarios that assume also the pledges, so it becomes very obvious that scenarios are consistent. I think this is self-fulling prophecy, as I can also make scenarios assume the pledges, that lead to 650 ppm CO2eq. More fundamental I think if we want to address questions like are the pledges consistent with a certain concentration level, we need to move from the 2010 emissions to the emissions resulting from the pledges in 2020, and than assume a extrapolated emission trend, and look to which emission levels we are heading. This leads to temperature increases in the order of 3-4 degrees, as has been done by many authors in the literature (check Rogelj et al. in Nature; ERL etc.; and also the many UNEP gap reports, see also climateactiontracker.org).	Taken into account - there is no discussion of Cancun Agreements in page 17 of the SPM.
26735	SPM	17	30			Why is a message about a projected (highly uncertain) development derived from top down models highlighted as some sort of conclusion regarding transport? How probable is this kind of development especially in OECD countries? What about the ongoing trends towards a saturation in passenger road transport demand?	Accept, text has been reworded
28569	SPM	17	30	19	32	The focus is so far only on the CO2 emissions of aviation. A second perspective should be added including other climate effects of aircraft emissions (short lived tracers and contrails) which would be more evident using other metrics than GWP100. See also our comment on ch 8, p 21, line 10.	Limited space in SPM for Transport so many key issues cannot be included
26474	SPM	17	31			Suggest "in both OECD and non-OECD regions" is replaced with "globally". There is no need to split the world into two groups for the purposes of the SPM.	Accept
25416	SPM	17	33	18	2	"Reductions in future transport activities could result from improved IT communication, internet shopping, social networking etc. but are difficult to predict[8.3]." COMMENT: This sentence should be deleted. REASON: In [8.3] there is no description concerning IT communication, internet shopping, social networking, etc in a veiw point of future tranport activities reductions. Since there is no evidence and reference, this statement is not appropriate for SPM.	Has been redrafted

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32851	SPM	17	33	18	3	Bised statement suggesting favorable "Reductions in future transport activities could result from improved IT communication, internet shopping, social networking etc. but are difficult to predict…" Evidence cited in report is too limited to support claim. Current research is also too limited to support this claim. Suggest removing entire sentence or alternatively re-wording to: "CHANGES in future transport activities AND DEMAND MAY result from IT communication, internet shopping, social networking etc. but are difficult to predict IF THESE MAY PROVE ADVERSE OR BENEFICIAL TO EMISSION REDUCTIONS…"	Has been redrafted
20867	SPM	17	5	17	10	In order to introduce renewable energies, there are several problems to solve, such as high generation cost, influence to grids. These problems should be identified as well.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
25372	SPM	17	5	17	23	This part lacks good balance, listing only potential and decline in cost of RE. Issues caused by installing CCS in large amounts, such as measures taken to power system and securement of power source for adjustment should also be described.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints. Integration issues of RE now are discussed.
23497	SPM	17	5	17	5	Define "RE" here, not in line 14	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
31341	SPM	17	5	17	10	Please consider including some text about the variability in some renewable energy sources and the need to develop the energy systems in order to compensate for this variability. The global energy demand referred to in line 8 should also be specified (future?, which scenario?).	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints. Integration issues of RE now are discussed.
30654	SPM	17	5			RE should be spelled out here, not in the following paragraph.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
33602	SPM	17	5	17	6	We would suggest not to use abbreviations such as RE without introducing it first.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
30453	SPM	17	5	17	23	1) The two paragraphs (line 5-10 and line 14-23) cover the potential for renewable energy (RE) technologies in contributing to mitigate climate change. Some examples or guidelines, if available, for the share of RE in the total energy supply (according to the modelled mitigation pathways in accordance with the 450 ppm CO2eq goal) would be usefull. 2) Suggestion: Include the following information from chapter 7 (Energy Systems): According to a review of the energy scenario litterature, Fishedick et al. (2011) find that, while there is no obvious single dominant RE technology that is likely to be deployed at a global level, bioenergy, wind, and solar have become more commonly identified as the largest possible contributors by 2050 (section 7.5.3, page 25). 3) The two paragraphs contain key results and should be moved up first in the section (to page 16 line 13)	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21094	SPM	17	5	17	5	Renewable energy should be writen in extenso	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
25267	SPM	17	5	17	6	This sentence is obvious and can be found in all textbooks on renewable energy. - So suggest deletion	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
25268	SPM	17	5	17	6	The statement on renewable needs to be posed in a more positive tone with changed wordings	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
26136	SPM	17	5	17	5	The abbreviation RE is confusing and unnecessary and it is also only explained on line 14 when it is mentioned for the second time.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
38960	SPM	17	5	17	28	These two sections imply renewable technologies are ready for commercialization at a scale consistent with a massive global mitigation program. This presents an incomplete picture. While renewables are a critical part of an integrated mitigation approach, it must be emphasized that renewables alone, certainly at current levels of development, are not able to meet current or projected energy needs alone. Without affordable storage technologies, not currently available, solar and wind can not generate the base load power that is necessary and that is currently generated by coal and natural gas (and nuclear to a more modest extent) generation. Also the cost for solar power generation is still prohibitively expensive for mainstream applications in many parts of the world.	Accepted - the text has been revised by deleting the potential discussion, highlighting the costs and the integration needs.
32451	SPM	17	5	17	23	The truth that RE do affect the power system and have the cost problems should be mentioned here.	Accepted - the text has been revised by deleting the potential discussion, highlighting the costs and the integration needs.
28554	SPM	17	5			"RE" needs an explanation here (Renewable energies?).	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
28556	SPM	17	5			A definition of "technical potential" is needed here. The definition in the glossary mentions all other than technical considerations, including social, economic and/or environmental considerations. Does the statement still hold if such aspects are taken into account?	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
28555	SPM	17	5		10	"The global technical potential of all available RE does not pose a practical constraint…" Why only medium evidence? In the light of the following sentence it would be plausible to state high evidence.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
28557	SPM	17	5	17	6	For natural gas, nuclear, and CCS technologies a "significant reduction of carbon dioxide" is mentioned. For the sake of balance, please add for RE: "RE have the lowest carbon dioxide emissions of all the mentioned energy generation technologies."	Rejected - the statement does not necessarily hold true for all forms of RE (e.g. bioenergy) - at least from a life-cycle perspective.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28558	SPM	17	5	17	6	Please formulate the sentence positively, e.g. " The global technical potential for RE is substantially higher than the global energy demand. The global technical potential of all available RE does not pose a practical constraint on their potential to mitigate climate change during this century. Even in regions..." (and so on)	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
29075	SPM	17	5	17	5	Please expand "RE" to "renewable energy (RE)" as first time seen this abbreviation.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
25124	SPM	17	5	17	28	Here, technological potential of RE is discussed. It will become more balanced if physical and economic constraints are briefly added, such as trade-off with food security, limitation of areas, additional cost to explore full potentials of RE. Aren't there any literatures?	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
25154	SPM	17	5	17	13	See comment on 7.4.2 entitled: **Section 7.4.2, total global potential of renewable energy, open to critique for highlighting trivial data and overlooking relevant challenges. (affects the Summary for Policymakers, page 17, lines 5-13 and the Technical Summary, page 32, lines 33-36)	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
20878	SPM	17	7	17	8	Renewable energies by no means satisfy global energy demand practically. Therefore, I hope to delete this sentence.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
22445	SPM	17	7	17	10	Although technical potential or RE is substantially higher than global energy demand, feasibility of RE is uncertain due to socio-economic constraints (barriers). Thus, following sentence should be added: "However, feasibility of RE is limited due to several constraints"	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
31699	SPM	17				It seems excessively vague on the cost of renewables and policy: “some are already economic” then “many are still not competitive with market prices and there is a need for support” .	Taken into account - text revised.
28568	SPM	17	28	17	28	The TS p. 19, line 27 to 34 relates the near-term scale-up of low-carbon energy supply technologies to mitigation. This should be included in SPM.4.2.1	Rejected - space constraints do not allow to go into such details at the level of the SPM.
26490	SPM	17	28			…after "capacity building," indluce: "technical, vocational and managerial skills and in some cases public perception. A skills gap in renewable energy technologies is found in many counries hindering its deployment." Source: ILO and EU, Skills and Occupational Needs in Renewable Energy (2011); and ILO and CEDEFOP, Skills for Green Jobs A Global Review (2011);	Taken into account - comment is obsolete as the underlying sentence has been deleted.
20998	SPM	17				Please explain what is meant by "STEG - LFR" etc. As it is, the figure contains mostly information not readily accessible to the target readers and thus should either be deleted or revised.	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.
41047	SPM	17	1	17	3	Barriers related to nuclear power plants. Nuclear energy source requires excessive financial resources which is not attainable to developing countries.	Accepted - financial risks now are mentioned.
41049	SPM	17	24	17	25	Direct and indirect support for RE technology. Addressing competitiveness of RE economic viability is significantly driven by the financial support (incentives), therefore it is not sustainable, nor is it attainable to many developing countries.	Rejected - the statement is true independent of the capability of some countries to afford the support.
41048	SPM	17	7	17	8	Global technical potential of RE is higher than global energy demand. Supporting evidence need to be presented in paragraph of the SPM. It is an overstatement to say that technical potential for RE is substantially higher than global energy demand.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
32712	SPM	17	31	17	31	Instead of “… in both OECD and non-OECD…”, write: “… in all countries… ”.	Accept

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32379	SPM	17	11	17	13	Figure SPM.12: This figure provides a lot of information for an SPM figure. Unfortunately, many of the technologies are not know to us and thus the use of abbreviations without further explanation is not very useful. Please revise accordingly.	Taken into account - comment is obsolete as Figure SPM 12 has been deleted due to space constraints.
23039	SPM	17	5	17	6	The statement is true but the costs are prohibitive	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
32378	SPM	17	5	17	5	Please introduce full wording for RE.	Taken into account - comment is obsolete as the discussion of the RE potentials has been deleted due to space constraints.
32380	SPM	17	29	19	32	Please consider to include subheadings in section SPM.4.2.2, e.g."transport", "buildings", "energy efficiency", to provide a clearer structure.	Accept - a good suggestion
34543	SPM	17	31	17	33	The text of "top-down models, total passenger transport demand, (passenger km/yr), almost triples between 2010 until 2050 and freight movements (tonne km/yr) double [8.1, 8.9]." should be replaced by "top-down models, total passenger transport demand, (passenger km/yr), more than doubles between 2010 until 2050 and freight movements (tonne km/yr) increasing by around 80% [8.1, 8.9].". The reason is as follows: This conclusion seems to be extracted from TS.4.3 "Transport", however, the orignial text in TS.4.3 stating that "In Integrated Assessment Model (IAM) scenarios, total passenger transport demand (passenger km / year) more than doubles or even triples between 2010 until 2050 with freight demand (tonne km / year) growing by around 80% over the same period (medium confidence)...[8.1]". That is why this sentence neede to be amended. Moreover, it is noted that there is no evidence in Chapter 8 (either from 8.1 or 8.9) to support such a conclusion because it is not mentioned about the transport demand until 2050, so it is appreciated if further explaination can be provided. In fact, in the Executive Summary of Chapter 8 in Chapter 8, it is stated that "Based on continuing current rates of growth for passengers and freight, and without new GHG mitigation policies being implemented, emissions could double by 2035.", and "If no mitigation options are implemented, the transport sector's GHG emissions could double by 2035 at continued current rates of growth [FAQ 8.1]".	Reworded text
34544	SPM	17	33	17	33	After "double [8.1, 8.9].", the following is suggested to be added: "Compared with other energy consuming sectors, it has been accepted that transport proves difficult to decarbonize before 2070 [8.9.1], and transport-related CO2 emissions are difficult to mitigate since trade, economic development, etc. all rely on the transport sector [8.1.1]."	Limited space in the SPM does not allow for this detailed discussion. However, Figure SPM.11 provides an overview of the sectoral interdependencies and the distribution of efforts for decarbonizing the energy supply and energy demand sectors.
41009	SPM	17	4			There is no evidence that alternative medium could decarbonise transport sector.	Taken into account - comment seems to be misplaced.
41010	SPM	17	8			electricity, hydrogen or biofuel These entire alternative transport modes require sustainable primary resource to produce secondary carrier.	Rejected - comment seems to be misplaced.
29747	SPM	17		17		What does STEG mean in the figure above? What do the numbers, the signs mean in the figure? Needs more explanation to this Figure	Taken into account - comment is obsolete as the figure has been deleted due to space constraints.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40841	SPM	17				This section is focused on the transport and buildings sectors and little is written about industries. More discussions may be spent on the industry sector. In the AR4 report, the transport, buildings, industry, agriculture, land use and waste management sectors were all discussed, though its focus was relatively on transport and buildings sectors.	The different sectoral sections have been given more equal weighting in new draft.
35205	SPM	17	29			When addressing mitigation measures in energy end-use sectors, issues of lifestyle and consumption pattern should be discussed, as well as the distinction between developed and developing countries. It is suggested to add the following sentences, “Due to their different development stages, developed and developing countries face different challenges, thus need to adopt different mitigation strategies for addressing climate change. Developed countries should transform their high carbon infrastructure and promote the use of advanced low-carbon technologies in transport and building sectors. In the case of developing countries, since poverty eradication and human development are still their overwhelming priorities, rises in living standards and rapid urbanization are inevitable in the next few decades. Thus, urbanization should be well guided by climate friendly urban planning and a low carbon lifestyle should be achieved, in order to avoid repeating the same high-carbon pathway experienced by developed countries.”	Due to space limitations this comment cannot be accepted in full. But text has been reworded
31344	SPM	18	1	18	3	The relation between internet shopping and reduction in future transport activities does not sound very obvious and could be explained.	Taken into account - text reworded
21531	SPM	18	1	18	2	Isn’t spatial planning also part of this?	Accept- text has been redrafted
28573	SPM	18	1	18	1	Activities such as internet shopping may reduce individual traffic to shopping centers, etc. However, the apparent ease of such procurement of goods leads to a sharp increase in consumption/orders, which in turn causes a marked increase in freight transport, especially road freight. Since technical/construction improvements regarding efficiency/fuel consumption are not as easily applied to large vehicles as they are to small ones, internet shopping will likely increase CO2 even though it may restrict individual traffic. Furthermore, this claim is not discussed in 8.3. and no reference is given.	Accept- text has been redrafted
28574	SPM	18	1	18	1	Exchange "predict" with "project" as IPCC, this sounds like you are aiming at divination.	Accept
28575	SPM	18	1	18	1	Reductions of transport activity by internet shopping are scientifically not proven yet. In contrast, there are references, that internet shopping increases transport volumes (Hesse, Markus (2002): Shipping news: the implications of electronic commerce for logistics and freight transport; In: Resources, Conservation and Recycling 36 (2002) 211-240. http://www.sciencedirect.com/science/article/pii/S0921344902000836) "internet shopping" should therefore not be mentioned as an example in this case. The cited analysis by Edwards et al. 2010 assumes, that a personal shopping trip by private car is substituted by a van delivery. But this is not generally the case. Shopping is often integrated in complex journeys and doesn’t create additional trips necessarily. People often visit shops at first to check goods and then finally order by internet in order to save money. In addition, a third of all shippings are returned to the seller. This also worsens the environmental performance of e-commerce.	Accept - text may change
25417	SPM	18	10	18	11	"Electric, hydrogen and compressd natural gas-fueled light duty vehicles (LDVs) may all be adopted for short-range journeys in urban areas[8.3]" COMMENT: Fuel cell vehicles (FCVs) with a high-pressure tank can cruise much longer range (400-700km) than electric vehicle, so it should be separated. FCVs would rather be applied for long-range inter-city travel. It is not clear why high cost of hydrogen makes FCVs for short-range travel. Toyota Motors' FCV have a crusing distance of 700km or more due to 70MPa high-pressure tank. site: http://www.toyota-global.com/innovation/environmental_technology/fuelcell_vehicle/ Honda's FCV with 35MPa high-pressure tank have the performance about 240 miles driving range. site: http://world.honda.com/FCXClarity/specifications/index.html	Accept - details are in the Chapter 8
26736	SPM	18	10			Why are LNG vehicles seen as a near zero alternative? What about methane leakage?	Accepted. Text has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25838	SPM	18	11	18	13	Also mention averse effects on biodiversity, water and food availability (see Bioenergy Annex in Chapter 11).	Accept
33603	SPM	18	13	18	15	Please explain that IAM means "Integrated Assessment Modelling" before using the abbreviation.	Was defined earlier in text
21534	SPM	18	13	18	13	Define what type of uncertainty. Is it the sheer size or is it potential impacts on land use emissions or impact on food production? References to biofuel should be cautious about whether these actually reduce GHG and the multiple risks associated.	Accept
21535	SPM	18	13	18	15	If such a statement needs to be included, then indicate which ones are more progressive or conservative on the reduction potential. Otherwise delete.	Noted, but space in SPM is limited.
23955	SPM	18	13	18	15	It is suggested to provide some explanation on the reasons of the poor agreement.	Noted, but space in SPM is limited.
28582	SPM	18	13			Please explain abbreviation "IAM".	Editorial, is explained in preceding sections.
28583	SPM	18	13	18	13	We welcome that prominent place is given to constant travel time budget in Chapter 8, page 15 line 36 and page 16/1ff. The constant travel time budget has far reaching policy consequences so it should also been clearly mentioned in the SPM (e.g. on page 18, line 13 after ' … SPM 4.2.3' as basic prerequisite for decision makers who work on transport items	Accept
23769	SPM	18	14	18	28	RES should note be co-listed with CCS. RES except than many forms of bioenergy have fundamentally have no resource cost and are bound to be more economical than any non-RES.	Take into consideration
25418	SPM	18	16	18	18	"Reducing fuel consumption per kilometre of newly sold LDVs by 50% globally in 2030 is a feasible target technologically [8.3]." COMMENT: "a feasible target technologically" should be replaced with "an ambitious target". In the case that it would be described based on MIT paper, "by 50%" sould be replace with " by 50% maximum" and "in 2030" should be replace with "in around 2035". REASON: In chapter 8, this statement is referring GFEI, but GFEI does not discuss feasibility from technology perspectives. Only MIT paper (in SOD references) discusses feasibility. Therefore, if IPCC intends to keep the word "feasible", IPCC should indicate the reference to MIT after this statement. Even in that case, MIT conclude (as of 2008) that a 30-50% reduction in fuel consumption is feasible over the next 30 years.	Text revised
25271	SPM	18	16	18	17	" energy intensity" and "reducing fuel consumption" - Why two phrases are used	Accept
38965	SPM	18	16	18	18	Mentioning the technological feasibility of reaching a particular vehicle fuel economy (per-mile consumption) target in the SPM does not seem appropriate. It is suggested instead to state that significant fuel economy improvements are possible and may be an important part of mitigation approaches in the transport sector. However, mentioning a specific technology target, especially without any statement on its cost and potential, could be misinterpreted as a statement of the desirability of adopting such a target. The discussion of specific vehicle technology targets' ability to contribute to overall GHG emissions reductions should be left to the Transportation chapter.	Accepted. Text has been revised.
28584	SPM	18	16	18	16	"improving energy intensity": You should rather use the term "reducing energy intensity" because this is much better to understand. In other parts of the report this is already considered.	Accept
28585	SPM	18	17	18	22	Please explain abbreviations "LDV" and "HDV".	Accept
26475	SPM	18	17	18	18	For readability change the order of the last three words in the sentence such that it reads: "technologically feasible target".	Accept
25445	SPM	18	18	18	21	KEEP these sentences as it is important to indicate "eco-driving" and ”Intelligent transport system". (Many fuel-economy technologies are already commercially available and cost-18 effective for consumers with behavioural options such as “eco-driving” offering an additional 5-10% 19 fuel savings [8.3]. Improved traffic management, intelligent transport systems, plus better vehicle, 20 road and rail maintenance may achieve another 5-10% in fuel savings [8.3].	Accept but space limited for Transport section of SPM

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25419	SPM	18	18	18	21	"Many fuel-economy technologies are already commercially available and cost-effective for consumers with behavioural options such as “eco-driving” offering an additional 5-10% 19 fuel savings [8.3]. Improved traffic management, intelligent transport systems, plus better vehicle, road and rail maintenance may achieve another 5-10% in fuel savings [8.3]." COMMENT: These sentences should be kept. Above explanation is providing well underatanding that eco-driving and traffic management, etc (i.e. integrated approach) help to improve the gap between lavel and actual fuel economy.	Accept but space limited for Transport section of SPM
28586	SPM	18	19	18	19	Please, explain "eco-driving"	Noted, text has been revised.
33604	SPM	18	21	18	23	There is a study by CE Delft (Schroten, 2012), commissioned by the European Commission, that says that 30% efficiency improvement in HDVs can be achieved at sub-zero costs (Schroten, 2012. Marginal abatement cost curves for heavy duty vehicles. http://ec.europa.eu/clima/policies/transport/vehicles/heavy/docs/hdv_2012_co2_abatement_cost_curves_en.pdf)	Noted.
21536	SPM	18	21	18	23	HDV improvements can probably be greater than suggested by 2050. Recent analysis carried out for the European Commission for instance suggests improvements of more than 40 to 50% are possible with about 30% achievable cost effectively by 2030. These are not at high costs. Up to about 30% are achievable at negative cost to users and society.	Global data different from EC
23151	SPM	18	23			50% increases in aircraft efficiency and 60% for ships are not credible. These industries have worked very hard to improve efficiency because fuel costs are a major part of their expenses; further improvement will be incremental.	Based on literature covered in Section 8.6. Text has been revised.
28587	SPM	18	23	18	24	It is stated that "Aircraft could achieve efficiency improvement of 50% by 2050 compared to 2005 levels and ships around 60% per tonne kilometer by 2050." There is no reference in chapter 8.3 stating that shipping could reach this. Is this an estimation of a combination of various instruments? The SPM must only use information from the underlying report and not give unsourced estimations.	Based on literature covered in Section 8.6. Text has been revised.
28588	SPM	18	23	18	24	The base year for measuring the efficiency improvement for aircraft in 2050 is 2005. The base year for the navigation in 2050 is not mentioned. Is this also 2005?	Accepted, text has been reivsed.
24062	SPM	18	24			From comment No 33 we know that at least half of the rafiative forcing from aviation emissions could be reduced by elimating contrails and cirrus clouds. This should be also mentione in the SPM "Necessary to mention that for aviation warming of CO2 is less than half of full warming (radiative forcing). And that formation of contrails and cirrus clouds is independent from fuel (even if hydrogen) ... this could be avoided from other routing / altitudes and thus reduce the warming effect by more than 50%"	Accept- but Transport space very limited in SPM
31346	SPM	18	25	18	26	Please consider to remove the quotation marks.	Accept
33605	SPM	18	25	18	26	We don't know "shift and avoid options", so we propose to rephrase the bolded section to: "… behavioural change …".	Term used widely and in chapter
32098	SPM	18	25		32	The paragraph is inprecise; using too many semantically underdetermined terms.	Accepted. Text has been revised.
28589	SPM	18	25	18	25	For several years now, there has been hope for a shift in behavior more towards "eco" lifestyle in Western countries. Yet from observing energy consumption values it does appear as if simply appealing to people's conscience rather than enforcing it through financial means remains on a large scale utopian. Well-placed incentives are therefore needed.	Accept
28590	SPM	18	25	18	26	Well done, it is crucial to emphasize the ASI-concept (avoid/shift/improve) to politicians. Especially because its role has become more important compared to AR4.	Accept
24063	SPM	18	25	18	32	Necessary to mention contrails and cirrus clouds from aviation, see e.g. Lee http://elib.dlr.de/59672/1/scientdir.pdf - 4.9 % of radiation forcing from aviation	Limited space in SPM for Transport so many key issues cannot be included

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23498	SPM	18	25, 33	18		Many of the options listed relate to "infrastructure" improvements rather than technology alone (i.e. replace "technology" with "infrastructure"?)	Agreed, transport section has been revised to emphasize role of role of infrastructure and related investment requirements.
20092	SPM	18	26	18	27	Aircrafts contrails and contribution to the formation of cirrus clouds are not cited as example of potential short lived effects that should be mitigated. They however deserve consideration, since, in spite uncertainties they could multiply by a factor 2 to 4 the CO2-only effect of aviation. See IPSS special report on aviation (1999) or more recent Lee and al. (2011, 2012) papers	Limited space in SPM for Transport so many key issues cannot be included
28591	SPM	18	26	18	28	The sentence "Reducing transport-related short-lived climate forcers, including black carbon,… " does not seem to fit in this context. Please consider revising or delete.	Accept, sentence has been removed.
25537	SPM	18	27			Maybe include "short-term" between "rapid" and "mitigation", as the long-term effects in a decarbonizing world are much smaller and more uncertain.	Accept
38966	SPM	18	27	18	27	This is the first time black carbon is mentioned. BC does not seem to be included in the mitigation analyses cited earlier. This is potentially a very important climate forcer. However, there are major scientific uncertainties in forcing intensity and effectiveness of mitigation from many combustion sources given the fact that reflective particulates are often emitted along with the absorbing BC particles. The same can be said of tropospheric ozone and its precursors (NOx, CO and VOCs)	Accept
28592	SPM	18	28	18	28	Discuss more on warming effects of contrails and cirrus clouds, see chapter 8.	Limited space in SPM for Transport so many key issues cannot be included
28593	SPM	18	28	18	30	Please also name the impact of the mentioned measures on private transport by car to give a balanced picture. Furthermore, we were not able to find the given numbers in the 8.4, 8.7 or 8.8.	Has been revised
33606	SPM	18	33	18	38	There is no reference to a source.	Accepted. Added [9.3] after line 38
24131	SPM	18	33	18	38	Keep this para as it is very important to highlight the new construction.	Noted. No action required
38967	SPM	18	33	19	16	It would be helpful to add a statement on implication from knowledge/data gaps, including the need for promoting building science education	Rejected. Although relevant, the idea is implicit. Unfortunately the space allocated in the SPM does not allow such inclusion.
38968	SPM	18	33	19	16	There is a need to ensure consitency with actual contents presented in Chapter 9 and the TS. In addition, statements (in bold) contain "x"-fold to "y"-fold, when comparing or quantifying energy savings magnitudes, please ensure these are updated and are supported by reliable and representative studies.	Noted. The underlying figures are supported in the chapter text, not possible to elaborate in the SPM.
26476	SPM	18	37			This is a punctuation comment but included here as the missing comma between "development" and "policies" makes the sentence close to impossible to understand. Please insert the missing comma.	Accepted. Added comma before "policies"
40842	SPM	18	38	18	38	The end of the sentence needs a reference to corresponding chapters/sections in underlying report	Accepted. Added [9.3] after line 38
23499	SPM	18	39	18	43	But only if rebound can be avoided?	Rejected. Rebound effect addressed in SPM page 15 lines 23-29. Unfortunately the space allocated in the SPM does not allow such specific discussion
24132	SPM	18	39	18	43	Keep this para as it is very important to highlight the potential reduction of retrofitting.	Noted. No action required
38969	SPM	18	39	18	41	$100-400/m2 at best is a regional example and shouldn't be presented as universal average.	Rejected. There is no universal average for building retrofitting, but this wide range is applicable to a vast sample in the developed world.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28594	SPM	18	39	18	43	When discussing retrofitting buildings on page 18, lines 39ff it is worth to mention the jobs and regional values created when incentivising retrofitting.	Noted. Table 9.7 in main text addresses this point. SPM 4.3 is related to co-benefits and welfare gains. Unfortunately the space allocated in the SPM does not allow such specific discussion
21532	SPM	18	4	18	24	The key improvement needed is vehicle efficiency. This should come first before discussion of other measures such as different energy sources.	Noted. Revised text specifically addresses future possible energy efficiency and vehicle performance improvements.
34713	SPM	18	4	18	15	This para should bring in some findings from CH11, pages 80-81, about the true life-cycle emissions of biofuels, including emissions from indirect land-use change (ILUC). Assuming biofuels as carbon neutral can be dangerously misleading. It is not enough to discuss the sustainability of biomass only in the AFOLU section.	Transport chapter only "uses" the biofuels. Ch 11 produces them so test appears there
21096	SPM	18	4	18	32	The text should stress that to restrain growth or even to lower the demand in the transport sector would be one of the most powerful levers to transport mitigation. Low carbon alternatives are more difficult to developp on a large scale for transport than for other sectors, like power, so demand-side reductions are even more strategic for transport than in other sectors.	Accept - text has been redrafted
32097	SPM	18	4			"dramatic" is not precise	Accept - reworded
28576	SPM	18	4			Better us a more neutral expression than the word "dramatic".	Accept
28577	SPM	18	4			Please explain "mitigation potential", which is also displayed in Fig SPM.13	Rejected - depends on specific context and can not be provided as a generalized definition across sectors
28578	SPM	18	4	18	7	This is extremely important, as quite often the scenarios used to predict transport increase do not take into account any kind of interaction/correlation/interdependency with other markets.	Accept
28579	SPM	18	4	18	7	Well done, it is very important to stress that a "wide range" of measures is needed. Politicians tend to focus on technical measures (improve) as they are most "easy and quick" to achieve.	Accept
23152	SPM	18	40			Much effort has been spent on retrofitting. The low hanging fruit has been plucked. Further 50% improvements are not credible.	Rejected. There is still a significant stock not retrofitted. The chapter text substantiates these claims in more detail.
30424	SPM	18	42	18	43	This could be clearer	Noted. Unfortunately the space allocated in the SPM does not allow for long clarifications
24064	SPM	18	42			Please add after 'and so are often attractive from a purely economic point of view' 'e.g. a lot of new jobs'	Noted. Table 9.7 in main text addresses this point. SPM 4.3 is related to co-benefits and welfare gains. Unfortunately the space allocated in the SPM does not allow such specificities
31347	SPM	18	44	18	45	We think that the sentences in bold should be self-explainable, and propose that the following is added to " ..in the cost of several energy efficient technologies and systems in the building sector." Could you please quantify here the percentage of cost reduction?	Rejected. Unfortunately there is no single number nor space allocated in the SPM for this

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30656	SPM	18	44	18	45	The text says that there has been large improvements in the performance and cost of mitigation technologies for buildings. It would be valuable to mention whether this has had a quantified impact on the projected mitigation potential from buildings.	Rejected. Unfortunately there is no single number nor space allocated in the SPM for this
25644	SPM	18	44	18	48	This part should be kept in the final version report because heat pump technology has huge potential to reduce GHG emission from building sector, as described in (IEA/OECD, 2010, page6-64) and (IEA, 2011, page16). These literatures are listed in the No83 line of this table. In addition, this part should also explain that heat pump technology has huge potential to reduce GHG emission from industrial sectors, as described in the page40 of Technical Summary, (IEA/OECD, 2010, page65-83) and (UNIDO, page38, Fig14). <Reference> [1] IEA/OECD Heat Pump Centre (2010). Special Task: Case Studies. Available at: http://www.heatpumpcentre.org/en/projects/specialtasks/casestudies/Documents/Case%20Studies%20report.pdf [2] IEA (2011). Technology Roadmap: Energy-efficient Buildings: Heating and Cooling Equipment. Available at: http://www.iea.org/publications/freepublications/publication/buildings_roadmap.pdf [3] UNIDO. Renewable Energy in Industrial Applications: An assessment of the 2050 potential.	Noted. Unfortunately the space allocated in the SPM does not allow for long clarifications
40843	SPM	18	44	18	48	This paragraph briefly introduce the technological development and transfer. This is very important information and not to be deleted.	Noted. No action required
28595	SPM	18	44	18	48	Please clarify to what extent these cost decrease had been anticipated by the IAM models used for AR4. If these cost decreases had not been anticipated, please clarify to what extent the IAM models therefore project now lower mitigation costs in comparison to AR4 (other things being the same).	Rejected. Unfortunately there is not enough space in the SPM for this
29079	SPM	18	45	18	45	"and systems…" relating to? Buildings? Domestic buildings? Also confidence level would be useful.	Rejected. The text refers to a wide range of technologies, and also the examples highlight this. It is hard to qualify this in more detail with a space-constrained SPM and may not even be the best use of space.
24133	SPM	18	46	18	46	Insert "Energy Saving WIndows" after insulation materials because there is a great CO2 reduction opportunuty in windows. http://www.glassforeurope.com/images/cont/166_43490_file.pdf	Rejected. Unfortunately there is not enough space in the SPM for this level of detail
25270	SPM	18	5	18	5	What is "RE"? Define.	Accepted
26107	SPM	18	6	25		Please add text about the uncertanties of consumption-based GHG emissions.	Taken into account, but space limited
29078	SPM	18	6	18	16	"energy intensity" is this the right word? Energy efficiency better? Also confidence level would be useful. (repeated line 16)	Energy intensity used throughout chapter
31345	SPM	18	7	18	10	Please consider inserting "fossil" before "fuel carbon intensity" since biofuelsis an option without necessarily reducing the intensity.	Accept
20093	SPM	18	7	18	7	The list of options to mitigate transport emissions is fair. However, in the following lines, only biofuels are developed, while lowering demand activitiy is not developed/detailed further. This let the reader think it is a secondary option. Could it be developed ?	Accept- text has been revised
38964	SPM	18	7	18	10	It is important to note the importance of policy or economic signals in providing sustained incentives for innovation in advanced low carbon transport (and broadly all GHG mitigation) options.	Accept

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38963	SPM	18	7	18	9	This paragraph needs to place greater emphasis on the primary source of energy. Although it is noted that H2 and electricity can only yield zero C intensity if they are generated from renewable/nuclear sources, this is only marginally addressed ("Depending upon their source") and does not adequately convey the critical aspect of these carriers. Current language is well on the optimistic side of reality.	Accepted. Text has been revised.
28580	SPM	18	7	18	9	The possibility to generate gaseous and fluid fuels with regenerative electricity (power-to-gas and power-to-liquid) should also be regarded here and in 8.3. These "synthetic fuels" may play a major role in mid / long term and should be addressed in the report. This would also put "decarbonization" into other perspective, as synthetic fuels still contain carbon. Thus, the aim is to avoid "fossil carbon".	Limited space in SPM for Transport so many key issues cannot be included
20880	SPM	18	8	18	10	The concept of this sentence is based on assumption. How is the feasibility of such technological breakthroughs? Fuel carbon intensity close to zero cannot be actualized easily. Therefore, I hope to delete this sentence.	Accepted, text has been reivsed.
28581	SPM	18	8			It would be extremely difficult to reduce the CO2 intensity for biofuels close to zero. Even if iluc effects are excluded there would be a bottom of CO2 emissions due to harvesting and production. In addition the para should at least mention that there are differences between the three options and today we have more clarity compared to what is written in the text. The option do not stand equally side by side. Conversion rates, energy use for production differs from biofuel, electric mobility and hydrogen. This should not be ignored, in particular not in a summary for policymakers.	Accept
21533	SPM	18	9	18	9	Why mentioning specifically 2100 here? Is a similar transformation not possible at an earlier stage, e.g. 2050, or are breakthroughs really expected to take up to the end of the century?	Accepted, text has been reivsed.
24015	SPM	18	4	18	6	SPM.4.2.2 Energy end-use sectors. 'For the transport sector to decarbonise and achieve its mitigation potential will require dramatic changes and depend upon a wide range of technologies, strategies and policies linked to lowering fuel carbon intensity, improving vehicle energy intensity, developing infrastructure, encouraging modal shifts and lowering demand activity (robust evidence, high agreement).' Question: Which mode of transport (i.e., aviation, land transport, maritime, etc…) that is more suitable to decarbonise and achieve its mitigation potential?	All modes considered in Chapter
26491	SPM	18	42			...after "point of view." include: "In addition, retrofitting offers a significant potential for employment and income generation as well as social inclusion through upgrading and lowering families' cost of housing. In many countries it is this social gain that constitutes the primary motivation to engage in climate policies and can be used as a driver of mitigation efforts. Soure: ADEME: Markets, employment and energy issues in activities related to energy efficiency Improvement and Renewable Energy (2012).Cafe C.F. 2011: Brazil Low-income multi-family house with individual solar water heaters and gas back-up, Global Solar Thermal Energy council, 12 March.	Noted. But space constraints in SPM do not allow for such detailed clarifications.
23115	SPM	18	33	19	11	In AR4, the building sector was seen as the sector with the highest mitigation potential (see e.g. figure SPM.6 in AR4). This seems no longer to be the case.	Rejected. There is no figure similar to AR4 SPM 6, since in AR5 the approach is more systemic. Figure SPM 11 shows a wide range of possible future emissions in the Buildings Sector, signalling large mitigation potentials.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21000	SPM	18	33	18	35	Please clarify what is meant here. A ten-fold reduction in energy requirements means ten times less energy than needed today which imples an energy generation of 9 times that needed today …	Rejected. The 10-fold difference was observed in similar buildings in a given period. SPM summarizes what is presented in the main text, section 9.3.10. Unfortunately the SPM does not allow much space for clarifications.
32266	SPM	18	39	18	43	Energy efficiency improvement or decarbonation by installation of PV or other options of the housing/building sector is very important. The period of time need to recover the investment for insulation or other means depend on the amount of upfront investment and the average amount of energy the inhabitants were using. The lenth of time needed to cover the cost of investment needs to be discussed.	Noted. Addressed in 9.3.4.2. Thank you for pointing this. Reference [9.7.1.2] changed to [9.3.4]
32265	SPM	18	4	18	15	Hydrogen as well as electricity, is not a primary energy and its carbon intensity depends on how it is made. In the transport sector, a practical near term solution is to use hydrocarbon as the source of hydrogen. Then, the carbon intensity from LCA aspect need to be scrutinized before putting it as a decarbonizing solution.	Accept
20999	SPM	18	7	18	9	Please be careful - biofuels from biomass always emit carbon.	True but is sequestered by future biomass growth
34545	SPM	18	2	18	3	The text of "but are difficult to predict [8.3] as is the rate of improving mobility access in many developing countries [8.9]." should be superseded by "but are difficult to predict as oil and carbon prices are uncertain and the deployment rates of new and innovative technologies, infrastructure developments etc., reducing demand for journeys and shifting modes, are unknown[8.3], and there are many barriers to implementing a significantly lower carbon transport system in OECD countries since increasing mobility through LDVs, HDVs and aircraft has been happen during the past century of industrialization [8.8]". The reason is as follows: As it is clearly concluded in section 8.3 of chapter 8 that "Future GHG emissions are difficult to predict because oil and carbon prices are uncertain and the deployment rates of new and innovative options for vehicle designs, advanced biofuels, batteries, hydrogen fuel cells, infrastructure developments etc., are unknown (8.3).", and in FAQ 8.1 of chapter 8 it is described that the rapid increase of transport demand "is due to factors such as rapid growth in light-duty-vehicle (LDV) ownership and use in developing and emerging countries, but also of economic wealth all over the world". Furthermore, there is no evidence found in section 8.9 of chapter 8 claiming that "the rate of improving mobility access in many developing countries". Finally, in section 8.8 of chapter 8 it is stated that "barriers to deployment of technologies and practices exist as do opportunities for those nations (i.e. OECD countries) willing to make low carbon transport a priority", so it should address the increasing mobility through LDVs, HDVs and aircraft in OECD countries rather than in many developing countries.	Accept - though text may change and space is limited in the Transport section of the SPM
34546	SPM	18	24	18	24	The "...ships around 60% per tonne kilometre by 2050 [8.3]." should be replaced by "...ships potentially up to around 60% per tonne kilometre by 2050 through combined technical and operational measures [8.3].", because this is the correct meaning extracted from section 8.3.2.5 of Chapter 8.	Noted. However, due to space constraints, revised text does not give this detailed information for efficiency improvements in ships anymore. Related nformation is now collated in Figure TS.22 in underlying Technical Summary.
41011	SPM	18	13			What is IAM scenario?	Noted, text has been revised and clarified.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
41012	SPM	18	13			It is also evident that appropriate urban planning in developed countries can also reduce travel demand as important as their consumption pattern.	Accept
41013	SPM	18	41	18	42	While building in some parts of the world appear to have potential for retrofitting, buildings in developing world may not have the same potential.	Noted. Page 18 line 36 states clearly " mostly developed countries". No action needed.
29748	SPM	18	21	18	22	Please replace 'fuel consumption' with 'fuel consumption per kilometer'	Reject - no need to give units. Could be freight t k m for example
31281	SPM	19		21		Informations are missing in order to be usable by policymakers:-Where?- How to achieve this mitigation potential?- What social, economic consequences? what environmental impact ?	Rejected. Unfortunately due to space limitations the details are only presented in the main text.
29080	SPM	19	1	19	16	Standards and regulations are only effective if they can be properly enforced. This section's focus on behavioural barriers is welcome, but the SPM could usefully also highlight the enforcement challenge for many developing countries.	Rejected. Although Chapter 9 Executive Summary highlights "enforcement", in the SPM page 19 line 1 it is implicit in the wording "adoption"
31350	SPM	19	10	19	11	For clarification, we propose that the sentence is extended as follows: ".. may in practice lead to up to 9 times more energy use than…"	Noted. But seems that the sentence is clear.
30657	SPM	19	12	19	12	Suggest bolding this sentence, as this message can directly inform policymakers in their efforts to advance mitigation.	Accepted. Bold "Many policies have shown to reduce building energy use very cost-wise and environmentally effectively."
40845	SPM	19	12	19	16	The description on recognition of barrier is very important and, thus should be maintained.	Noted. No action required
29644	SPM	19	17	19	32	This section discussing Chapter 10 should include broad industry impacts to provide context for mitigation potential in the industrial sector. Some important points (from Ch. 10 Executive Summary): "Direct GHG emissions from industry and waste/wastewater represented 18.4% of total GHG emissions in 2010 (24% if AFOLU emissions are not included). More broadly, energy-related CO2 emissions from manufacturing were 38% of global CO2 emissions. There are significant opportunities to reduce these emissions, through energy efficiency, emissions efficiency, material efficiency, process efficiency, and demand reduction. With global primary material use projected to increase between 45-60% in the BAU case by 2050, absolute emissions reductions will require options beyond energy effiency such as material use efficiency, fuel and feedstock switching, waste recycling, and energy recovery. [10.3]"	Accepted. More general introduction for each sector regarding their contribution to CO2 emissions etc. has been included.
33607	SPM	19	17	19	22	There is no confidence statement.	Accepted, confidence statement has been added.
25016	SPM	19	17	19	32	The initial sentence sounds very pessimistic as it applies a very narrow focus. This makes the point that savings of 10 to 26% of energy per unit of product (this is clearer than 'energy intensity') is achievable but, as pointed out later (in lines 28-32), this is just one of a range of options to cut industrial energy use and emissions. It would be more useful to reverse the order and point out that there is a variety of ways to cut industrial emissions, with examples, then point out that one specific option alone offers 10-26% savings.	Accepted: order and context has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21399	SPM	19	17	19	19	Delete "demand reduction" from these sentences. Material use efficiencyand carbon intensity improvements depend on producers but demand reduction is out of control of the producers.	Rejected: it is true that demand reduction is out of direct control of producers, nevertheless a sustainable consumption strategy can lead to less product demand and corresponding less industry related GHG emissions. In this context it is a strategy which should be covered in the chapter.
21537	SPM	19	17	19	19	What is the evidence that limits of energy efficiency are being achieved by best practices? Are these really physical limits or limits of current technology? The large majority of installations still has substantial room for energy efficiency improvement compared to best in class (e.g. analysis of the European Commission in the context of benchmarking). Should CCS not be included as an option?	Taken into consideration: Statement has been revised. The argument is that in best practice we see today that limits to energy efficiency are achieved (technologies being implemented in practice approach more and more technical limits)
21539	SPM	19	17	19	32	Is there scope for product substitution, i.e. where certain industrial products are replaced by other ones which have a lower carbon footprint?	Noted.
34715	SPM	19	17	19	17	It is not clear what's the evidence for this claim. The underlying chapter (10) doesn't clarify.	Taken into account. In the FD of the main chapter particularly the statements about energy efficency potential have been sharpened.
38971	SPM	19	17	19	22	A lot of industry does not do all they can. The authors should take care to explain that cost-effectiveness is the real issue.	Taken into consideration when revising the text
38972	SPM	19	17	19	22	The current text attributes this excerpt to Sec 10.6, but it appears to be Sec 10.8. Please double-check and correct if needed.	Taken into consideration when revising the text
40846	SPM	19	17	19	22	The description of general problem of material efficiency improvement is not clear. Please add the following sentence from Chapt.10, "Improving material efficiency by integration of different industries is often limited by specific local conditions, infrastructure requirements (e.g. pipelines) and the complexity of multiple users." There are some technological problems to re-produce sufficiently high quality products with appropriate cost and energy, depending on materials, systems.	Taken into consideration when revising the text, but as space constraints are severe we might not be able to add such a long explanatory sentence
28596	SPM	19	17		19	What is the evidence of this statement? Is this true for all countries/regions? Efficiency improvements due to new efficient/best available technologies e.g. for electric motors, pumps, air conditioning systems, compressed air systems, heat recovery and utilization of waste heat are not at all mentioned in this paragraph. In general, it would be good to have under this point more concrete examples.	Taken into consideration when revising the text
20094	SPM	19	19	19	19	"demand reductions become increasingly important", again , this is cited, but should be developed : how, who would be concerned, with which consequences on economy and on well being ?	Rejected: SPM does not allow in-depth descriptions and impact analysis of single options
21538	SPM	19	19	19	22	Unclear upon what this statement is based on. At least section 10.6 is not on this topic. Furthermore would be good to indicate if this is based on bottom up analysis or top down modelling.	Taken into account: in the FD of the main chapter particularly the statements about energy efficency potential have been sharpened. Wrong reference to 10.6 has been changed.
25272	SPM	19	2	19	2	"Energy implications" - I presume it is mitigation implications	Noted. Yes, it is both mmitigation and savings

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28597	SPM	19	20			"is estimated to be roughly 25%" It would be useful to distinguish between OECD and non-OCED, if possible.	Rejected: In the SPM we do have severe space constraints and can not go into more details. Main chapter is discussing the differences between OECD and Non-OECD countries.
31351	SPM	19	23	19	32	Mitigation potentials on process emissions are not quantified in the summary. Please consider including this. When mitigation potential of emissions from energy use in the industry is quantified and process emissions not, one can get the impressions that the potential in the industry is lower than it really is.	Rejected: Process emissions are in general covered under the category "carbon intensity improvements" in the first pragraph (cf. line 18), but as all other categories besides energy efficiency we do not have the space in the SPM to discuss quantitative numbers for the potential in detail.
30658	SPM	19	23	19	24	Starting the sentence with "pace and extent" reads strangely. Perhaps it could be rewritten as "The pace and extent of the realisation of mitigation in industry faces significant limitations unless barriers 23 can be removed."	Taken into consideration when revising the text
33608	SPM	19	23	19	32	There are no confidence level and source reference.	Accepted. Text has been revised.
30454	SPM	19	23	19	24	It should be clarified that these efficiency improvement opportunities also apply to international aviation and shipping	Rejected: this paragraph is specifically about industry and does not cover transport issues.
38973	SPM	19	23	19	32	This paragraph lacks a reference to the chapter and section of the main report.	Accepted. Text has been revised.
28598	SPM	19	23	19	26	Again, the text is not balanced and CCS is overemphasized.	Taken into consideration when revising the text
28599	SPM	19	23	19	32	Please check the whole paragraph for language, especially the 2nd sentence.	Taken into consideration when revising the text
26477	SPM	19	23	19	32	Several typo/grammar type mistakes in this paragraph make it difficult to read, in particular in the second sentence.	Taken into consideration when revising the text
31352	SPM	19	24	19	26	The structure of this sentence is too complicated to understand, please clarify.	Taken into consideration when revising the text
23709	SPM	19	24	19	26	The subject is unclear. Comma after CCS? i.e. availability of alternative resources… is also relevant as…	Taken into consideration when revising the text
40847	SPM	19	24	19	25	”Low evidence” is not the term that is defined in the Guidance Note for Lead Authors of the IPCC AR5 on Consistent Treatment of Uncertainties, and should be corrected to ”limited evidence” in line with the corresponding statement in TS(TS page 42, lines 11-13)	Rejected: comment seems to belong to different part of SPM
23956	SPM	19	25			It is suggested to insert a comma after "CCS".	Taken into consideration when revising the text
40848	SPM	19	32	19	32	The end of the sentence needs a reference to corresponding chapters/sections in underlying report	Accepted. References were added in the revised version.
31353	SPM	19	33	19	41	Due to the importance of BECCS in the AR 5 draft, please consider to include BECCS in this paragraph-	Rejected. BECCS is discussed in other paragraphs.
26737	SPM	19	33	19	43	Being aware that IPCC introduced AFOLU many years ago this is not a sector according to the categorization used by the UNFCCC. Suggest to distinguish between agriculture and LULUCF here or to skip the abbreviation in the heading: “Agriculture, Land use, Land use change and Forestry”. Further, the AFOLU sectors needs to be introduced better. Seems like the mitigation potential analysis for the sectors also covers effects in other sectors?	Rejected. The organization the chapter as AFOLU sector was defined by IPCC plenary. The chapter presents the sector in the introdutory sections.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33609	SPM	19	34	19	42	There is no source reference.	Accepted. References were added in the revised version.
26137	SPM	19	34	19	35	The text gives a very strong statement after which it is stated that there is only low evidence to support it. Please consider rephrasing the sentence to "AFOLU provides significant mitigation potential in transformation pathways… etc."	Accepted. Paragraph was revised.
38974	SPM	19	34	20	5	Add discussion of productivity-enhancing R&D as supply-side measure. (see chapter-wide comments on Ch 11)	Rejected. The SPM highlights the main points, detailed discussion is presented in the main text.
38975	SPM	19	34	20	5	Though refelcted prominently in Figure SPM13, the text does not discuss (adequately) forestry supply-side mitigation options.	Accepted. The paragraphs of SPM were revised to present a balance view of agriculture and FOLU options.
28601	SPM	19	34	19	36	Uncertainty language:" Low evidence" is not a term to be used according to the "Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties IPCC Cross-Working Group Meeting on Consistent Treatment of Uncertainties Jasper Ridge, CA, USA 6-7 July 2010." Delete "low" and insert "limited". As there is only limited evidence and medium agreement the sentence should be in bold. The statement is to vague.	Accepted. Text was revised.
28600	SPM	19	34	19	42	The reference to the chapter in the underlying report is missing. This is true for many of the paragraphs in the SPM.	Accepted. References were added in the revised version.
29082	SPM	19	35	19	35	Not sure why low evidence for mitigtaion potential from AFOLU - believe evidence is high, although quantification lower	Accepted. Text was revised.
28602	SPM	19	36		37	Examples should be added, how a "reduction of emissions arising from land use change and land management" can be reduced.	Rejected. Detailed information is presented in the main text.
28603	SPM	19	38	19	39	Using biomass instead of fossil energy carriers does not reduce the AFOLU emissions in general, but can even boost them (see also chapter 11, page 90, line 37-48). It is strongly suggest to delete the part "or the substitution of fossil fuels by biomass for energy production".	Noted. The text was revised. Potencial trade-offs of biomass use are presented in the main text.
28604	SPM	19	39	19	39	Clarify whether human or animal diet or both are meant.	Accepted. Text was revised.
31348	SPM	19	4	19	4	We think that the main message could be clearer by not including zero-carbon energy purchases under this context.	Accepted. Removed "or purchased from zero-carbon sources"
28605	SPM	19	40	19	42	This sentence is very difficult to understand, please simplify.	Accepted. Text was revised and this sentence was deleted.
28606	SPM	19	40	19	42	Whether large scale bioenergy generation contributes to net GHG reduction, taken into account all effects and processes, is scientifically contended and therefore it seems not adequate to stick to promoting bioenergy altogether as a mitigation technology (see also chapter 11, page 90, line 37-48). At least, a differentiation (waste/residues, first generation biofuels, stem wood vs. wood residues etc) is essential. I would advocate again a deletion of the energy generation parts and a focus on AFOLU sequestration options.	Rejected. The IAM models show the importance of bioenergy for ambitious mitigation targets. However, large-scale bioenergy generation could indeed cogenerate undesired side effects; also it should be specified that this is the result of the IAM models. Hence, the sentence is now revised to: "In models, large-scale energy generation of carbon sequestration in the AFOLU sector WOULD provide headroom..."

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30368	SPM	19	42	19	43	There needs to be statement inserted here along the lines of "AFOLU can also affect climate through other processes beyond GHG emissions and sinks, eg: modification of surface albedo and evaporation. Use of ALOLU for climate change mitigation should thefore be undertaken with awareness of these additional climate effects." These additional influences are rightly mentioned several times throughout chapter 11, and this needs to come through to the SPM.	Noted. Non GHG forcing is noted in the main text but no space in the SPM
40850	SPM	19	42	19	42	The end of the sentence needs a reference to corresponding chapters/sections in underlying report	Accepted. References were added in the revised version.
31354	SPM	19	43	20	5	The reasons for the very large span in estimates for economic mitigation potentials should be explained in some detail.	Rejected. Unfortunately due to space limitations the details are only presented in the main text.
23957	SPM	19	43	19	45	It is suggested to comment/explain the significant range of the mitigation potential of the AFOLU sector by 2030.	Rejected. Unfortunately due to space limitations the details are only presented in the main text.
29083	SPM	19	43	20	22	It would be useful to know what any of these (GtCO2eq) figures mean in the scale of global (annual) emissions.	Rejected. Unfortunately due to space limitations the details are only presented in the main text.
25017	SPM	19	44	20	5	Modelling provided suggest a carbon price of $100 per tonne, which is excessively above current international carbon prices. Clearer justification of the likelihood that this price might be achieved would benefit the report, as this will inform the likelihood that policy interventions, based on a high price, might be successful.	Noted. The range of carbon prices found in the literature are presented.
25273	SPM	19	44	19	44	Range of 0.49 - 10.6 Gt CO2 is very high - Is there a mean or a median number to represent this?	Noted. The range is based on available literature. The revised version of the SPM presents a narrower range (7.2 to 10.6) using studies with similar premises but the full range of all studies is also presented.
28607	SPM	19	44			Very wide range, isn't it possible to derive more precise estimations/a more meaningful conclusion by distinguishing different type of estimation studies?	Noted. The range is based on available literature. The revised version of the SPM presents a narrower range (7.2 to 10.6) using studies with similar premises but the full range of all studies is also presented.
28608	SPM	19	44	19	45	Why 100 $/tCO2e? and what would be a "low carbon price"? A number is given on the next page (20 $/tCO2e).	Accepted. The text was revised.
28610	SPM	19	45	19	45	Please, be specific what "low carbon price" means!	Accepted. The text was revised.
28609	SPM	19	45	19	47	Delete "could" insert "might". Insert after "but" "more research is needed to learn more about the mitigation potential, co-benefits and risks, opportunities and barriers." This is a more appropriate summary of the box on biochar, chapter 11, page 25, box 11.4.	Thhe sentence was excluded in the revised version of the SPM
30461	SPM	19	47	19	48	The reference to demand side measures should preferably include the possible impacts of demanding sustainably produced goods such as timber (i.e. such measures should not be limited to dietary change and waste reduction).	Accepted. The text was revised.
26740	SPM	19	47	20	1	Why is demand-side taken up under the heading supply-side?	Mitigation potential options (supply and demand side) are presented together to facilitate comparison.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28611	SPM	19	47	19	47	Clarify whether human or animal diet or both are meant.	Accepted. Text was revised (human diet).
28612	SPM	19	47	20	1	The text is not balanced as it suggests, that barriers cannot be overcome. Please change to "If barriers to implement can be reduced, demand-side measures (e.g. dietary change and waste reduction) can also provide significant GHG emission reductions."	Rejected. Detailed information is presented in the main text.
30425	SPM	19	6	19	7	What is the optimal solution (it is implied in the text that this is known).	Rejected. It depends on each case. Text states clearly "not always"
30426	SPM	19	8	19	11	Not clear, what is centralised chiller technology	Accepted for clarification. Replace chiller by air conditioning
31349	SPM	19	8	19	8	Consider removing "of".	Accepted. Removed "of"
34714	SPM	19	8	19	16	Could add, as an important reminder of the limitations of carbon pricing as a policy tool: (from Ch9, p 5, lines 44-46): There is no evidence that energy pricing instruments deliver change in building energy efficiency and experience shows that pricing is less effective than programs and regulation.	Rejected. Unfortunately there is no space for buildings. Carbon pricing is addressed in other parts of the SPM
22415	SPM	19	8	19	8	A word (or words) is missing between "in the" and "of energy".	Accepted. Removed "of"
38970	SPM	19	8	19	11	As noted in comments to Chapter 9 (page 24, line 31, page 25, line 6), the conclusion that centralized chiller systems are inherently less efficient than user-controlled room unit air conditioners is based on a single citation (that investigated an improperly continuously operated central chiller); is in conflict with the general recommendation of Chapter 9 that district centralized chillers should be promoted; and is, therefore, not credible. Consequently, the statement:"For instance, centralized chillers, at least twice more energy-efficient than individual systems, may use up to 9 times more energy than small decentralized units that are used selectively. [9.3.10]" is not a good example of the importance of behavior aspects of building energy consumption. Indeed it sends the wrong message. It should be removed and replaced by a reasonable and, thus, better example.	Rejected. Although a centralized technology may be more effieicnt, in this part of SPM were addressed different behavioral patterns.
40844	SPM	19	8	19	8	As described in Chapter 1[?]P34 L16-19, Japanese had a serious national movement of "electricity[?]saving" because of the shortage of electricity supply after the Fukushima accident, and this movement affected lifestyle and behavior of many Japanese. As can be seen, behavior effects can vary with the energy efficiency before the action, culture, local climate, and[?]therefore, it might be hard to say "behavior can suppress energy use by 2 to 4 fold".	Rejected. Unfortunately there is not enough space in the SPM for this level of detail
24016	SPM	19	34	19	36	SPM.4.2.3 Agriculture, Forestry and Other Land-Use (AFOLU). 'AFOLU is a significant component of mitigation in transformation pathways, offering a variety of mitigation options and a large, cost competitive mitigation potential (low evidence, medium agreement).' Question: Would it be possible to indicate how the cost of such mitigation options will be varying for both developed and developing countries?	Noted. Regional disaggregation is presented in the main text but considering the different regions and options, it would be difficult to present this information in the SPM.
29084	SPM	19				Tthe mitigation potential for the forestry sector should be mentioned, broken down into reduced deforestation/degradation, afforestation and Forest management. The mitigation potential of using harvested wood products in place of other materials should also be quantified - even if no change from AR4. The split between agricul;ture and forestry shown in Figure 13 should be included in the narrative.	Rejected. Detailed information is presented in the main text.
32713	SPM	19	35	19	36	The assessment of the evidence is different from the one in the Technical Summary (limited evidence vs. low evidence). Both terms (limited and low) seem a bit weak in light of the recent scientific literature (e.g. Smith et al. 2013). Smith, P., H. Haberl, et al. (2013). "How much land based greenhouse gas mitigation can be achieved without compromising food security and environmental goals?" Global Change Biology: http://dx.doi.org/10.1111/gcb.12160	Accepted. Text was revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32717	SPM	19	36	19	39	It is surprising to read exclusively about bio-energy production and carbon sequestration as opportunities for supply-side mitigation in AFOLU, and nothing about more efficient livestock produktion and improved manure management.	Accepted. Text was revised.
32718	SPM	19	40	19	42	The sentence contradicts itself: " […] provides headroom for the development of mitigation technologies […] as the technologies already exist […]"	Accepted. Text was revised and this sentence was deleted.
40849	SPM	19	33			In addition to crop/grazing lands and forests, other sinks such as wetlands should also be discussed. The inventory guidelines currently being developed also places importance on the assessment of wetlands, etc.	Rejected.The options with the greatest mitigation potential are highlighted in the SPM. The main text presents a broader set of mitigation options (according to the available literature).
28613	SPM	19				Although REDD is a topic of the UNFCCC, it is not mentioned in the SPM. It is suggested to add this aspect to the SPM, e.g. TS, p45, l1-5: "Policies governing practices in agriculture as well as forest conservation and management need to account for the needs of both mitigation and adaptation (medium evidence, high agreement). The implementation of REDD (Reducing Emissions from Deforestation and Forest Degradation) mechanisms and its variations that can represent a very cost-effective option for mitigation with high social and other environmental co-benefits (e.g. conservation of biodiversity and water resources). [11.10]"	Accepted. Text was revised to include REDD+ explicitly.
31279	SPM	19		21		Informations should be given on of the concerned areas , according to the different options and carbon prices	Rejected. Comment is too general to be addressed properly.
31280	SPM	19		21		Informations are missing on the possible competition between bioenergy and food production, environmental, social and / or economic risks dues to some options	Noted. The competition to other objectives is discussed in the last paragraph on p. 20. The 4th sentence of that paragraph is now modified to "Competition with food production, sustainability and livelihood concerns might constrain deployment levels."
26492	SPM	19	16			… after "behavioural" include "human resource and skills)"	Rejected. While contentwise it is a good suggestion, such wording is not included in the underlying chapter text, nor is it a typical classification of barriers in the literature.
33955	SPM	19	12			“cost-“ is “cost-wise” ?	Rejected. " Cost-" means "cost-effective" with the adjective being later in the sentence.
41050	SPM	19	36	19	42	Mitigation opportunities under agriculture. This section should highlight the amount of emissions from agriculture activities before suggesting means and ways to reduce emission by substitution of fossil fuel. The emissions from fertilizers and livestock industry are by far higher than the emissions coming from energy use in agriculture.	Noted. Paragraphs were revised to present the main options. Emissions from Industry are present in the specific chapter.
41051	SPM	19	43	19	45	Economic mitigation potential in AFOLU. It is far stretched argument to use to $100/tCO2 equivalent scenario to make a comparison for potential mitigation benefits.	Accepted. Text was revised indicating the potential at lower carbon prices (<20USD)

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23116	SPM	19	44	19	45	If the range of mitigation potential is a factor of 20 between 0.5 and 11 Gt, then "medium evidence" is not appropriate. The statement is much too vague to give it a degree of evidence.	Noted. The range is based on available literature. The revised version of the SPM presents a narrower range (7.2 to 10.6) using studies with similar premises but the full range of all studies is also presented.
21001	SPM	19	8	19	8	Sentence is incomplete.	Accepted. Removed "of"
26139	SPM	19	33	21	39	The considerable uncertainties related to the role of the AFOLU sector in mitigation (discussed in Chapter 11) should be better reflected in the SPM.	Accepted. Text was revised to present the uncertainties
29081	SPM	19	34	19	42	It would be worth adding a little more detail here - the potential for carbon sequestration in soils (especially agricultural soils) is regionally variable and subject to uncertainty. The long term fate of sequestered carbon is vulnerable to management change and uncertainty around the impacts of changing climate. An additional sentence reflecting on difficulties and regional constraints would be worth while.	Noted. Discussion on permanence is presented in the main text as well regional differences when information is available. However considering the different regions and options, it would be difficult to present this information in the SPM.
41014	SPM	19	23	19	31	With technical efficiency improvement opportunity, other non-technical efficiency improvement opportunity shall also be discussed.	Taken into consideration when revising the text, although non-technical options are already partly mentioned (e.g.product-use efficiency, demand reduction), but it is true that for instance consumer or producer behavious can contribute to GHG mitigation.
33610	SPM	19	33	19	36	low evidence, medium agreement based on ?; seems to conflict with high agreement, robust/medium evidence in Executive Summery of Chapter 11, lines 10 to 22 and high agreement ; medium evidence in lines 33 to 45; see also next remark	Accepted. Text was revised and harmonized with theExecutive Summary of Chapter 11
41015	SPM	19	38			There is great deal of technical barrier in implementing such substitution and biomass supply shall ensure sustainable supply for large scale demand	Noted. Such barriers are presented and discussed in the main text.
33611	SPM	19	40	19	42	Large-scale energy generation or carbon sequestration techniques in the AFOLU sector already exist and most of them are commercial ; SKIP provides headroom for …end use sectors	Accepted. Text was revised and this sentence was deleted.
29749	SPM	19	24	19	26	The sentence is complicated and it is not clear what is the subject of this sentence	Taken into consideration when revising the text
40851	SPM	19				Although it is well understood that the present AR5 report has integrated the agriculture and forestry sectors into one AFOLU sector, the output of this integration is somewhat confusing for the policymaker as different countermeasures are taken in the two sectors. If the sectors could be discussed in separate paragraphs or items, the message herein would be more practical for the policymaker. At least Figure SPM 13 should be arranged so that the potentials of each sector are presented separately, instead of stacking on a single bar.	Noted. These aspects are stressed in the main text but one central objective of the SPM is still to present an integrated analysis for the sector. The figure was excluded from the SPM but na improved version is presented in the TS.Q2045
29750	SPM	19	47	1	20	This is the only sentence about Demand-side measures in this paragraph. Better move it to the next paragraph to avoid confusion.	Rejected. Mitigation potential options (supply and demand side) are presented together to facilitate comparison.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20531	SPM	2	13	2	20	It is mentioned that risk management is a unifying perspective in AR5. It is then further mentioned that WGIII looked specifically into sustainable development (SD) and ethics. It is however not so clear how risk management in sensu stricto has been now integrated addressed. Either this is made clearer in referering to SD and ethics, but also mentioning if there has been any additional chapters etc on this issue now.	Taken into account - text revised.
32692	SPM	2	4	2	17	We propose to shift section “SPM.5 Institutional options by governance level” after section SPM.3. In fact, it would present the content of the SPM according to three blocs: 1) Emissions trends and drivers (SPM.1), 2) Pre-conditions / frameworks for mitigation (SPM.3 and current SPM.5): scenarios, costs, and institutional and governance issues, and 3) Mitigation potential in the sectors (SPM.4).	Rejected - similar to the outline of the full report, the summary closes with an assessment of policies and institutions.
21541	SPM	20				Is this an exhaustive overview of literature? Many seem to be based on IAM but aren't there additional literature on estimated costs to avoid deforestation for instance? Many IAM include assumptions of decreases in deforestation even without climate policies. Can results from bottom up studies be compared to IAM results? The on-going model inter-comparison project (AG-MIP) shows that these models and many others are very different wrt 1) assumptions of basic land endowment (incl. “spare land”); 2) Assumptions on technological progress 3) Set of mitigation technologies 4) Price assumptions and linkage to the rest of the economy (e.g. arbitrage with bioenergy market) 5)Cost allocation to CO2 in poly-production systems and costing methodology (incl. discounting) 6) Degree of competition for land. Therefore this figure should be carefully reviewed on how it is represented and if necessary omitted.	Noted. The figure condense important information for the sector. However the text was revised to provide more context about the studies included.
38977	SPM	20				This figure does not belong in the SPM	Rejected. The figure condense important information for the sector.
38978	SPM	20				This figure is not appropriate or helpful for the SPM given that the range of studies are not comparable in many ways. For example, the side by side of the demand-side measures with the supply-side measures is very misleading since the latter is technical potentials and the former economic potentails. In the SPM, there is no context for what these studies mean or their assumptions/methods - it does not provide synthesis or context for readers of a summary.	Noted. The figure condense important information for the sector. However the text was revised to provide more context about the studies included.
40854	SPM	20				For Figure SPM 13 , the premises given in each paper should be made clear and the descriptions provided in the figure should be rearranged to facilitate understanding.	Noted. The figure condense important information for the sector. However the text was revised to provide more context about the studies included.
28628	SPM	20				General remark to that passage: Given the facts lying on the table the potential of biofuels is limited. This has to be noted. There will be a limited amount available that is produced in sustainable way but this could only be a resource for one part of the transport sector and it needs to be considered carefully where to put this limited amount. In addition, prices of crude oil might drop again and thus the market position of 2nd generation biofuels will be even worse. For kerosene, today the price is two to three times higher compared to conventional kerosene. The question is: who is going to pay the difference?	Noted. If GHG emissions are priced, bioenergy, if produced with neither LUC nor ILUC emissions, is supposed to be cost competitive.The SPM clarifies that deployment levels might be much lower than otherwise estimated, if sustainability concerns are comprehensively addressed, and hence, no further modifications are required.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29086	SPM	20				'Sustainability and livelihood concerns might constrain deployment levels. Achieving such levels would require, among other options, extensive use of agricultural residues and second generation bio energy..'. I think I am right in saying that the levels in the second sentence are not the constrained levels of the previous sentence, but I'm not sure; they might be. If things are 'required', how can they be also 'options'. I myself don't know what an agricultural 'residue' is - manure? - or what makes a biofuel 'second generation'.	Accepted. The sentences read now: "Sustainability and livelihood concerns might constrain deployment levels. Achieving deployment levels above current levels would require, among other options, extensive use of agricultural waste productions and dedicated high-yield plantations".
26478	SPM	20				No clear information is provided about the different assumptions driving the wide-range of abatement potentials shown in this graph, which makes it hard to draw any useful conclusions.	Noted. The figure condense important information for the sector. However the text was revised to provide more context about the studies included.
29085	SPM	20	1	20	2	The risk that climate change presents to the carbon stocks needs to be highlighted, particualrly the fact that mitigation through organic soil restoration may only be temporary	Noted. Discussion on permanence is presented in the main text.
26741	SPM	20	11	20	22	Demand-side is in the head of the figure to the right, but also supply-side should be specified for clarity (to the left three sections?)	Noted. The figure was not included in the revised version of the SPM but an improved version was included in the TS
28618	SPM	20	11	20	11	Insert a para extracted from 11.6 which deals with what is most striking about the new calculated mitigation potentials of the AFOLU sector the huge range in estimates. The difference between the low end and the high end is two orders of magnitude! This should be highlighted and commented on in the SPM.	Noted. The range is based on available literature. The revised version of the SPM presents a narrower range (7.2 to 10.6) using studies with similar premises but the full range of all studies is also presented.
31355	SPM	20	12			The figure is difficult to understand. Please define better the classification along the x-axis. Consider also including the table 11.7.	Noted. The figure was not included in the revised version of the SPM but an improved version was included in the TS
25839	SPM	20	12			This figure contains too much detail for an SPM. Summarize the different studies and include ranges for the different categories	Noted. The figure was not included in the revised version of the SPM but an improved version was included in the TS
28619	SPM	20	12			In its current form the figure is not very useful, especially for policy makers, who are not scientific experts. What is shown on the x-axis, what is the difference between these studies, and why are the results so different? Do not give references as labels. Please provide information on the difference between bottom-up and top-down studies for non-experts. The red arrows for AR4 are confusing, just put the AR4-column as the first on for each group carbon-price-group. Is the mitigation potential for forestry indicated by height of the red boxes or is it the height from the bottom (mitigation potential=0) to the top of each of the red boxes? What does the right column (demand-side measures-technical potentials) mean? The caption states that further details are given in the text, but this is not true for the SPM.	Noted. The figure was not included in the revised version of the SPM but an improved version was included in the TS

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28620	SPM	20	12			The difference between the studies is sometimes larger than the effect of carbon-prices: the message of the figure is weak.	Noted. The figure was not included in the revised version of the SPM but an improved version was included in the TS
32100	SPM	20	14			The sentence is ambiguous: Is it welfare-gains in terms of air quality or because or air quality or overall welfare?	Rejected. The text does not correspond to page and line.Q2104
31282	SPM	20	2			Not precise enough : sample of possible mitigation measures "cropland management" or "grazing land management" is very wide (reduced tillage, improved manure management, better fertilizer management, maintenance of permanent grassland, etc..).	Rejected. Unfortunately due to space limitations the details are only presented in the main text.
26738	SPM	20	2	20	5	Instead of just saying that Cropland and Grazing land management has the greatest potential (which is not very clear in the figure since the Forest bars are of almost the same magnitude) it could be more useful to mention the specific measures within the activity instead. For instance restoration of organic soils is a measure that could take place on either agricultural or forest soils.	Rejected. Options were presented for Agriculture and for FOLU
23583	SPM	20	21	20	22	Delete "further details are given in the text" . This is true in chapter 11 not in the SPM	Accepted.
30367	SPM	20	23	21	2	The statement "Bioenergy deployment offers both significant potential for climate change mitigation but also considerable risks" (medium evidence, medium agreement) seems to be well-supported by chapter 11. However I think the SPM statement needs to explicitly mention the evidence from chapter 11 that bioenergy poses direct risks of deforestation.	Accepted. We specify further risks now (see comment 2082). The text is modified to explicitly also now refer to deforestation.
31356	SPM	20	23	21	2	The risks, trade-offs and co-benefits could be more precisely addressed in this paragraph. Please consider to include in this paragraph or elsewhere: TS p 44 "Trade off considerations with water, land and biodiversity needs to take central stage to avoid harmful and even disastrous outcomes", efforts that could be win-win situations (co-benefits; e.g TS p 45 "The implementation of REDD .. can represent a very cost-effective option with with social and other environmental co-benefits" - conservation of biodiversity and water resources), and TS p 44 "There are important feedbacks to adaptation, conservation of natural resourses such as water and terrestrial and aquatic biodiversity".	Noted. Because of space constraints, these aspects were not included here.
22885	SPM	20	23	21	2	KEEP this para as it is important to highlight the risk.	Noted.
21542	SPM	20	23	21	2	Is there more information available about the potential impact on food production in the longer term of the use of Biofuels and BECCS and CDR. See aloes comments given on lines 13-14 page 10.	Some model results are cited in Ch. 11. Overall, uncertainty on the future interaction between the bioenergy and the food system is high.
29284	SPM	20	23	21	2	A clear phrase concerning the mitigation potential of bioenergy as discussed in Chapter 11.A section 4.2. should be added. E.g. "The mitigation potential of bioenergy use depends on the total life cycle emissions of bioenergy production, the dynamics of the carbon cycle, the system effects related to land use change, and on the efficiency of fossil fuel displacement. "	Accepted.
25275	SPM	20	23	20	32	There is no mention of potential for reducing emissions from wood and charcoal combustion in cooking and other rural applications.	Rejected. Space doesn't allow in depth discussions here.
25046	SPM	20	23	21	2	Keep this paragraph.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38976	SPM	20	23	21	2	Implying "cosiderable risks" from bioenergy does not reflect actual experiences on the ground to date. Suggest changing language from "considerable" to "theoretical". While modeling certainly suggests potential for downsides from large-scale bioenergy development, actual experiences to date have shown that leakage is so highly dependent on local policy frameworks, that practical impacts may be minimal (e.g. projected increases in Brazilian deforestation have not occurred in recent years, etc.). If local policy is the primary determinant, than it is difficult to attribute changes to increases in bioenergy demand. Also, does not mention the real economic gains bioenergy development has provided to rural producers in OECD nations. If necessary, caveats could be placed that say negative impacts are possible for developing countries with weak land use policies rather than imply negative impacts globally.	Rejected. The role of local policies is indeed considerable, but risks would nonetheless not be realized without global demand. Also: Risks cannot be assessed by ignoring possible weak preconditions for local governance.
32452	SPM	20	23	21	2	The risks of bioenergy should be remained.	Noted.
40852	SPM	20	23	20	32	To recognize risk as well as benefit is very important. Please do not delete it.	Noted.
28621	SPM	20	23	20	24	Please, specify risks similarly to Chapter 11.A. : "but also considerable risks such as net global warming and /or detrimental effects for local environments and livelihoods".	Accepted.
25156	SPM	20	23	21	2	See comment in Chapter 7 entitled: **Accepting biomass as a renewable energy creates an internal contradiction	Noted.
31283	SPM	20	24			the word « considerable » seems to be a bit too strong (for something that is assess as medium evidence, medium agreement)	Rejected. The medium evidence, agreement phrase relates to the overall sentence. There is substantive literature on the risks, and their scale.
28622	SPM	20	25	20	25	In the SRREN it has been suggested that a sustainable BE potential is not higher than 100-300 EJ - Please add this lower limit of the maximum sustainable potential.	Accepted.
29088	SPM	20	25			Would be useful to have these energy figures put into context, e.g. compared to global energy, or energy generation by another means.	Noted. The issue is complicated as a percentage of today's energy consumption would be meaningless, and future overall energy demand is scenario specific and highly variable.
28623	SPM	20	26			Please provide information on the difference between bottom-up and top-down studies for non-experts.	Rejected. Text has been revised to avoid such technical terminology.
31357	SPM	20	27	20	27	Given the potential for negative effects on biodiversity and ecosystems by increased land demand for bioenergy production, this as well as food security should be included here. Please consider to rephrase: "The risk for adverse effects on sustainability, biodiversity, food security and livelihoods are important aspects to take into consideration, and will constrain possible development levels."	Accepted.
28624	SPM	20	27	20	27	Clearer would be the following phrasing: "If sustainability and livelihood risks are addressed properly, potential deployment levels are lower."	Accepted. The phrase suggestion by comment 2088 (Christophersen) was chose, as it also includes food security.
25645	SPM	20	28	20	31	This part should explain that it is uncertain whether BECCS can be utilized in the future, as described in the section TS.3.3 (page 21, line 37). Safety confirmation, affordability and public acceptance are indispensable in CCS site selection. There is a much higher barrier to adopt BECCS than CCS because BECCS requires stable biomass supply for generation at reasonable cost. Since feasibility for BECCS has not been established so far, it is not appropriate to expect huge potential for BECCS in the future, as described in (Rhodes, 2008, page323). This literature is listed in the No7 line of this table.	Accepted. The second part of the sentence now reads: BECCS, if it becomes feasible and efficient on relevant scales, to make low net GHG-emitting transportation fuels and/or electricity".

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28625	SPM	20	29		31	Delete "and the co-processing of biomass with coal or natural gas with CCS to make low net GHG-emitting transportation fuels and/or electricity" as it describes/implies a questionable strategy (use coal and gas with CCS to produce transportation fuels) without being related to the bioenergy deployment issue in this paragraph. This possible element of energy systems is introduced in Chapter 11, page 85, row 29 as an assumption of certain scenarios (GEA 2012) without any explanation and discussion. Therefore it should not appear in the SPM.	Agreed. This specification is too far stretching. Nontheless, IAMs explicit BECCS as a major backstop technology, and hence, we have to refer to BECCS here. The text has been modified from "and the co-processing of biomass with coal or natural gas with CCS to make low net GHG-emitting transportation fuels and/or electricity" to "and BECCS, if it becomes feasible and efficient on relevant scales, to make low net GHG-emitting transportation fuels and/or electricity"
28626	SPM	20	30			Please note that CCS is not a globally feasible option - there are at least regional differences which affect the transport sector. This needs to be considered in particular also in context with transport and seems to be no real solution and should be considered very carefully due to the enormous risks of extra CO2-emissions.	Noted. It is an option among others and might be deployed where feasible.
28627	SPM	20	31	21	2	Two very important and valuable sentences which are worth being highlighted.	Noted.
40853	SPM	20	32			Land carbon (forest) protection should be changed to "land (forest) conservation" because conservation is a wider concept than protection, and mitigation can be realized not only by land protection but conservation.	Accepted. The phrase is modified.
28614	SPM	20	4	20	4	Please avoid platitudes like "in other words".	Accepted. Text was revised.
30659	SPM	20	6	20	11	Should a finding that is only supported by "low evidence, low agreement" be a key finding for the SPM? Suggest reviewing.	Rejected. Although there are still few studies on that, results are quite relevant and represent a ragne of possibilities that will be possibly exploited in the coming years.
24152	SPM	20	6	21	2	It is very important in this section to show risks resulted from specific GHG mitigation action/technologies.	Rejected. Detailed information is presented in the main text.
21540	SPM	20	6	20	8	Difficult to understand the relationship with dietary change and assumptions about implementation of biofuels. Why is there low evidence and low agreement that dietary change can have an impact on GHG emissions? Isn't a switch towards less meat based diet resulting in less GHG emissions. See for instance also work by PBL indicating the importance of agriculture emissions for low stabilisation concentration levels (http://link.springer.com/article/10.1007%2Fs10584-008-9534-6)	Accepted. Text was revised.
26739	SPM	20	6	20	11	In this section mitigation potentials are described in volumes and also at different levels of carbon prices. This kind of results are not presented for the other sectors, why? If modelled carbon prices/mitigation potentials are shown they need to be introduced carefully. Esp. in the AFOLU sector where it in reality is very complicated to introduce carbon pricing as policy instrument and other instruments may be more appropriate due to market failures.	Noted. The text synthetizes the information available in the literature. Details are presented in the main text.
32099	SPM	20	6		11	If a finding has low evidence as well as low agreement, it is questionable why it still is in the SPM	Rejected. Although there are still few studies on that, results are quite relevant and represent a ragne of possibilities that will be possibly exploited in the coming years.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25274	SPM	20	6	20	8	It is not clear whether the changes in diet mentioned in this conclusion are endogenous to BAU scenario or are incremental to the endogenous dietary changes in the BAU. It is important to clarify this to ensure whether the GHG savings from food production are additional to the BAU or part of BAU.In case these are additional, then it would be useful to mention typical mitigation measures.	Rejected. Detailed informat+Q1950ion is presented in the main text.
26138	SPM	20	6	20	8	The same comment as above: the text makes quite a strong statement after which it is indicated that there is "low evidence, low agreement" on it. -> The statement should be rephrased.	Accepted. Text was revised.
26140	SPM	20	6	20	8	The sentence is unclear: why is the impact of changes in diet on GHG emissions from food production determined by assumptions on bioenergy implementation?	Accepted. Text was revised.
28615	SPM	20	6	20	6	Clarify whether human or animal diet or both are meant.	Accepted. Text was revised (human diet).
28616	SPM	20	6	20	8	To make this statement more meaningful, please add "(i.e. the reduction of animal products in diets)" after "changes in diet".	Rejected. Detailed information is presented in the main text.
28617	SPM	20	8			Uncertainty language:" Low evidence" is not a term to be used according to the "Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties IPCC Cross-Working Group Meeting on Consistent Treatment of Uncertainties Jasper Ridge, CA, USA 6-7 July 2010." Delete "low" and insert "limited". As there is only limited evidence and medium agreement the sentence should be in bold. The statement is too vague.	Accepted. Uncertainty language has been corrected and text has been revised.
30427	SPM	20	9	20	9	low evidence low agreement but significant emissions mitigation, how can this be asserted?	Accepted. Text was revised.
32715	SPM	20	23	20	24	The assessment of evidence and agreement seems not very realistic. The recent scientific literature treats bioenergy much more ambiguous than other options such as demand-side measures. Furthermore, the assessment is strongly dependent on the type of bioenergy (e.g. first generation vs. second generation, residues vs. planted biocrops). Last but not least the possible negative side effect are not easy to assess and often neglected. Alternative land use should be considered in the case that the substrate for bioenergy is actively grown for this purpose. But even if bioenergy should be gained from “residues”, alternative use of these residues should always be considered, such as mulching for soil carbon increase or use as compost for fertilization (Smith et al. 2012, Wilhelm et al. 2004). These side effect ad significant uncertainties assessment of the potential of the use of bioenergy. Smith, W. N., B. B. Grant, et al. (2012). "Crop residue removal effects on soil carbon: Measured and inter-model comparisons." Agriculture, Ecosystems & Environment 161 (0): 27-38. Wilhelm, W. W., J. M. F. Johnson, et al. (2004). "Crop and soil productivity response to corn residue removal: A literature review." Agronomy Journal 96 (1): 1-17.	Noted. The specification of "considerable risks" tries to address the points mentioned here without going too much into detail (prohibited because of space constraints).Not everyone agrees that there is high low-carbon bioenergy potential, and not everyone agrees that risks are really considerable. Hence, the assessment seems to be appropriate.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32714	SPM	20	6	20	8	Generally the assessment of the evidence and agreement of demand-side measures seems very low, particularly considering the large potential of a reduced consumption of ruminant meat and a reduction of food waste. Recent scientific findings estimate the technical potential as very high and are in large agreement (e.g. Bellarby et al. 2013, Garnett 2011, Kastner et al. 2012, Rosa and Dietz 2012, Smith et al. 2013, Stehfest et al. 2009) . Disagreement could maybe attributed to the degree of implementation that can be achieved. Behavioral and socio cultural barriers might exist indeed and should be addressed. However, these barriers are not in the main focus in this text and the potential expressed in numbers and indicated in Figure SPM.13, relates to the technical potential. Assessment of evidence and agreement as given in line 8 should therefore be separated in assessment of the technical potential and assessment of the potential of implementation. In my opinion the technical potential of demand-side measures receive far too less attention in this text. The potential lies in the fact that the whole production and food chain is affected by demand-side measure while supply-side measures often concern a small part of the production process. Furthermore supply-side measures might lead to significant pollution swapping or negative side effects, where mitigation measures for one emission source might well lead to higher emissions from another emission source. This makes supply-side measure much harder to assess and it does not seem logical why evidence and agreement of supply-side measures should be rated higher than evidence and agreement of demand-side measures (see also Smith et al. 2013). Furthermore, the assessment of evidence and agreement is not identical to the one in the Technical Summary. It is not clear, why assumptions about the implementation of bioenergy should have great effects on the impacts on demand-side measures. Bellarby, J., R. Tirado, et al. (2013). "Livestock greenhouse gas emissions and mitigation potential in Europe." Global Change Biology 19(1): 3-18. Garnett, T. (2011). "Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)?" Food Policy Volume 36 (Supplement 1): S23-S32. Kastner, T., M. J. I. Rivas, et al. (2012). "Global changes in diets and the consequences for land requirements for food." Proceedings of the National Academy of Sciences 109 (18): 6868-6872. Rosa, E. A. and Dietz, T. (2012). "Human drivers of national greenhouse-gas emissions." Nature Climate Change 2 (8): 581-586. Smith, P., H. Haberl, et al. (2013). "How much land based greenhouse gas mitigation can be achieved without compromising food security and environmental goals?" Global Change Biology: http://dx.doi.org/10.1111/gcb.12160 Stehfest, E., L. Bouwman, et al. (2009). "Climate benefits of changing diet." Climatic Change 95 (1-2): 83-102.	Noted. The text synthetizes the information available in the literature. Details (such as barriers, co-benefits, impacts) are presented in the main text. The figure was excluded from the SPM but na improved version was included in the TS.
32719	SPM	20	6	20	8	The relationship between the first (demand-side measures) and the last part of the sentence (assumptions about the implementation of bioenergy) is not clear.	Accepted. Text was revised.
21002	SPM	20				Please rework this figure. Giving all studies / sources makes the overview difficult. Collate information to one e.g. boxplot / cost level.	Noted. The figure condense important information for the sector. However the text was revised to provide more context about the studies included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23117	SPM	20	6	20	11	If the range of mitigation potential is a factor of 10 , then "medium evidence" is not appropriate. The statement is much too vague to give it a degree of evidence.	Noted. The range is based on available literature. The revised version of the SPM presents a narrower range (7.2 to 10.6) using studies with similar premises but the full range of all studies is also presented.
41052	SPM	20	8			Changes in diet that can impact GHG emission. This is a “low evidence” and “low agreement” conclusion therefore is should not be reported in the SPM.	Rejected. Although there are still few studies on that, results are quite relevant and represent a ragne of possibilities that will be possibly exploited in the coming years.
32382	SPM	20	13	20	22	Figure SPM.13: Given that this figure summarizes an assessment of the existing literature, is it necessary to list all individual studies? As non-experts, we wonder about the usefulness of this amount of detail information cluttering the x-axis. It seems more important to highlight the key differences between individual estimates.	Noted. The figure was not included in the revised version of the SPM but an improved version was included in the TS
32381	SPM	20	13	20	22	Figure SPM.13: Please move the IPCC reference bar to the right, perhaps with a slightly different background colour to improve clarity for each of the three categories.	Noted. The figure was not included in the revised version of the SPM but an improved version was included in the TS
29087	SPM	20	23	21	2	Whilst biofuels/bioenergy and aforestation may provide opportunities for mitigation it is important to reflect on the potential conflicts with food production; the Foresight Farming Futures report higlights significant challenges of food security in a resource constrained world of potentially over 9 billion inhbaitants. The tradeoff between sustainable fuel and energy and food security should be given greater prominence, not only in this section, but in general throughout the reoprt.	Noted. Food security is mentioned in the 4th sentence of this paragraph.
33613	SPM	20	23	21	2	Ad the text of Chapter 11 page 5 line 36 and 37 that emphasis should be given to multifunctional systems	Accepted. The 2nd last sentence now reads: "Both mitigation potential and sustainability hinges crucially on land carbon (forest) protection, careful fertilizer application, interaction with food markets, and good land and water management.".
33612	SPM	20	4	20	5	SKIP: In other words ….with the carbon price.	Accepted. Text was revised.
41016	SPM	20	6			missing animal feed type Significance of animal feed in GHG emission reductions	Rejected. Due to space limitiation this aspects were aggregated as grazing land management. Detailed information is provided in the main text.
31359	SPM	21				Please consider including the following text at the end of the para in line 13: "However, they have little impact on long-term stabilisation goals. An important factor will be political decisions on the importance of short- and long-term climate change. A similar strain of research is to see whether air pollution policies can be formulated in such a way that it does not work against climate policy (i.e. optimisation of sulphur emission reduction in time, as function of other gases) – and whether indirect impacts of climate policy on aerosol emissions can be optimised in time. [3.5, 4.8, 6.3, 6.6]"	Taken into account - text revised.
30660	SPM	21	14	21	14	In the technical summary (page 45 line 43), the word "Many" is used, rather than "Most". Recommend being consistent.	Taken into account - text revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25840	SPM	21	14	21	23	Also mention the risk due to the reduction of the absolute figures of the negative RF related to anthropogenic aerosols (c.f. SPM WG1)	Rejected - this is too detailed for the SPM; see chapters 5 and 6 for more details.
30455	SPM	21	14	21	23	This is a key finding and could be given a more prominent role in the SPM (moved up or put in table/figure to highlight it)	Editorial
21544	SPM	21	14	21	23	Would it not be more correct to state that 'Most mitigation options result in co-benefits for energy security'.	Taken into account - text revised.
19753	SPM	21	14	21	23	Co-benefit for air quality with significant short-term welfare gains is mainly exists in developing countries, in which environmental protection regulations are relatively weaker than developed world. Therefore, mitigation actions with co-benefits in this kaind are the opportunities in developing countries.	Rejected - there is a large strand of literature on the co-benefits for air quality and cost reductions for associated policies for industrialized countries, see section 6.7 and 6.6.
29091	SPM	21	14	21	23	The potential for biomass as a renewable energy source to have a negative impact on air quality - if substituting for natural gas should be mentioned.	Rejected - this section focuses on the implications of mitigation scenarios for additional objectives rather than on individual mitigation measures.
29092	SPM	21	15	21	15	Insert "air" before "pollutant emissions…' for clarity.	Accepted.
30661	SPM	21	17		19	It would be useful here to link the quantified co-benefits to the costs of mitigating the CO2 that would realize said co-benefits.	Noted - but due to the limited space, co-benefits are not quanitifed. See the TS section 3.1.4 and the underlying chapters.
25646	SPM	21	17	21	19	This part should include how much mitigation cost is invested for climate change issue because it is necessary to compare the mitigation cost with the economic value of air quality co-benefits.	Noted - but due to the limited space, co-benefits are not quanitifed. See the TS section 3.1.4 and the underlying chapters.
30662	SPM	21	24	21	31	Carbon Capture & Storage (CCS) has been used as an example of mitigation measures that reduce resource efficiency with negative effects on energy security. It is difficult to substantiate this in the underlying report and without proper context and explanation, it might lead to the perception that CCS has adverse impacts on energy security. CCS is an important mitigation technology intended to reduce GHG emissions by capturing and storing it underground while facilitating the production of oil (enhanced oil recovery) while using other, often domestic, sources of energy such as coal, and thus increasing energy security. We suggest that either another example should be used, or it should be clarified how CCS will reduce energy security.	Suggested: Taken into account - text revised
25276	SPM	21	24	21	31	Energy security co-benefits are more complex than what this paragraph communicates. It is advisable to communicate diverse, complex and situation specific implications for the energy security across countries.	Suggested: Taken into account - text revised
38980	SPM	21	24	21	31	This paragraph notes that RE deployment could afford co-benefits for energy security, from "reductions in global energy trade" that would "reduce dependency on fossil fuel imports." The issue is in fact more nuanced, and it might be worth pointing out that high biomass futures, especially if deploying bio-CCS (BECCS), might increase global trade in bioenergy specifically, with potential for biofuel driven geopolitics (in a much altered global energy landscape) to compromise importing regions' (bio)energy security.	Suggested: Taken into account - text revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40857	SPM	21	24	21	31	It is not appropriate to describe that "many" mitigation options result in co-benefits, since, for example, CCS-ready requirement on power plants might result in an adverse effects.	Taken into account - text revised. However, the word 'many' allows for some technologies that have adverse effects on energy security.
24416	SPM	21	24			This depends on the stringency of mitigation target. Too stringent targets require shifting from coal to other fuel sources or CCS deployment. Some coal rich countries need to import alternative fuels, instead of utilizing domestic coal, which has an adverse impact to energy security. See K. Akimoto, F. Sano, A. Hayashi, T. Homma, J. Oda, K. Wada, M. Nagashima, K. Tokushige, T. Tomoda, "Consistent assessments of pathways toward sustainable development and climate stabilization", Natural Resources Forum, Vol.36, No.4, pp.231-244, 2012	Taken into account - As the reviewer points out, only some coal rich countries might be negatively affected, but only for very specific mitigation pathways. Reducing energy demand, switching to domestic renewable energy sources, or nuclear energy does not affect energy security negatively. The findings of the reference are in this respect contrary to the great majority of the literature and are not even well documented (e.g. in terms of indicators used, alternative fuel switch strategies considered, see above).
25157	SPM	21	24	21	25	See comment on Chapter 7 entitled: **Implicit assumption of renewable energy mitigation potential are not supported by recent empirical, behavioral, and macroeconomic analyses	see answer to comment on chapter 7.
33614	SPM	21	26	21	27	The relation between CCS and resource efficiency is not straightforward for many policy makers. We propose to rephrase this sentence to: "The capture of CO2 from flue gas, a critical technology to achieve close to zero or negative emissions, uses approximately 30% of the energy gained in the combustion that resulted in the CO2, which may negatively impact on the needed volume in fossil fuels, air pollution, and energy independence.".	Taken into account - text revised
20881	SPM	21	26	21	27	Could you please add concrete examples of reducing resource efficiency? Why may CCS have such negative effects?	Taken into account - text revised
28633	SPM	21	26			Better us a more neutral expression than the word "help", as for some countries a reduction of fossil fuel imports would not be considered "helpful".	Taken into account - text revised
23500	SPM	21	3	21	31	Other co-benefits include health and nutritional benefits from constraining further climate change and its adverse effects on temperatures, extreme weather events and food production	Rejected - the benefits described by the reviewers are not referred to as co-benefits or advese side-effects in this report because these effects are the aims of climate policy (see section 3.6.3 for further information).
20095	SPM	21	3	21	3	It is very interesting that AR5 assessed potential co-benefits. But it seems that only air pollution and energy security have been assessed in depth. Therefore, issues like biodiversity of poverty alleviation are not even cited. Could this introductory paragraph recall the potential co-benefits (positive or negative), even though they are not detailed further ? I think it is important that the SPM talks about biodiversity, desertification, etc.	Taken into account - the implications for more objectives (e.g. ecosystem impacts, energy access) have been included but there are too many effects to be included in the SPM (see TS and underlying chapters for more details).

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25142	SPM	21	3	21	13	The paragraph here is good as far as it goes. But it might be improved by making direct reference to Article 2 of the UNFCCC and the goal of avoiding dangerous anthropogenic climate change “to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”	Accepted - the Article 2 of the UNFCCC is introduced directly in the beginning of the Introduction.
26742	SPM	21	3	21	39	Possible cost reductions because of co- benefits (at least in the near term) are not mentioned in the earlier sections were results from modeling of macroeconomic costs (p 10 for example) are presented. This needs to be explained. Overall there is no clear line in the document when it comes to conclusions regarding costs, multiple goals etc.	Taken into account - section revised.
38979	SPM	21	3	21	13	This repeats a concept from earlier in the SPM on p12, lines 10-17. Perhaps this could be consolidated into a single section.	Taken into account - section revised.
28629	SPM	21	3	21	3	It seems that for the much discussed alternative fuels in road transport, the highest risk remains shifting a problem from "developed" countries to "developing" countries by commanding so much land use for the production of biofuels that food production will be endangered.	Noted - Land use implications are discussed in the AFOLU section.
28634	SPM	21	31	21	39	The relation between mitigation policies, cost of energy and development objectives/poverty reduction is presented too simplistically. The presented conclusion is highly contentious. There are other effects than those presented here.	Taken into account - text revised. Due to space constraints, the SPM cannot give a comprehensive overview of the effects from mitigation policies on all additional objectives.
31285	SPM	21	32	21	39	It could be interesting to mention in this section, to counterbalance the reasoning that renewable energy is against energy access, the fact that renewable energy is in (developing) countries sometime less expensive than current energy sources, and that it is particularly the case in remote areas where current energy is or very expensive or not avaliable.	Taken into account - text revised
30428	SPM	21	32	21	32	It should be clear that this is for developing countries	Taken into account - text revised
32590	SPM	21	32			The cost point is really important, but it is equally important to distinguish price from cost. It is very likely that mitigation scenarios involve higher energy prices. Whether they raise aggregate energy costs will depend on the corresponding degree of energy efficiency improvement, both induced by price and by other policies, and other technological and infrastructural responses . Internationally the evidence is for "cross-price" elasticity of around -1 implying that regions with historically higher energy prices do not spend more on energy in the long run; this is entirely with Bashmakov's observations on the surprising historical constancy of energy expenditures (Grubb et al, Planetary Economics, Chapters 1 and 6, notably Fig 6.1). Given that the point is referenced to no less than six different chapters I am not sure where in the AR5 this point would be best addressed.	Taken into account - text revised
25019	SPM	21	32	21	39	This section presents only one aspect of the impact on energy costs for disadvantaged groups. Suggest it should consider other factors, for example, governments could invest in energy efficiency as an alternative to subsidising energy use. Similarly, distributed energy solutions are already cheaper than extending power lines from large power stations to many rural communities.	Taken into account - text revised
30456	SPM	21	32	21	39	This is true but it should be mentioned that some climate mitigation options (fossil fuel subsidies reform for instance) that can result in higher energy prices will have negative net costs or result in large savings in public spending. Fossil fuel subsidy reform is also touched upon on page 25 line 17-21 and could be re-used here.	Taken into account - text revised
22888	SPM	21	32	21	39	KEEP this para as it is important to highlight adverse side effets as well	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21545	SPM	21	32	21	39	The emboldened statement on line 32 seems too strong. Research also indicates in the lowering impact of fuel cost savings across the life time but indeed the need for higher investments upfront which can be problematic for the poor. While concern for the poor is important, no evidence is given that access to energy policies conflict with climate goals, a point made for instance in large-scale studies such as the Global Energy Assessment: http://webarchive.iiasa.ac.at/Research/ENE/GEA/doc/GEA-Summary-web.pdf. Similar findings can be found in for instance the 2011 World Energy Outlook by the IEA. The link between access to energy for the poorest and the impacts of climate policies is thus rather tenuous and might be beneficial for some, for instance where climate finance such as CDM can invest in sustainable electrification. But it is indeed important that access to energy policies, are integrated in climate and energy policies.	Taken into account - text revised
34716	SPM	21	32	21	39	This paragraph, or the bolded sentence, seems a bit misleading, in the context of energy access for the poor. Today decentralised renewable energy is often the most economic solution for providing energy access for the poor. According to a recent, broad study by the International Renewable Energy Agency: "renewables are increasingly becoming the most competitive option for new grid supply and swift grid extension. Where electricity systems are dominated by oil-fired plant, cheaper—sometimes significantly cheaper—renewable generation choices are available. For off-grid power supply, renewables are already the default economic solution."So mitigation doesn't necessarily mean higher energy prices." (Renewable Power Generation Costs in 2012: An Overview. IRENA Report. 2013. Available online: www.irena.org)	Taken into account - text revised
25048	SPM	21	32	21	39	Keep this paragraph.	Noted.
28636	SPM	21	32	21	32	Statement not balanced: How does this relate to decreasing costs of RE, savings due to energy efficiency and rising costs of fossil fuels in the long run? The sentence as it stands is an unbalanced contraction of the situation, also because external costs like effects on the environment are not considered. Please delete this sentence.	Taken into account - text revised
28635	SPM	21	32	21	39	Paragraph not balanced: How do these pessimistic statements relate to the much more optimistic findings of the SRREN, that come to a contrary conclusion? See for example SRREN, SPM Section 5, in particular "RE can help accelerate access to energy, particularly for the 1.4 billion people without access to electricity and the additional 1.3 billion using traditional biomass." Please modify.	Taken into account - text revised
28637	SPM	21	32	21	39	This is an oversimplified if not wrong analysis of costs derived from mitigation options. In contrast, Chapter 7 reads: "The extent of the ... risks will differ greatly across regions, and depend on local circumstances, implementation practices as well as the scale and pace of the deployment of the different options." Chapter 7, p.43. lines 13-15) In the SPM, it sounds as if the poor are for the most part financially adversely affected by climate mitigation; this is often wrong. Quite often mitigation options reduce energy costs for the poor; in other cases they increase the cost only in the short term but reduce costs in the mid and long term. Please reflect this more balanced view of Chapter 7.in the SPM as well.	Taken into account - text revised
29093	SPM	21	32	21	39	It would be useful to include in this paragraph something on the costs of inaction, to prevent it being interpreted for example by the media as a reason not to tackle climate change.	Noted.
20800	SPM	21	32	21	33	KEEP. This sentence should be kept. This sentence represents the truth.	Noted.
38981	SPM	21	35	21	39	The statement that design of climate policy will need to take into account distributional effects is a policy call and should be revised. There is not broad agreement in the underlying chapters on whether or how to do this, which should be more clearly reflected.	Taken into account - text revised
28638	SPM	21	35	21	37	Statement not balanced: When talking of increases in energy costs (from RE) which may impede development objectives reference shall be made to fossil fuel subsidies and their effects on competition, as well. (see p.25, l. 17-21)	Taken into account - text revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30664	SPM	21	37		39	This sentence could be construed as being policy prescriptive. Suggest starting the sentence with "To avoid adverse impacts to impoverished people, the design of climate policies would have to…"	Taken into account - text revised
23541	SPM	21	4	21	13	I find this paragraph hard to understand. Lines 6-7: Why not just say that mitigation will be considered practically as one objective among many? Why the "should"? Line 8: "this implies" -- really? There appears to be a logical problem here. "May" is also coming out of nowhere. Lines 9-12: This sentence is vague and hard to follow.	Taken into account - text revised.
24153	SPM	21	4	21	13	Economic co-benefit is reported for both of the cement industry and local government to treat municipal wastes in the cement kiln as GHG emissions are reduced in the local community (See Chapter 5; Sano et al., 2005, Journal of the Japan Society of Material Cycles and Waste Management, Vol.16, No.5, p.341, 2005 “Effects of CO2 Emissions from the Utilization of Municipal Solid Waste as Alternative Fuel and Raw Materials in Cement Production”).	Noted.
22886	SPM	21	4	21	5	KEEP this para as it is important to highlight adverse side effets as well	Noted.
25047	SPM	21	4	21	5	Keep this paragraph.	Noted.
40856	SPM	21	4	21	5	SPM Page21 line 4-5, regarding “Climate policy decisions often lead to co-benefits and/or adverse side-effects for other societal objectives.”, Compared to this leading sentence, following sentence does not include adverse side-effects, therefore line 4-5 should be rewritten by “Climate policy decisions often lead to co-benefits and side-effects for other societal objectives.”	Taken into account - text revised.
28631	SPM	21	4	21	13	This paragraph reads mostly descriptive and partially normative. Please present results and arguments.	Taken into account - text revised.
24065	SPM	21	4	21	13	I miss a mentioning of effects of global warning on human health	Noted. This is discussed in Working Group II.
23959	SPM	21	40	25	21	It is suggested to also inform about the problem of stranded investments in case of more ambitious mitigation goals and about the current "lock-in" effect in fossil fuels.	Taken into account - this aspect is considered in section 3.1.
25143	SPM	21	41	22	8	While this paragraph does a good job framing some underlying drivers of the deficiency in addressing climate change, it could be observed that human social organization in every form and at every scale has not proven to be optimum at dealing with long-term and non-local risk.	Taken into account - text revised.
25277	SPM	21	41	21	47	Section SPM 5.1, - reads more philosophical or a personal reflection - to be of any relevance to policy making	Taken into account - section removed.
38982	SPM	21	41	22	26	Regarding human decision-making, the discussion focuses on a few specific techniques or is at a very abstract level, and not very prescriptive. I suggest a few sentences be added along these lines: In the residential and small and medium business sectors, most energy saving actions involves behavior: purchasing and installing technology such as an more energy efficient refrigerator; settings and control behaviors such as lowering thermostat temperature and reducing pool pump use; maintenance behaviors such as cleaning furnace filters; changing habits or repeated behaviors such as hang drying clothes and bicycling rather than using a clothes dryer and driving; eliminating wasteful energy uses such as extra refrigerators and DVRs; etc. These actions can be facilitated through the application of behavioral principles through programs implemented at the policy/incentive, technology, built environment, media/marketing, and organizational/community levels. It is important to evaluate these programs in order to assess their energy savings, and improve programs over time. In addition, the ability to quantify energy consumption via the smart grid has the potential to allow for personal energy consumption feedback at scale, as well as objective evaluation of energy consumption.	Taken into account - details on sector-specific behavioral issues are summarized in section SPM.3.2.
33615	SPM	21	42	21	43	We propose to delete the word "choice", because it is confusing rather than elucidating.	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38983	SPM	21	42	21	43	"The success of climate policy depends on how people perceive and respond to climate and other risks in their choice context" is too strong an assertion in some sense and incorrect in others. A policy like a carbon price that provides the proper incentives to consumers may not reach an expected goal due to unforecast behavioral responses but that doesn't mean it won't be successul. If the statement is asserting that public support for climate change policies is influenced by there level of information which may currently be incomplete it should be made more specific.	Taken into account - text revised.
26479	SPM	21	43	21	46	Sentence beginning "Awareness of the factors..." is extremely hard to understand. Who are the 'experts' and 'key decision-makers' which are referred to?	Taken into account - text revised.
32101	SPM	21	46		47	The passage seems to imply that there is a unified economic theory and a homogenous understanding of rationality. This is false: there are heterogeneous theories of rationality - both individual and collective. Some of these models address human decision-making including Procrastination and Akrasia well-	Taken into account - text revised.
24394	SPM	21	5	21	6	"Limiting climate change is one of many economic, social, and 5 environmental policy objectives." This is true; however, climate change impacts all those other things and is the biggest long-term issue we face. Of all organizations, the IPCC should be willing to clearly state the unique importance of climate change.	Taken into account - Section SPM.1 covers these aspects.
25018	SPM	21	6	21	6	Suggest this section should reference biodiversity to reflect the environmental component of ecologically sustainable development (ESD). Significant climate change mitigation can be achieved by conserving and managing biodiversity. However, the vulnerability of biodiversity puts this mitigation pathway at risk.	Taken into account - text revised. Biodiversity is rather the focus of Working Group II.
29090	SPM	21	6	21	9	The issue is less about avoiding trade-offs (which is probably not realistic) but transparency about what those trade-offs are, so an informed decision can be made.	Taken into account - text revised.
31358	SPM	21	8	21	13	Please consider also to include the risks to biodiversity, ecosystems and ecosystem services posed by afforestation/reforestation.	Noted - see the section on AFOLU.
25125	SPM	21	9			After 'consider', please add "balance between global urgent issues including MDGs as well as".	Taken into account - text revised.
24017	SPM	21	4	21	5	SPM.4.3 Co-benefits, risks & sustainable development. ‘Climate policy decisions often lead to co-benefits and/or adverse side-effects for other societal objectives (high confidence).’ Question: Is it possible to indicate in which areas (urban or rural) climate policy decisions lead to adverse side-effects?	Rejected - not all details can be covered in the SPM; please refer to the TS and sections 5.7 and 6.6 for further details.
40855	SPM	21	2			As there is no discussion of human settlements, consumption and lifestyle, which has been newly given a chapter in the AR5 report, it is suggested that a section dedicated to these studies is added after line 2: as“SPM.4.2.4 Human Settlements and Infrastructures”, and the following statement may be cited from TS p.45 l.27 to 31: “There is path dependency with the built environment and infrastructure, which can ”lock in” lifestyles and consumption patterns and limit mitigation options. Infrastructure is defined broadly as the provision of water, energy (including electricity), food, mobility/connectivity, waste management and built environment materials to a community as a whole (co-located homes, businesses and industries). [12.1]”	Accepted. New section on 'Human Settlements, Infrastructure and Spatial Planning' has been included, which is based on text from the Technical Summary.
26924	SPM	21				The lack of discussion about intra- and inter-generational equity considerations in this section is egregious, particularly given its relevance to climate change and the weight given to this discussion in the IPCC document (Chapters 3 and 4). A proposed paragraph would be the following: Ethical concerns regarding both intra-generational and inter-generational equity heighten the relative importance of climate change impacts and reinforce the need for policy interventions. In particular, given the asymmetric impacts of climate change on the current world’s poor and future generations, any weighting given to the equitable distribution of goods across individuals increases the urgency for mitigation [3.3].	Taken into account - details on this aspect are summarized in sections SPM.1 and SPM.3.1.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28632	SPM	21	24	21	31	SPM.4.3 this is a repetition, see ch. 3 p. 13 and should be shortened or deleted.	Taken into account - text revised.
31284	SPM	21	3	21	39	It would make more sense not to put section 4.3 on « co-benefits, risks & sustainable developement » as a sub-section of section 4 on « mitigation options by economic sectors », in order to have more emphasis on this issue.	Rejected - this section focuses on the implications of mitigation scenarios for additional objectives. However, the section on the different sectors also includes information on co-benefits and adverse side-effects.
27042	SPM	21	3			Given the extended discussion of equity concerns in Chapter 3 and their relevance to mitigation efforts, an additional paragraph should be included in this sentence adding a summary of the implications of the discussion in Chpt 3.3 as follows: "Ethical concerns regarding both intra-generational and inter-generational equity can heighten the relative importance of climate change impacts and reinforce the need for policy interventions. In particular, given the asymmetric impacts of climate change on the current world's poor and future generations, any weighting given to the equitable distribution of goods across individuals increases the urgency for mitigation [3.3]."	Taken into account - Section SPM.1 covers these aspects.
28630	SPM	21	3	21	3	SPM.4.3 see comment on SD as scattered in ch. 3 - all Sustainable Development- related information should be merged here. Also the TS-paras listed in remark no.3 on resource efficiency, which is a crucial aspect of SD.	Taken into account - the structure was revised but Sustainable Development permeates so many aspects of the relevant literature that it was not possible to focus the relevant discussion in one place.
28639	SPM	21				A rating on how much different types of policies has already contributed to climate change mitigation is lacking. The importance of sectorial policies does not get clear.	Taken into account - text revised.
26493	SPM	21	2			… after "deployments." include: "Despite little knowledge on the livelihood effects it is estimated that the biomass and biofuels sector provides employment for more than 2.2 million jobs worldwide. This is the highest share ouf of total employment in the renewable energy sector." Source: REN21: Renewables Global Status Report (2012).	Rejected. Space constraints prohibit to discuss this issue. Employment would also be needed to be seen in the context of displacing local, mostly non-commercial livelihood activities (which has not yet been quantitatively assessed, but could possibly be relevant).

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26494	SPM	21	31			Include a new paragraph: " Many mitigation options have significant social co benefits and could result in net employment gains. One method of assessing mitigation effects on employment is to compare employment in terms of jobs per unit of energy capacity. Most renewable energy show higher employment factors as compared to fossil fuel. This is mainly due to higher labor intensity in operation and maintenance. Regarding the levelized cost of renewable energy most are cost competetive to fossil fuels already today if full costs are calculated (that is, including open and hidden subsidies). In addition, because of the more decentralized and location specific character renewable energies often show a higher degree of economic integration in national and local value chains. Policies combining local economic development, income generation, employment creation and low carbon technologies could become drivers of mitigation efforts." Source: Wei, M.; Patadina, S.; Kammen, D.M.: Putting renewabs and energy efficiency to work. How many jobs can the clean energy industry create in the US? in Energy Policy, No 38, pp919-931; and International Institute for Labour Studies (2012), Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy (Geneva, ILO, 2012); and IRENA 2012: Renewable Power Generation Costs in 2012: An Overview. This would be supported by arguments regarding co-benefits in Chapter 3. at 3.5.3.2; Chapter 7 on Energy Systems; Chapter 10 on Industry at P. 44 L 25; Chapter 2 on Assessment, Chapter 11 on Agriculture, Forestry and Other Land Use (AFOLU) at P. 87 L31, and Chapter 15 on Policies.	Rejected - but the literature was reviewed by the underlying chapters.
41054	SPM	21	24	21	26	Mitigation actions that result in co-benefit of energy security. This conclusion is prejudges and does not take into account the need for countries with natural resources to address their sustainable development needs. It is very subjective and politicized science.	Rejected - though the authors are unclear what the reviewer is referring to when stating that the conclusions are politicized, the text was revised to specify the meaning of energy security to avoid misunderstandings.
41055	SPM	21	30	21	31	Developments that make energy system less vulnerable to chocks and stresses. Highly politicized conclusion.	Rejected - though the authors are unclear what the reviewer is referring to when stating that the conclusions are politicized, the text was revised to specify the meaning of energy security to avoid misunderstandings.
41056	SPM	21	42	21	47	Success of climate policy depends on people perception to risks in their choices context. Very subjective conclusion and does not reflect the different social and economic diversity of countries and of course does not take into account the historic responsibility of countries and their societies perceptions about climate change and the need to take actions.	Taken into account - text revised.
41053	SPM	21	8	21	13	Policy design and implementation practices need to consider local priorities. The risks of mitigation policies for developing countries are greater given their social and economic implications.	Noted - it is unclear on which basis the reviewer makes the assertion about higher social and economic risks of mitigation policies in developing countries.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29654	SPM	21	4			In spite of a stated commitment to addressing equity and moral issues in AR5, the SPM completely omits discussion of these concerns. Recommend adding language from chapters 3 & 4 regarding the complexities of addressing equity concerns and distributional impacts of mitigation efforts, especially considering their vital importance in determining the outcome of international climate negotiations. Propose adding language such as: "Ethical concerns regarding both intra-generational and inter-generational equity can heighten the relative importance of climate change impacts and reinforce the need for policy interventions. In particular, given the asymmetric impacts of climate change on the current world's poor and future generations, any weighting given to the equitable distribution of goods across individuals increases the urgency for mitigation [3.3]."	Taken into account - Section SPM.1 covers these aspects.
30663	SPM	21	26	21	27	"Other mitigation options, such as CCS, however, reduce resource efficiency, and thus may have negative impacts on energy security". It's not clear from this paragraph how CCS reduces resource efficiency. Additional explanation would be useful to better understand the point.	Taken into account - text revised.
21543	SPM	21				This finding is vague. If kept should it not include in its in the multi objective framework the need to include the risks related to climate change itself. They also have a transparency problem that could be briefly included in this paragraph (see for instance the finding on page 22 lines 1 to 6). Other uncertainties are the magnitude of possible future events which matter when making judgements, see for instance findings by Weitzman on uncertainty related to the 'fat tail' when assessing the economics of climate change. This type of risk should be highlighted also.	Rejected - this section is about the adverse side-effects of mitigation on additional objectives. Risks and uncertainty related to climate change are dealt with elsewhere in Section SPM.1.
29317	SPM	21	3			Add a paragraph on equity considerations, in line with the call for such analysis in the introduction.	Taken into account - Section SPM.1 covers these aspects.
29327	SPM	21	3			Recommend new paragraph on equity: "Ethical concerns regarding both intra-generational and inter-generational equity can heighten the relative importance of climate change impacts and reinforce the need for policy interventions. In particular, given the asymmetric impacts of climate change on the current world's poor and future generations, any weighting given to the equitable distribution of goods across individuals increases the urgency for mitigation [3.3]."	Taken into account - Section SPM.1 covers these aspects.
20027	SPM	21	39		40	Insert a block between line 39-40 or somewhere appropriate, which corresponds to p.13 line 25-32 of TS, to explain the needs for comprehensive evaluation and status quo of such evaluation.	Rejected - no need for redundancy in such a short summary.
20026	SPM	21	7			Replace "and to avoid trade-offs" with ",taking into account trade-offs", as the problem is to maximize utility of a society, balancing marginal utility of each objective and taking trade-offs into account, where trade-offs almost always (unavoidably) exist.	Taken into account - text revised.
32383	SPM	21	41	25	21	The structure of section SPM.5 appears to be somewhat counterintuitive going from the individual to the international, regional, then national and finally sub-national level.	Accepted - order revised.
32384	SPM	21	41	22	26	If length is an issue, you might consider to shorten this section since many of the aspects raised (risk perception, communication, and response) appear to be somewhat outside the WGIII remit.	Accepted - section removed.
41017	SPM	21	2			Define livelihood effects both in developed and developing country contexts	Livelihoods in the context of bioenergy are fully described in Chapter 11. The SPM does not provide the space for a full definition.
28641	SPM	22	1	22	8	This paragraph could be shortened, it reads mostly descriptive. Focus on the key results of the assessment and be specific.	Taken into account - text revised.
21546	SPM	22	14	22	17	Difficult to understand the language on 'classes'. What is the message that one wants to give to policy makers from this?	Accepted - text revised.
26480	SPM	22	15	22	17	This sentence uses the phrase "choice architecture interventions". Not sure that this will be readily understood by policy-makers. Suggest the authors look at a clearer way to communicate the idea.	Accepted - text revised.
21547	SPM	22	18	22	26	Can this be formulated in more concrete language for policy makers on how they should devise policies?	Accepted - text revised.
28644	SPM	22	22	22	22	"Best designed" is not unambiguous. Please be concise.	Accepted - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28645	SPM	22	23	22	26	Please explain the concepts of descriptive, normative, and prescriptive analysis for non-experts, at least in the glossary.	Taken into account - text revised.
38985	SPM	22	24	22	26	The last sentence in this paragraph uses terminology in a way that appears fundamentally different than the economics literature. It also appears to be more of a policy statement/endorsement than a technical note and thereforethe authors should consider removing the sentence.	Accepted - text revised.
26481	SPM	22	24	22	24	"...may be given to methodologies" - passive sentence, so subject is unclear - suggest making into active sentence.	Accepted - text revised.
23710	SPM	22	25	22	25	Why do you refer "methodologies and decision aids for systematically addressing issues of risk and uncertainty" to "normative analysis"?	Taken into account - text revised.
31286	SPM	22	27	24	24	The carbon markets are discussed from the CDM point of view only.Empirical evidence and lessons learned from existing emission trading systems should be assessed.	Accepted - text revised.
28646	SPM	22	27	22	32	From Ch. 2, p7, line 18-22 should be considered: "Decision-makers often misperceive climate change risks and consequences and place weight on short-run outcomes when making mitigation or adaptation investment decisions (high confidence). Policy instruments that acknowledge these behavioral biases and spread upfront investment expense over time, so the short-term benefits exceed the costs, are likely to perform quite well (high confidence)."	Taken into account - text revised.
28647	SPM	22	27	22	39	Please revise the description of the spectrum of policy approaches. Aside from its rules-based structure, the Kyoto Protocol has targets that are set by the individual nation states largely themselves (with the modification of Art. 3.7ter now for CP2). However, this is far less "centralized" than for example a formulaic allocation regime approach would suggest, in which each country receives a specific target based on a set of agreed indicators. Secondly, the second approach is commonly discussed in the international arena under the key word "policies and measures" which should be included here. Thus, the text on lines 31ff should read something like "At one of the spectrum is strong multilateralism, whereby countries and regions agree to mutually binding rules or standards to guide their actions, for example with a single formulaic allocation based approach of linearly converging per capita emissions. A more flexible approach is to keep mutually binding rules, but to allow flexibility in regard to the target setting - with the Kyoto Protocol being an example of such an approach. A less-centralized approach would structure international cooperation around policies and measures, i.e., harmonized national policies, where national or regional policies are made compatible through, for example, harmonized carbon taxes, cap and trade schemes, or standards. "	Reject. Unlike what the commentor suggests, The SPM text only defines this spectrum along the dimension of centralized authority/formalization. This notion is supported by the underlying text (section 13.4.1) by the more specific discussion of "the degree to which they [approaches to international cooperation] confer authority on multilateral institutions to manage the rules and processes agreed to." Policies and measures has a specific definition in international negotiations. This notion is reflected (briefly) in the underlying text but does not rise to the level of importance of the SPM.
34279	SPM	22	28	22	39	The multilateral approach in dealing with international cooperation on CC response strategies is described in such way that tends to ignore or underestimate the relevance of multilateral efforts / negotiations as the main source of fully participatory and sustained solutions /agreements.	Accepted - text revised.
38986	SPM	22	28	24	24	Section SPM 5.2: This section does not provide a complete overview of the topics covered in Chapter 13 nor does it provide the complete context of international and regional cooperation. Rather, it focuses on only one example the Kyoto Protocol. To provide the full context, two additional paragraphs should be added here: 1) to describe the latest contribution to multilateral climate cooperation, the Copenhagen and Cancun agreements and the associated mitigation pledges and discuss the contribution to the landscape of climate cooperation; and 2) describe the broad range of new international and regional cooperative initiatives and fora working on climate since AR4 (e.g. G8, G20, MEF, CCAC, etc).	Taken into account - text revised. Note that space constraints in the SPM are severe. For more details, please go to cross-referenced sections of the underlying report.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40859	SPM	22	28	22	29	Increasing role of international frameworks other than UNFCCC, including CCAC, MEF, and IEA should be recognized. (cf. 13.3.3)	Taken into account - text revised. Note that space constraints in the SPM are severe. For more details, please go to cross-referenced sections of the underlying report.
30665	SPM	22	29	22	30	Suggest clarifying whether it is truly that the "number of climate policy approaches has increased" (as current text says) or whether this should be rephrased to say that there has been an increase in the number of scenarios or studies examining different policy approaches.	Taken into account - your interpretation is correct. We made this clearer.
23711	SPM	22	35	22	35	Even at the middle level, I would not use the terms "harmonised" or "compatible". At best coordinated. You could consider the whole range of spectrum for different degrees of coordination and cooperation.	Taken into account - text revised.
25279	SPM	22	45	22	45	Change "climate" to "threat of climate change"	Editorial
23501	SPM	22	9	22	17	This can also usefully be framed from a social practice theory perspective which highlights collective (norms, rules, institutions) and 'material' (artefacts, infrastructures) aspects of practices and can thus account for the stability of practices (see Shove, E., et al. (2012). The Dynamics of Social Practice. Everyday life and how it changes. London, Sage).	Noted.
32591	SPM	22	9			This crucial point on "status quo bias" is presented purely in terms of individual behaviour. Yet parallel effects are even better established in terms of systems lock-in literature. Suggest a separate para on this point with the underlying theme being made clear, as partially covered in Chapter 7 (also see my comments on this including the overview in book Planetary Economics (Grubb et al, Chapter 10)	Taken into account - text revised.
25020	SPM	22	9	22	26	This section adopts a pessimistic rather than balanced perspective. The reality is that humans respond differently to change depending on how they perceive its implications. For example, adoption of energy efficient tablet computers has been very rapid. Again, the issue is how to implement effective policies and avoid framing change as painful. This is touched on in lines 18 to 26, but only after human nature has been framed as a problem. Suggest that this section could be rebalanced.	Taken into account - text revised.
24395	SPM	22	9	22	17	Discussions like these ignore the fact that there is a concerted effort to confuse and create doubt in the minds of the public regarding the cause and seriousness of climate change. The scientific community needs to do a much better job of communicating the scientific facts about climate change in a way that the general public can understand.	Noted.
23958	SPM	22	9	22	17	It should be considered to inform about the option to address uncertainties by risk management approaches - a common approach in other policy areas.	Taken into account - text revised.
25278	SPM	22	9	22	17	This message is generic and is not specific to the climate change policy making. It will be useful to tie the message to the specific policy issues which accordingly to the current scientific literature are infleunced by the 'Status-Quo Bias'.	Taken into account - text revised.
38984	SPM	22	9	22	17	The comments on status-quo bias do not provide valuable information with respect to decision making in regards to climate policies/programs. This comment should be rewritten (in a robust and even handed tone) to focus on how this information could be used to impact the optimal transfer of inormation given the interaction with climate policies/programs.	Taken into account - text revised.
40858	SPM	22	9	22	9	This paragraph is also a suggestive paragraph, and please maintain it.	Unclear comment.
28642	SPM	22	9	22	12	From Ch. 2, p7, line 4-7 should be considered: "When taking the uncertainty associated with the link of emissions and climate change impacts into account the effect of uncertainty depends on the decision criterion chosen. If this link involves irreversibilities, thresholds, strong nonlinearities, and/or fat tails, then investments in mitigation technologies should be enhanced (high confidence)."	Taken into account - text revised.
28643	SPM	22	9	22	17	This paragraph reads as a textbook explanation. Please elaborate on the relevance for climate change mitigation and empirical evidence.	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26406	SPM	22	9	22	17	Institutions and individuals generally do not accurately perceive the economic risk-return tradeoffs associated with climate change. Instead, institutions and individuals generally apply a heuristics approach - or rule of thumb approach - to understanding the risk-return tradeoff associated with not mitigating climate change. Prudent institutions need to be encouraged to execute their legal fiduciary duty to maintain stakeholder and shareholder value by accurately percieving the enormity that climate change risk represents to their ability to be a "going-concern" and responding by financing climate change mitigation activities.	Taken into account - text revised.
28640	SPM	22	1	22	8	The section talks about risk perception. In line 6 "uncertainty" is abruptly introduced and further recommendation focuses on uncertainty. This is not coherent. It should be explained, why the shift is made.	Taken into account - text revised.
28648	SPM	22				No mentioning of the European ETS (being the largest emission scheme worldwide as pointed out in Sect 14.3.2.1 of AR5). In particular the limited success of this system is worth to be mentioned in SPM.	Taken into account - text revised.
35206	SPM	22	28	22	39	UNFCCC and its Kyoto Protocol are the legal basis and fundamental framework for the international cooperation to combat climate change; and are widely recognized as the main channel of the international climate change negotiations. Any international or regional cooperation initiatives may facilitate the implementation of the Convention, but shall not replace the Convention. As an intergovernmental body, the IPCC is expected to strengthen the understanding of climate change in order to better address climate change. It should therefore attach more attention to the UNFCCC process where the major intergovernmental efforts have been and will be made instead of various other initiatives which are far less influential and effective. There is wide-spread concern that the deviation of focus will eventually undermine the efforts made under the UNFCCC process and compromise the achievement to be made in future. This opinion should be reflected in both the SPM and Chapter 13 in the underlying report. It is suggested to add the following texts here: “The UNFCCC is currently the only international climate policy institution with both virtually universal membership and the authority to serve as a venue in which governments can negotiate agreements to address climate change. Although an increasingly broad range of policies and institutions, which provide greater efficiency and flexibility, have emerged recently, it is also recognized that these complementary instruments have certain disadvantages, including lower legitimacy due to a lack of universal membership, and lower environmental effectiveness due to insufficient participation and resulting potential emissions leakage to countries outside the agreement.” (13.ES)	Taken into account - text revised.
23118	SPM	22	39	22	39	Add behind "linked": "However, the latter two approaches have neither been implemented nor empirically assessed."	Taken into account - text revised.
41057	SPM	22	9	22	17	Status-quo and bias in human response to uncertainty and change. Once again, very subjective and judgmental. Of course individuals do not want to pay the cost of reacting to climate change, but the question is which society should bear such costs.	Taken into account - section removed.
41019	SPM	22	1	22	8	L1-8 P22 Section on risks and expert judgment Please justify necessity of this section.	Taken into account - section removed.
30668	SPM	23				Suggest adding "harmonized regulations" to this figure. E.g., Canada is aligning its regulatory approach to addressing GHG emissions with that of the US, recognizing the two countries' intricately linked economies.	Noted, but not included since these are only examples.
23712	SPM	23				Figure 14 requires careful discussion as stakeholders and scientists may not have the common understanding, and what is a form of centralisation or decentralisation.How does this matter to the SPM context? A more common framework is to map initiatives inside and outside the UNFCCC/KP. Real decentralisation is observed at cities, sub-sectors etc.	Noted. Full explanation is given in the underlying text and more description has been added to the caption.
33616	SPM	23		23		We do not think this figure is helpfull. We propose to delete it.	Reject, but further explanation added in the caption

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38994	SPM	23				There is no mention in this section on chapter 13 of the de facto current climate architecture through 2020? eg. the Cancun pledges and related MRV plus ADP negotiations. This is a huge omission that leaves the reader with the understanding that the only international agreement on climate is Kyoto. Sections from chapter 13 on the Cancun agreements must be included here.	Taken into account. New discussion added
40870	SPM	23				The definition of horizontal and vertical axis are not clear and mapping may vary depending on interpretation of each explanation. Thus, this figure should be deleted.	Noted. Full explanation is given in the underlying text and more description has been added to the caption.
40868	SPM	23				Plurilateral initiatives such as Major Economies Forum on Energy and Climate (MEF), Clean Energy Ministers Meeting (CEM) and bilateral ones (e.g., Japan's Joint Crediting Mechanism / Bilateral Offset Credit Mechanism) should be incorporated in the Figure SPM 14 from the neutrality viewpoint. (describing only ETS system lacks balance). Unless otherwise, this Figure should be deleted.	Noted, but not included since these are only examples and multilateral clubs and offset certification schemes now included
40869	SPM	23				This figure is presumably based on AR4 (2007) after which many developments in findings have been made. Therefore the overly simplified figure does not adequately exhibit approaches to international cooperation and should be omitted.	Reject, but further explanation added in the caption
28659	SPM	23				Please revise the figure in regard to the separation between "existing" and "proposed" approaches. All listed approaches exist in one or the other form already today, with the exception of the global carbon tax and the "harmonized carbon taxes". The figure seems to have little information content, consider deleting.	Reject, but further explanation added in the caption
29094	SPM	23				Would be useful to make it clear that there are other possible hybrid options not included in this figure.	Noted, these are examples, and some do span wide ranges.
25841	SPM	23	1			It is not clear what the difference between "pledge and review: pledges" and "pledge and review: review" is	Taken into account - figure revised
28649	SPM	23	1	23	1	In contrast to carbon taxation, ETS-systems require clarification on the goal, i.e. the amount of certificates to be created for a time period. Thus it should be much more on the "end" side of the graph then carbon taxes.	Noted. Figure revised to read "ETS linkages" referring just to the linking aspect
28650	SPM	23	1	23	2	The caption of Fig SPM.14 is not fully consistent with the corresponding Figure 13.2 in chapter 13, page 25. Please use the same titles.	Taken into account - caption revised.
40862	SPM	23	10		11	It is not appropriate to asses effectiveness of JI only based on low trading volume. As a matter of fact, amount of issuance has been increasing dramatically recently.	Noted, no longer discussed here
28654	SPM	23	10	23	10	If the authors would like to state the reason of why the JI has not "been as effective as its theoretical potential", then they ought to include "weak rules" as well. The listed low trading volume is to some degree just a symptom of decreased demand for JI credits that are perceived to be less credible than CDM credits in many instances.	Noted, no longer discussed here
21551	SPM	23	11	23	17	The text hints that environmental effectiveness depends on a number of factors. Can the text be more specific how these interact and how these can be improved. For instance a criticism has been that indeed some CDM projects offered vast scope for rents, making them a tool where very large profits were made for a given amount of mitigation. Or in other words, if the instruments would have been designed differently, it could have achieved higher reductions for a given amount of money paid for the credits, thereby being more effective in reducing emissions for a given financial transfer. Furthermore certainly JI has been criticised that it could result in transfer without actual additional emission reductions (this risk relates specifically to JI projects under 1st track JI). Actually more recent issuance data on both CDM and JI seem to indicate higher volumes of issues credits as listed here.	Taken into account, although the discussion of the CDM has been greatly shortened due to space limitations
40863	SPM	23	11	23	17	Half of CDM projects are hosted in one country (EXECUTIVE BOARD ANNUAL REPORT 2012). It would be better to analyze the cause of such a biased mitigation technology transfer.	Noted and discussed in chapter, but insufficient space to discuss here
32206	SPM	23	13	23	13	USD 1.15 billon	Noted, no longer discussed here

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40864	SPM	23	13		17	This sentence does not assess effectiveness of the CDM whereas IET and JI are assessed in previous sentences. There should be elements which are effective and ineffective in the CDM and those should be analyzed with reasons.	Noted and discussed in chapter, but insufficient space to discuss in great detail here
21552	SPM	23	17	23	26	The principle of common but differentiated responsibilities and respective capabilities is well recognised, but is not limited to annex I parties. Please make that clearer. The paragraph would benefit from indicating relative global share of emissions of Annex I and non Annex I now and in the future. Furthermore the fact that flexibilities are included in the Kyoto Protocol only seems to matter for those with a binding emission reduction target when making a decision to ratify or not, this are hardly 190 parties.	Taken into account. CBDRRC is discussed only in the underlying text now due to space. Emissions trends are discussed in the context of drivers.
40866	SPM	23	17		21	"Common but differentiated responsibilities and respective capabilities" is a "principle", not a "goal" of the UNFCCC and should be revised.	Taken into account. CBDRRC is discussed only in the underlying text now due to space.
40865	SPM	23	17	23	21	Common but differentiated responsibilities and respective capabilities" is a principle", not a "goal" of the UNFCCC and should be revised.	Taken into account. CBDRRC is discussed only in the underlying text now due to space.
28655	SPM	23	17	23	17	What does "distributional impacts" mean?	Defined in the framing chapters
38990	SPM	23	18	23	21	The statement that Kyoto emissions targets were applied to the wealthiest and most responsible for the current stock of global emissions is not accurate. Whether considering the 1st or more limited 2nd commitment period, those countries subject to targets are not necessarily the wealthiest. It is important to note that in 2011, 5 of the top 10 wealthiest countries (in GDP/capita) are non-Annex I and 50 non-Annex I are more wealthy than the lowest Annex I Party. And this is not just a new development: in 1990 4 non-Annex I countries were in the top 10. It is also not accurate to say that Kyoto commitments encompass parties that represent the greatest contribution to emissions. Several analyses have shown that emissions are distributed evenly between developed and developing countries when both energy and land use sources are taken into account (see work from MATCH - www.match-info.net). Finally, it is also inaccurate to say that Kyoto is therefore fully consistent with the principle of CBDR, which is much broader than these specific criteria, and for which there is no single definition wiht which to be consistent with.	Taken into account. Text heavily revised
38991	SPM	23	18	23	21	There is not sufficient agreement on the interpretation of the phrase CBDR for anything to to be deemed as "consistent" with it.	Taken into account. CBDRRC is discussed only in the underlying text now due to space.
38992	SPM	23	19	23	20	It's worth backing up this assertion with some numbers to illustrate what the "majority" really is. For example, one can use the MATCH database which includes CO2, CH4 and N2O from all sectors (www.match-info.net) and shows that from 1751-2010 A1 nations account for 56% of emissions whereas NA1 nations account for 44% - probably not the disparity most people have in mind.	Taken into account. Text heavily revised
28656	SPM	23	19	23	19	Exchange the expression "responsible" with a more neutral expression, e.g. "those who have emitted the majority of the current stock of anthropogenic GHGs in the atmosphere."	Taken into account. Text heavily revised
23825	SPM	23	20			"consistent with UNFCCC". Well, as you write it says "common but differentiated responsibilities and respective capabilities". That does not seem to say wealthy countries mitigate and poor countries don't. It may imply that wealthy do more, but it does not say that others do nothing. Keep to the facts and not the politically correct interpretation of the text.	Taken into account. CBDRRC is discussed only in the underlying text now due to space.
30457	SPM	23	21	23	21	It would be very useful to include an annex that lists all countries by income- and emissions pr. capita now that the SPM refers to non-Annex B Parties with higher income than some Annex B Parties. The annex could also list whether the countries are Annex B or not.	Accepted - Annex II of the report provides information on country groupings.
27281	SPM	23	21	23	22	Reference to "non-Annex I countries with higher per capita income than the poorest of the Annex I countries" is inadequate. Such an analysis must also include social development indicators.	Taken into account. Text heavily revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25281	SPM	23	21	23	22	This sentence may not be relevant - Comparison of per capita emissions may be more useful than comparing per capita income	Taken into account. Text heavily revised
22379	SPM	23	21	23	22	The inclusion of the sentence "However, by 2011, approximately fifty non-Annex I countries had higher per capita income that the poorest of the Annex I countries" is, in the context of the immediately preceding and succeeding sentences, a complete non sequitur. There does not seem to be aby logical reason as to why such a sentence has been included. It should be deleted.	Taken into account. Text heavily revised
40867	SPM	23	22	23	26	Specific name of the countries (e.g., China and India) should be described for the intensive distribution of the CDM projects. Also, cause of such distribution should be described.	Rejected. Text heavily revised
26482	SPM	23	22	23	24	The information in the sentence "The geographical distribution of CDM projects across developing countries has been uneven, with 80% of CDM projects in Asia and less than 3% in sub-Saharan Africa" doesn't seem to be in the underlying sections quoted (13.7 and 13.13). It is however a useful piece of information, but is incomplete as it does not include the reason for this distribution. Distribution of CDM projects reflects level of industrialisation and it would be useful for policy-makers to have this information included.	Noted. This is now only discussed in the underlying chapter due to space constraints
30430	SPM	23	23	23	24	This is a series of leading questions rather than an assessment. The report should provide an assessment.	Noted
21400	SPM	23	24	23	26	Even though the Kyoto Protocol was ratified by more than 190 countries, the total CO2 emissions from the Parties under the obligation of the Kyoto Protocol accounts for only 27% at the first commitment period and 14% at the second commitment period. In this regard, it is incorrect to mention that Kyoto Protocol attracted high levels of participation.	Noted. Text revised.
38993	SPM	23	24	23	26	It is not accurate to say that because Kyoto was ratified by 190 parties that it demonstrates institutional feasibility. The fact that Kyoto only applied to a limited number of countries (in terms of mitigation commitments), one of the world's major emitters refused to ratify, no additional countries have taken on targets under Kyoto, and in fact several countries have either pulled out of the Protocol or declined to make commitments in a second commitment period seem to indicate just the opposite. Also, all of the countries that made commitments for a 2nd commitment period also pledged those same targets under the Copenhagen/Cancun structure, so it is difficult to say that in the absence of Kyoto, those commitments would not exist. The high rate of ratification could be attributed to the flexibility but is almost equally if not more attributable to the fact that it only applied to a very small number of countries representing a small portion of global emissions.	Noted. Text revised.
31287	SPM	23	3	23	26	Align messages on the Kyoto protocol efficiency between SPM and TS : one is negative (SPM) while the other (TS : p.55 line 29 to 41) is more favourable to the Protocole and its mecanisms.	Taken into account - text harmonized
23502	SPM	23	3	23	6	Re emission reductions - only true from a production-based/territorial perspective?	Taken into account - section SPM.2 provides detailed information in this aspect.
30666	SPM	23	3	23	6	Suggest splitting the text on lines 3-6 into two sentences and adding info about what the Annex 1 countries' aggregate goal is under the Kyoto Protocol to the first sentence. That is, sentence 1 would read: " In terms of environmental effectiveness, emissions reductions have exceeded the Kyoto Protocol's first commitment period goal for Annex 1 countries of reducing emissions by an average of 5 percent against 1990 levels over the period 2008-2012." The second sentence would begin with "Aggregate GHG emissions from Annex 1.....etc."	Noted. Text revised.
25842	SPM	23	3	23	6	The term "environmental" does not seem appropriate in this context, change to climatic	Rejected - environmental effectiveness is a standard term in policy evaluation. Also see section 3.7.1.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25647	SPM	23	3	23	26	This part should be kept in the final version report because it is important to explain the mixed performance of the Kyoto Protocol. In addition, this part should also mention that the principles of the Convention should appropriately reflect various changes since 1992 about the actual situation of international community.	Noted.
22889	SPM	23	3	23	26	KEEP this para as it is important to highlight that the perfomance of KP was mixed.	Noted.
25934	SPM	23	3	23	7	same as above of No.1 comment	Noted.
24396	SPM	23	3	23	26	This provides an honest and helpful self-evaluation of the effectiveness of well-intentioned UNFCCC efforts. This report needs to identify solutions and should also give an honest self-evaluation of the impacts of the three AR4 volumes. This and the other AR5 reports should be written in much more accessible language.	Accepted - text revised.
25900	SPM	23	3	23	26	This paragraph may mention the positive expected contribution of CDM - Programmes of Activities to facilitate the implementation of mitigation projects in developing countries contributing, at the same time, to energy access for all, in other words, contributing in a more direct manner to sustainable development.	Taken into account - text revised.
23826	SPM	23	3	23	26	I suggest to split this into several points.	Taken into account - text revised.
25280	SPM	23	3	23	26	The assessment of the performance of Kyoto Protocol convey several mixed messages. It would be useful explain the underlying issues and the causes of the performance of Kyoto Protocol vis-à-vis different indicators (e.g. extent to leakage, contribution of Non-Annex countries to the mitigation, capacity building for the post-Kyoto period, distributional impacts etc.).	Noted. The assessment of the Kyoto Protocol is conducted along 4 dimensions (as established by the framing chapter) and reflects the balanced discussion in the chapter.
26122	SPM	23	3	23	17	The text refers to carbon leakage only in the context of the CDM, while the para as a whole deals with the KP as a whole. A much more important issue politically is the carbon leakage from countries with QELROs in CP1 to other countries. There is nothing in the text about this. What is the best scientific estimate about the magnitude of this leakage and the related uncertainty? Overall, this paragraph focuses very heavily on the Kyoto mechanisms - what about the other aspects of the KP, e.g. compliance regime, MRV system etc.??	Taken into account - text revised.
26121	SPM	23	3	23	26	The paragraph analyses the performance of the Kyoto Protocol. The text seems to suggest that the distributional impacts of the Kyoto Protocol, such as the geographical distribution of CDM projects, would be a measure of the Protocol's performance. While the distributional impacts are important, it is a matter of judgment whether they really measure the performance of the Protocol. Environmental effectiveness and level of participation are much more obvious factors of performance.	Noted. The assessment of the Kyoto Protocol is conducted along 4 dimensions (as established by the framing chapter) and reflects the balanced discussion in the chapter.
25049	SPM	23	3	23	26	Keep this paragraph.	Noted.
38987	SPM	23	3	23	26	This paragraph highlights the ineffectiveness of the Kyoto Protocol, but then ends on a misleading high: "This relatively high rate of participation may be due, in part, to the substantial flexibility provided by the Protocol. [13.7, 13.13]" To the uninitiated this could read like a success; suggest rewording to better reflect declining influence and effectiveness of this system.	Taken into account - text revised.
32453	SPM	23	3	23	26	Regarding the performance of the Kyoto Protocol, it should be remained since the challenges are also clearly mentioned.	Noted.
40860	SPM	23	3	23	26	The objective assessment of the Kyoto protocol is important, and maintain this paragraph. However, this paragraph is rather redundant and possibly to be shaped-up.	Taken into account. Text revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28651	SPM	23	3	23	26	Key messages of the main report on the outcome of the CDM are lacking e.g.: "The additionality issue (Gupta, Tirpak, et al., 2007, p. 779f; IPCC, 2007) continues to generate controversy, despite an increasing elaboration of additionality tests by CDM regulators (Michaelowa et al., 2009). On the one hand, (Schneider, 2009) found that key assumptions regarding additionality were often not substantiated with credible, documented evidence, in a sample of 93 projects. On the other hand, (Lewis, 2010) finds a clear contribution of the CDM to the rapid upswing of the 46 renewable energy sector in China.	Taken into account. A revised summary of the CDM included (only one sentence due to space constraints)
23822	SPM	23	4	23	6	What is the end year of the % changes? Is this based on official UNFCCC inventories or the EDGAR data as elsewhere in the report?	Taken into account - text revised.
23823	SPM	23	4	23	6	The success of the KP is based on a territorial perspective, and it is clearly not successful if you take a consumption perspective http://www.pnas.org/content/108/21/8903.abstract. It is worth mentioning, at least, the importance of system boundary in measuring the effectiveness of a global externality.	Taken into account - section SPM.2 provides detailed information in this aspect.
38988	SPM	23	4	23	5	What year's emissions is this statement referring to - 2010? "... emissions from A1 countries have fallen by 14% since 1990..."	Taken into account - no longer discussed here
28652	SPM	23	4	23	4	Does this refer to Annex B countries? With US or without?	Taken into account - no longer discussed here
20828	SPM	23	6	23	7	It is true that the scale back of GHG intensive industries affected the GHG emission reduction. However, many efforts to improve the technologies and to transfer them to developing countries made much sense. This point should be taken note.	Taken into account - no longer discussed here
23713	SPM	23	6	23	7	"most of these cuts may have been due to the scaling back of GHG-intensive industries in the transition economies": this sounds rather outdated. This may be the case for Annex I Parties with surplus AAUs. More recent reductions can be attrubuted to economic recessions triggered by financial crisis.	Taken into account - no longer discussed here
21548	SPM	23	6	23	7	The 14% reduction compared to 1990 is in which year? Nothing that the EU15 have reduced GHG emissions excluding LULUCF by 2011 by 14,6% compared to 1990 (data from recent inventory submission from EU to UNFCCC), it is unclear if one can conclude that most cuts came from scale back of industries in transition economies. Only giving this information might give the wrong impression that in other regions no large scale reductions took place.	Taken into account - no longer discussed here
23824	SPM	23	6	23	7	"scaling back of GHG-intensive industries". Well, I have never heard the economic collapse of a group of countries called scaling back. This terminology makes it sound like it was deliberate and controlled. The fact is these economies collapsed and this is why there was a drop in emissions. State the facts without trying to make it sound nice.	Taken into account - no longer discussed here
38989	SPM	23	6	23	7	This point reiterates that the feasibility - and true ambition of - commitments, etc. are highly dependent on the choice of base year. In this case, choosing a base year of 1990 has a considerable difference as opposed to choosing a base year of, say, 1995 or 2000 or 2005. Explicitly stating this is an important note for policymakers to understand.	Taken into account - no longer discussed here
28653	SPM	23	6	23	7	Please, present a more differentiated picture of the emission reductions in developed countries, such as development of those members and non-members to the KP, and those that pulled out the KP.	Taken into account - no longer discussed here

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22378	SPM	23	6	23	7	The sentence "However, most of these cuts may have been due to the scaling-back of GHG-intensive industries in the transition economies" needs to be reworded because it is ambiguous. In fact, the Annex I countries (other than the Annex I economies in transition) have not reduced their aggregate emissions below 1990 levels (despite their commitments under Art. 4.2(a) and (b) of the UNFCCC), as can be seen in the UNFCCC's official GHG data (excluding LULUCF) at http://unfccc.int/files/inc/graphics/image/jpeg/ghg_total_excl_2012t.jpg, showing that non-EIT Annex I countries' GHG emissions grow 9.2% in 2000, 11.2% in 2005, and 4.9% in 2010, above 1990 levels. While the EU's emissions fell by 2010 to 15.4% below 1990 levels, most of the other big non-EU Annex I economies' emissions have increased far beyond their 1990s levels by 2010 - e.g. Norway by 8.2%, US by 10.4%, Canada by 17.4%, New Zealand by 19.8%, Australia by 30% (see http://unfccc.int/files/inc/graphics/image/jpeg/ghg_total_excl_2012c.jpg). Annex I aggregate emission reductions have, between 1990 and 2010, clearly and unambiguously been driven by the economic collapse and consequent emission reductions in Annex I economies in transition after 1990. Hence, the sentence should be reworded by simply deleting the word "may".	Taken into account - no longer discussed here
21549	SPM	23	7	23	7	The heading of this paragraph indicates that the environmental performances has been mixed. As such it would be informative to indicate to what extent emissions have increased on a global scale, even if in Annex I they have decreased.	Taken into account - no longer discussed here. This is discussed in the context of drivers.
30429	SPM	23	8	23	8	Does this refer to the EU ETS?	Noted, no longer discussed here
21550	SPM	23	8	23	9	This statement is wrong given that trade in the ETS by companies across EU countries borders eventually is matched by IET trade between Member States.	Noted, no longer discussed here
26120	SPM	23	8	23	11	It seems "cost-effectiveness" here refers to the volume of activity rather than to the effects of the activity. Cost-effectiveness is however often understood also as the ability of a mechanism to reduce costs of climate policy in order to achieve the same result. Is there scientific evidence that JI and IET have not succeeded in this respect? If not, the text can be misunderstood. If the intention is to focus on volume of the activity, it would be useful to mention the volumes and the text could be clarified.	Noted, no longer discussed here
40861	SPM	23	8		9	During the 1st commitment period, EU-ETS was implemented under IET of the KP. This fact should be considered in the analysis.	Noted, no longer discussed here
28658	SPM	23	25	25	26	The sentence should be deleted. The high rate of participation is due to a whole set of reasons. If the authors would like to highlight the role of flexible mechanisms (and their potential role in a new UN regime) this should be related to the successes of CDM or the ETS.	Noted. Text revised.
23119	SPM	23	13	23	17	Substitute "However … projects" by "The effectiveness of the CDM was reduced by projects that were not motivated primarily by expected revenue from the sale of the emission credits and challenges to calculate the baseline from which emission reductions were calculated."	Taken into account - text revised.
28657	SPM	23	20			CBDR is not a UNFCCC goal, but a principle. The ultimate goal is outlined in Art. 2 UNFCCC. It is very important to get this right. Suggestion: "consistent with the UNFCCC principles including the principle of “common but differentiated responsibilities and respective capabilities.”	Taken into account. CBDRRC is discussed only in the underlying text now due to space.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35207	SPM	23	3	23	26	The assessment of the KP's impact on mitigation of developed countries is too general. It is suggested to make the following revisions: "As the first instrument with legally binding mitigation commitment, the Kyoto Protocol plays an important role in facilitating global efforts in addressing climate change. Firstly, for Parties with quantified emission reduction targets, the KP has certain impacts on their climate policies and actions including climate legislation, national mitigation strategy formulation, and cost reduction through the KP flexible mechanisms, which all have facilitated the fulfillment of mitigation commitment made by those Parties. Secondly, the KP is a reflection of the UNFCCC "common but differentiated responsibilities and respective capabilities" principle. Thirdly, the CDM under the KP has contributed in promoting sustainable development, raising the awareness of climate change and strengthening capacity building in developing countries. However, the effectiveness of the KP is largely compromised by the facts that the emission reduction targets under the KP are relatively low and some developed countries either refuse to ratify or have withdrawn from the KP.	Taken into account - text revised.
30667	SPM	23	21	23	22	In discussing the Kyoto Protocol, this sentence highlights that as of 2011, approximately 50 non-Annex I countries had higher per capita income than the poorest of the Annex 1 countries. In the context of highlighting how circumstances have changed by 2011, it may be appropriate to note here that a number of non-Annex I countries' emissions have surpassed those of Annex-1 countries.	Taken into account. Text heavily revised
41020	SPM	23				not necessary in the SPM	Noted, but not included since these are only examples.
41021	SPM	23	3	23	26	Too detail discussion on the Kyoto Protocol, not significant in SPM. Instead challenges and complexity of such mechanism shall be elaborated with statistics on projects and issued certified emission reductions. Also future learning from CDM architecture could enhance designing robust new market mechanism and could be a basis for negotiation.	Taken into account - text revised.
20199	SPM	24	1	24	2	please include a note on "the elephant in the room": none of the approachess except for the CDM and JI have to date delivered any meaningful mitigation and mobilized private sector financing. The CDM is often compared to other policy instruments in terms of harmonization etc. which is inappropriate without mentioning that the other approaches have been nothing than theoretical drawing-board/wishful thinking as opposed to the CDM/JI that mobilized billions of private sector money and has delivered over 2 billion emission reductions, with payment on delivery. All other costs count as transaction costs. In other words, whereas pledge and review as well as a global carbon tax for example have been on the drawing board for decades, the CDM has achieved above-mentioned within one decade. Every ton of CO2 from a renewable energy project in India for example has delivered sufficient electricity to power the needs of a four-head family for over one year! That is effective SD benefit. Also, it is worth noting that the CDM has identified novel abatement potentials and technologies and shown their marginal abatement costs at an an enormous speed, see for example the industrial gas projects: HFC23 and N2O from adipic acid production can be achieved large-scale at below 50 EURc per tCO2. Who whould have known that before 2005 and why do we exactly know all point sources of these two gases today? Because of the CDM.	Rejected. This figure is not intended to assess policy performance. That is discussed elsewhere in the SPM and the underlying text.
30458	SPM	24	1	24	5	Line 1-2 of this paragraph should be removed: TS p. 55 line 4 reports that there is only 'limited' evidence for the underlying estimate and the draft WGIII report states that 'estimates of current climate finance remain uncertain' (WGIII, chapter 16 p. 9). Alternatively, the definitions, assumptions, and calculations of the study reported should be explicitly laid out in the SPM paragraph.	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27282	SPM	24	1	24	24	The definitions of "current climate finance" and "public international climate finance flows" are not sufficiently sound, in relation to the figures presented. It should be included in the SPM the following paragraph contained in page 6 of Chapter 16, lines 33 to 36: "Under the UNFCCC the term climate finance is not well defined. However, it is much narrower in scope. It is limited to international flows from Annex II governments to developing countries to cover the agreed full incremental costs of mitigation actions, assistance in meeting the costs of adaptation to the adverse effects of climate change, and the full cost of various reports and activities."	Accepted - text revised. Please note that details on this aspect are provided by box TS.14.
38997	SPM	24	1	24	11	Climate finance is not well defined as the CPI number does not cover all sectors, such as the transport sector, household building or heating, or industrial/commercial energy efficiency sectors. The report should note sectors not included in estimates that could have significant impact.	Accepted - text revised. Please note that details on this aspect are provided by box TS.14.
38996	SPM	24	1	24	2	It is confusing to simply say that "climate finance reported under the UNFCCC accounts for less than 3% of current climate finance." A more accurate phrasing might be: "Climate finance reported as part of the formal reporting requirements of the UNFCCC accounts for a very small percentage of all current climate finance flows."	Taken into account - text revised.
38995	SPM	24	1	24	5	It's unclear here what the authors mean by "reported under the UNFCCC". Do they mean climate finance that has been reported as part of UNFCCC National Communications? If so, the authors need to specify that. Also need be clear that reporting requirements under the UNFCCC have improved in recent years, so better data should be available for more recent years, especially now that the common reporting format for the Biennial Reports has been developed.	Accepted - text revised. Please note that details on this aspect are provided by box TS.14.
28660	SPM	24	1			"Climate finance reported" please add a short explanations what these numbers comprise.	Accepted - text revised. Please note that details on this aspect are provided by box TS.14.
28663	SPM	24	1	24	2	There should be two separate sentences. Unclear, whether "15-25% of the public international climate finance" refers to "Climate finance reported under the UNFCCC accounts" or refers to "3% of current climate finance". (see comment to ch. 16, p. 4, lines 11-12 and to TS, p. 55, lines 11-12). Make two sentences out of one: Climate finance reported under the UNFCCC accounts for less than 3% of current climate finance. About 15-25% of the public international climate finance flows to developing countries (medium evidence, medium agreement).	Taken into account - text revised.
28662	SPM	24	1	24	5	There should be additional information/assessment to support a better interpretation of these numbers. Please explain, which climate finance is reported under UNFCCC and which is not.	Accepted - text revised. Please note that details on this aspect are provided by box TS.14.
28661	SPM	24	1	24	8	Is "climate finance" in line 1 the same as "mitigation finance" in line 8.	Taken into account - text revised.
22380	SPM	24	1	24	5	There should be a reference in this paragraph to Article 4(3) of the UNFCCC with respect to the provision of climate finance as a treaty commitment on the part of Annex II countries.	Taken into account. Para has been deleted. Reference to the 100 USD billion commitment is made in the end of new SPM section 4.
31702	SPM	24	10		11	This reads as though it is about investments in developing countries, not climate investment overall which can be driven by other policies.	Accepted. Text has been revised.
21554	SPM	24	10	24	10	replace "cover" by "reduce" at the end of the line so the phrase reads: "… public sector institutions to reduce the incremental costs and risks …"	Accepted. Text has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25648	SPM	24	12	24	24	This paragraph should be deleted completely because there are also many demerits of linkages among programs. It is prejudicial and misleading to make only the first sentence bold style. In addition, Market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). In addition, CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, do not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No9 line of this table.	Taken into account - text revised.
25282	SPM	24	12	24	24	This para seems more focused on European union type of regional co-operation - instead you should be more general, representing other regions as well.	Taken into account - text revised.
39000	SPM	24	12	24	24	This paragraph focuses on one single form of policy linkage (carbon markets), disregarding the vast majority of regional, national and sub-national cooperation frameworks currently in use. Markets also represent only a small fraction of relevant actors and emisisons. This paragraph should more accurately reflect the state of regional cooperation and effectiveness and opportunities created by each.	Noted. Text substantioally revised but also shortened due to space constraints. No room for additional exxamples
40871	SPM	24	12	24	24	There are some fora without carbon market, eg., Major Economies Forum on Energy and Climate (MEF), Global Superior Energy-efficiency Partnership (GSEP), and so on. Various kinds of regime should be covered in this part from the neutrality viewpoint.	Noted. Text substantioally revised but also shortened due to space constraints. No room for additional exxamples
20200	SPM	24	13	24	18	The "however" is inappropriate and it is wrong to say that additionality is about the project developers' motivation. Additionality as defined in the modalities and procedures of the CDM is defined as an assessment of whether or not the project scenario is a plausible baseline scenario. Otherwise, a wind farm that is installed in an otherwise fossil-fuel dominated country for reasons of personal environmental conscious by the project owner for example would not qualify as additional, which in turn would be difficult to assess objectively and counterproductive i.e. generate perverse incentives. The only thing that matters is to prove that the most likely scenario would be more GHG intensive. Additionality has been questioned time and again and the relevant experts have found no evidence that proves that issued CERs come from non-additional projects. Also, the rules have been tightened during the years, so that today even highly additional projects do not make it through to registration, which makes these tightened rules counter-productive. Same goes for leakage: no evidence has been found that issued CERs have caused leakage. On the contrary: The methodologies are so conservative that the effective mitigation effect of these projects is much bigger than what they get credit for. In short: I suggest to delete line 13 to line 17 as it suggests there is something wrong with the CDM, which it is not. The CDM has delivered exactly what it was asked to. If then 10 years later something else is asked for, for example because many non-Annex I countries have become richer than Annex-I countries that is an important but different matter and it should not be insinuated that the CDM is responsible for that.	Taken into account - text revised.
23714	SPM	24	14	24	14	Carbon markets can help us coordinate regional policies, but the effect would be much smaller due to the significant fall in carbon prices (EUA and CER). I wonder if "policy coordination"is more often used than "policy linkage".	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
39001	SPM	24	17	24	23	In line 17 it states that "The benefits of policy linkage may include lower mitigation costs", but then it goes on to state (in line 23), "policy linkage... [may lead to] an increase in mitigation costs." While both statements may in fact be true, it's worth expanding on the conditions and/or uncertainties that would validate both cases.	Noted. Text substantially revised but also shortened due to space constraints, so this point is no longer discussed in the SPM
21555	SPM	24	22	24	24	In principle there should be no increased costs if one refers here to the linking of trading systems, because highe carbon prices in one region rather offer a opportunity to sell into this market,	Noted. Text substantially revised but also shortened due to space constraints, so this point is no longer discussed in the SPM
26124	SPM	24	22	24	23	Text is speculative. Increase in price is not necessarily related to ambition only, but also to factors like mitigation potential. Proposal for change: "…among them).. While linking can reduce costs in some countries, it may also lead to an increase in mitigation costs in other countries."	Noted. Text substantially revised but also shortened due to space constraints, so this point is no longer discussed in the SPM
23503	SPM	24	25	25	21	Distributional implications of mitigation policies are also very relevant because they affect acceptability and thus effectiveness - include this in one of the paragraphs?	Accepted - aspect is included.
25283	SPM	24	25	24	25	This section SPM 5.3, Is focused more on market and price mechanisms - There is a need for balance between this and public interventions	Accepted - added more details on direct regulatory approaches.
39002	SPM	24	25	25	21	The discussion of policies is incomplete. It does not seem to (explicitly) address policies beyond end-of-pipe mitigation approaches and price signals. CDR and other geoengineering approaches have significant international policy implications that are not addressed here. Although there is some discussion here of behavioral constraints, these tend to be associated with energy efficiency and consumption, and do not address other social factors that drive energy and emissions growth and potential policy mechanisms to respond to those drivers. These drivers are discussed in Ch 5 but are not included here.	Taken into account - some of these aspects are treated in sections SPM.2 and SPM.3.
28665	SPM	24	25	24	25	This chapter should simply be called "mitigation policies", since the described mitigation options are not specific to a National or Sub-National level.	Taken into account - the title is chosen such that a differentiation to international approaches is made clear.
25373	SPM	24	26	24	29	It should be described that the combination of polices needs to be decided by taking into account not only positive effects but also negative impacts in economic activities and civil life.	Accepted - text revised.
24397	SPM	24	26	24	36	"There is no best policy for mitigating climate change (high confidence)." Can you truly make such a sweeping statement with high confidence? Would it not be better and more accurate to state that no single best policy has been agreed upon? Some economists will argue that a sufficiently high carbon tax would be the most effective policy.	Taken into account - text revised.
25284	SPM	24	26	24	26	"No best policy" - Does anyone expect a single best policy? This para is more generic to be of policy relevance	Taken into account - text revised.
25285	SPM	24	26	24	26	The sentence may be like; there is no single/universal best policies	Taken into account - text revised.
25286	SPM	24	26	24	36	The section only presents generic information about the policies and instruments. There are already numerous national and sub-national policies and measures being implemented in many countries. It would be more useful to assess the expereinces from implementation of these policies and measures and to delineate 'Best Practices' and also lessons from not so successful practices.	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
39003	SPM	24	26	25	21	Section SPM 5.3 overlooks a key policy for mitigating climate change, direct regulatory limits on GHG emissions such as would be provided by an emissions cap on a given unit or via application of a GHG emissions performance standard. This is one approach being taken by U.S. EPA in response to the U.S. Supreme Court ruling in Massachusetts versus EPA. The authors might check to see if it has also been adopted by some Canadian provinces. This policy type is not listed in the text, or given a role in Table SPM.1 The role of this policy type is generally to require actions that increase operating costs for a given facility or entity, but provide long-term economic, environmental, and security benefits to the people of a nation (e.g., protect the commons)	Accepted - text revised.
29095	SPM	24	3	24	4	For consistency (with later reference) and balance suggest this should read 'an average of around USD 10 billion per year rather than 'less than…'.	Noted. The para has been deleted. Chaper 16 elaborated in more detail on FSF commitments.
20096	SPM	24	31	24	33	This assertion implicietely assumes that in stable developed countries, market instruments are more efficient that tradtional regulatoy framworks (legislations, norms…), which has to be proved, and probably vary greatly across cases and sectors	Taken into account - text revised.
22381	SPM	24	31	24	33	The assertion in this sentence does not seem to be supported by the literature discussed in Chapter 15. In the reference sections indicated for this paragraph (Chap 15, Sections 15.5, 15.6, and 15.8), the references to "property rights" were with respect to intellectual property rights and land property rights, but the discussion in these sections with respect to these types of property rights does not necessarily support the assertion in this sentence.	Taken into account - text revised.
21557	SPM	24	37	24	46	The discussion on which instrument creates most certainty seems to be unbalanced. Taxes can create similar certainty or uncertainty on the short and long term as feed inn tariffs. The later also have regulatory risk, as demonstrated by retroactive changes that have occurred in some systems. Feed in tariffs are limited to specific technology options and do not give incentives for a broad set of options and reduction strategies as carbon pricing does. Carbon pricing through emission trading has benefits in relationship environmental outcome/risk, and can create certainty about long term ambition level of sectoral or economy wide reduction target, doing so at lowest cost. For instance a feed in tariff for a low carbon technology might promote this technology on the short term but does nothing to disincentivise investments in carbon intensive technologies (e.g. would a feed-inn tariff for lets say wind really discourage investments in coal?). Emission trading can also set higher marginal incentives in the form of carbon pricing while still limiting direct costs for those affected through free allocation. See for instance also empirical studies by Ellerman et al. (http://fsr.eui.eu/Publications.aspx?FSRPublicationsListing1_Types=0%2f304%2f1847%2f1852%2f1943) on the EU ETS or the detailed annual market surveys by Point Cabon that clearly indicate the carbon pricing impacts investments decisions. Furthermore different instruments have costs for different actors, i.e. who pays any bill and have certain instruments not hidden costs and risks in the form of focussing on specific technologies? As such this text is not balanced and should be reworded or deleted.	Rejected - FITs create contractual obligations which are perceived to be less prone to changes than taxes.
30431	SPM	24	4	24	4	the FSF is $30bn and this has been delivered. The report should be clear on this.	Noted. The para has been deleted. Chaper 16 elaborated in more detail on FSF commitments.
21553	SPM	24	4	24	4	USD 28 billion should be replaced by "more than USD 30 billion" in line with the provisional FSF reports presented in Doha.	Noted. The para has been deleted.
38998	SPM	24	4	24	5	This statistic - $28 billion - should be updated based on official information presented at the Doha climate conference. Donor contributions to fast start finance exceeded $33 billion, and this was the basis of the COP decision acknowledging the fulfillment of the fast start finance commitment.	Noted. The para has been deleted. Chaper 16 elaborated in more detail on FSF commitments.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28664	SPM	24	4			The Fast Start Commitment is 30 billion USD. It is a political commitment and not a technical value being the result of extensive economic calculations. Therefore, a price-adjustment is not appropriate. Moreover, in other parts of text (e.g. ch. 16, p. 12, line 31), the commitment of 30 billion USD is mentioned - without price adjustment. (See comment to ch. 16, p. 4, line 14 and to TS, p. 55 line 14). See also description of "Copenhagen Accord" in Annex I.	Noted. The para has been deleted. Chaper 16 elaborated in more detail on FSF commitments.
29096	SPM	24	4	24	5	The figure for Fast Start finance delivered needs updating now. Reports presented by developed countries at Doha suggest that developed countries have delivered a total of around $33bn.	Noted. The para has been deleted. Chaper 16 elaborated in more detail on FSF commitments.
20882	SPM	24	44	24	46	Why can you see FIT have the effect of stabilizing long-term expectations, a feature that has been found to stimulate the level of investment relative to the magnitude of the subsidy? Could you please explain with some concrete examples?	Taken into account - text revised. Please note that more details are provided in the Technical Summary and referenced chapters.
23960	SPM	24	44	24	46	The recent fiscal/economic crisis has triggered significant changes in policies, also in relationship to subsidies, e.g. for renewable energy. This should be addressed - otherwise the message might be outdated for many countries.	Taken into account - to the extent that peer-reviewed literature is available on recent events.
31703	SPM	24	45			Text should outline how FITs are funded, eg “needs taxpayer or rate-payer subsidy”	Taken into account - text revised.
30084	SPM	24	6	24	11	The private sector's role as investors in R&D as well as provides of both goods and services should also be emphasised.	Noted. Text has been revised, but due to severe space constraints this issue is not discussed in the para in the context of finance and investment issues linked to the private sector.
26123	SPM	24	6	24	11	What has been the share of carbon finance/carbon markets in these figures? This is politically relevant information. Both direct amounts (i.e. value of units) and the related leveraged finance are of interest.	Noted. Due to severe space constraints this issue is not discussed in the SPM. Please look into chapter 16, 2.1.1 for more information on CDM and the attached investment.
38999	SPM	24	6	24	11	It is unclear whether contribution numbers (250-285bn) reflect investments only in developing countries? The large scale investment instruments listed are primarily only used in LDCs and LMICs.	Noted. Text has been revised. The numbers refere to flows to developed and developing countries.
19754	SPM	24	6	24	11	This is a good paragraph. The role and importance of business in mitigation and adaptation has been not necessarily well focused, though the private sector does have vast variety of technologies, know-hows and capitals necessary to combat with Climate Change riscs.	Noted.
29097	SPM	24	7	24	8	Do the figures for the total value of private low carbon finance represent the total cost of investments (ie the total cost of a wind farm or solar PV) or just the additional costs associated with low carbon technologies over what would have been spent on conventional power sources (ie the extra cost of windfarms over building a coal power plant of the same effective capacity)?	Noted. They represent total investment.
32207	SPM	24	8	24	9	Don't repeat 2010/2011	Noted. Text has been revised. Data source uses a mix of 2010 and 2011 data.
24018	SPM	24	26	24	26	SPM.5.3 National and sub-national policies. Page 24. L26. ‘There is no best policy for mitigating climate change (high confidence).’ Question: Is this an advantage or a disadvantage for the climate change community?	Unclear comment.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28666	SPM	24				Please include here language on public acceptance of different technologies from TS page 59 (16-24).	Taken into account - text revised. Please note that severe space constraints for the SPM limit the scope for additional information.
28667	SPM	24				The general, but very important message is missing that successful national and sub-national policies exists. Section SPM 5.2 provides a similar statement on international policies so you may expect this important message as well on national/sub-national policies	Accepted - text revised.
31288	SPM	24	25			the section is rather theoretical. It does not refer to the lessons learned from applied policies and already deployed measures.	Accepted - text revised.
35208	SPM	24	1	24	5	The argument of “financial flow to developing countries” is too general. Further clarifications should be made on whether it includes finance from ODAs, investment and off-set activities of developed countries, finance from developing countries themselves, or cooperation between developing countries. In addition, the number quoted “15-25%” is not supported by any reference, thus shall be deleted. It is suggested to add assessment results on overall investment and financial needs of developing countries to address climate change, and on how developed countries fulfill its long-term finance commitment of 100 billion USD.	Accepted - added details on types of climate finance to Technical Summary (box TS. 14).
41058	SPM	24	1	24	5	Climate finance reported under the UNFCCC percentage compared to current flow of finance. This statement is a misleading in the sense that it counts the reported finance under UNFCCC versus public international finance that flowed to developing countries, making a false assumption that there was actually a flow of public finance of significant size. In the absence of accountability, this conclusion can’t be supported and accepted.	Taken into account - text revised.
41060	SPM	24	13	24	16	Linkages of regional, national and sub-national programs may complement international cooperation. The concept of linkages through carbon markets imposes the concept of concept of the EU ETS to be the best model for regional, national and sub-national programs to complement international cooperation in mitigation. A balanced consideration should be made to the role of MOI, such as finance, technology, and capacity building as mediums for regional, national, and sub-national mitigation cooperation.	Taken into account - text revised.
35212	SPM	24	25	25	21	Ever since AR4, developing countries have conducted tremendous domestic voluntary actions and made great contribution in addressing global climate change, which should be reflected in the SPM as well. Relevant references include UNEP The Emissions Gap Report (UNEP 2010 and its appendices), Climate Action Tracker (Climate Analytics et al. 2010; Chen et al. 2011; Höhneet al. 2011), McKinsey & Company Climate Desk v2.1 (McKinsey & Company 2011), (Erickson et al. 2011) and Frank Jotzo (Jotzo 2010), (Wei et al, 2012).	Taken into account - text revised. Please note that severe space constraints for the SPM limit the scope for additional information.
35209	SPM	24	6	24	11	Only the role of private funding is emphasized here, while that of public funding is neglected. It is suggested to add more analysis on the role of public funding, with a specific focus on how to use public funding from developed countries to leverage climate finance in order to fulfill the financial needs of developing countries in addressing climate change.	Taken into account - text revised and level of public support to developing countries was included . Please note that severe space constraints for the SPM limit the scope for additional information. Section TS.4.5 provides more details on the aspects you mention.
41059	SPM	24	6	24	11	Private sector plays central role in investing in low carbon projects. Assuming the numbers are correct, this is a testimony that climate finance in general needs to be balanced between adaptation and mitigation in order to achieve implementation of the Convention.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21556	SPM	24				This section lacks any regional information, despite its title. In addition, it provides unbalanced and partial observations on policies instead. It would be logical to indicate at some aggregate level what type of policies or sectoral focus seem to be important or effective for different regions/countries.	Taken into account - text revised.
32385	SPM	24	29	24	30	Please avoid any formulations which might be perceived as policy prescriptive.	Accepted - text revised.
41022	SPM	24	1	24	5	Climate finance This section only refers to UNFCCC. However, there are other types of such finance which shall also be discussed here.	Taken into account - text revised. Please note that severe space constraints for the SPM limit the scope for additional information. Section TS.4.5 provides more details on the aspects you mention.
41024	SPM	24	12	24	24	Also linkages are exist across other economic sectors, shall also be mentioned.	Taken into account - text revised. Please note that severe space constraints for the SPM limit the scope for additional information.
41025	SPM	24	37	24	41	It shall be demonstrated in SPM that response to the existing mitigation policies are highly uncertain	Accepted - text revised.
41023	SPM	24	6	24	11	Investment by private sector This section shall elaborate on type of financing from private sector including schemes. A proper balance will be to include investment by other types of organization/stakeholders.	Taken into account - text revised. Please note that severe space constraints for the SPM limit the scope for additional information. Section TS.4.5 provides more details on the aspects you mention.
25461	SPM	25				replace "All of the components" by "All of the major components"	Taken into account - text revised.
23715	SPM	25				Why does this table not address risks? Risk management has been emphasised in this SPM, but it is strange not to mention in relation to roles of climate policy instruments.	Taken into account - table removed.
31704	SPM	25				This label should be replaced. Economic instruments as in the 2nd column promotes long-term investments. Suggest “additional measures”	Taken into account - table removed.
21558	SPM	25				Delete, for the same reason as referred to in our comment on last paragraph page 24.	Accepted - table removed.
25287	SPM	25		25		Feed in Tariff should have a footnote saying reverse bidding as practiced in India can preserve competition and incentives for innovation and cost reduction.	Taken into account - table removed.
20801	SPM	25				KEEP. This table should be kept. This table is well-balanced, and summarizes essential points.	Rejected - table removed.
25126	SPM	25				SPM.5.3 National and sub-national policies is generally well written and the content is reasonable. And classification of Table SPM.1 is reasonable in classifying short-term and long-term policies. However, classification of short-term policies is rather premature and may lead to misunderstandings. In addition, this classification is not an established one. Suggest rewrite in an matured way, i.e. to mention pros and cons for several typical policies such as economic insentive (tax and cap and trade separately), direct regulation, providing information, subsidies and voluntary initiatives etc. The main reason is that it looks like economic incentive is a policy to provide price signal, and all other short-term policies including direct regulation etc. are policies to remove barriers. In this sense, economic insentive is also a policy to remove barriers. Another suggestion to this Table is on 'suitable context' of price signal. It says that applying economic incentive to the whole exonomy is suitable. This is one part of the story. The reality is that no economic incentive policy has ever been applied to the whole economiy. This fact should be added.	Taken into account - table removed.
26483	SPM	25				Suggest adding "removing existing regulatory barriers" as an example in "removing barriers" box	Taken into account - table removed.
26484	SPM	25				This table is very basic and rather simplisitic. Providing a price signal will have an impact on long-term investments including tecnology R&D.	Taken into account - table removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29655	SPM	25	1			Recommend deleting. This table is confusing without the context provided by Chapter 15, and its categories are inconsistent. For example, "Suitable context" is not rigorously definable, and it is unclear how the concepts included in that category are of the same nature. The columns are also overly constraining and do not lend themselves to clear categorization - price signals are also long-term investments, and feed-in tariffs are not necessarily long-term investments at all. The table is also heavily focused on greenhouse gas emissions from the energy sector in particular and fails to cover any meaningful breadth of mitigation strategies. If it is not removed, it should at minimum be substantially revised to reflect these concerns.	Accepted - table removed.
29326	SPM	25	1			This table is confusing without the context provided by the chapter, and the choice of categories appears not to be consistent. Recommend deleting. For example, "Suitable context" does not have any definable boundaries, from general applicability ("entire economy") to types of activities ("technology development") to aspects of markets ("information asymmetries"). It is also widely acknowledged that putting a price signal on carbon will help stimulate long-term investments, hence the column choices cannot stand alone without the text descriptions of each category on Ch. 25, p. 5-6.	Accepted - table removed.
25021	SPM	25	1	25	2	The table implies that providing a price signal is only suitable at an economy-wide level. However, sub-national policies in the US and elsewhere show this not to be the case. Suggest amending the text in the 2nd from left box of the lowest row of the table to read “The entire economy (but also applicable at a sectoral or sub-national level).”	Taken into account - table removed.
30432	SPM	25	10	25	16	needs clarity and a line of sight to supporting analysis	Taken into account - text revised.
32595	SPM	25	10		15	This is a hightly stylised and unhelpfully simplified explanation. To ascribe the entirely of long term investment problems as "a second market failure ... Of intellectual property rights" vastly really does not do justice to the wider issues of infrastructure, evolutionary economics, network interdependences, etc etc. Developing a North Sea grid optimally to coordinate and deliver offshore wind energy, for example, is dependent neither on price nor intellectual property; nor are key decisions on urban and transport decisions. Thus the para shoudl be expanded to include infrastructure as well as the deeper levels of "technology valley of death" economics. See my comments on Ch 7 (.6) and 15 (.on this.	Taken into account - text revised.
31705	SPM	25	10		16	These sentences are not supported by the text in [15.6]. REWORD. The IPR section in Chapter 15 provides no examples of IPR impacting investments in either non-fossil energy production nor energy efficiency. It just suggests that it is “crucial to analyse” the extent that IPR impacts. Issues with energy efficiency investments are well set out in the paragraph above. It may be that there needs to be subsidies to overcome the energy efficiency “barriers”. No evidence is provided to suggest that IPR is a barrier to low carbon technology investment or that IPR in itself creates a barrier that requires subsidy. Statements such as these need to be based on facts, not assertions and viewpoints.	Taken into account - text revised.
21559	SPM	25	10	25	16	The background material in chapter 15.6 lists only a very limited amount of studies to come forward with very strong conclusions on the effectiveness of IPR on stimulating innovation or deployment. It is difficult to believe that these studies are conclusive on this topic. As such it is requested to delete this paragraph in the SPM	Taken into account - text revised.
40872	SPM	25	11	25	12	In this sentence, although the term "failure" is used properly, it might give wrong impression to the people who are not familiar with economics, and not suitable for SPM. Therefore, the expression should be altered as written in Chapt.15, "therefore an inherent trade-off for less developed countries between the limitations on widespread deployment that may be created by strong IP protection, and the need for such protections as a market precondition for inbound technology transfer. "	Taken into account - text revised.
28668	SPM	25	11	25	16	Chapter 15.6.4 does not provide for scientific evidence for the statements made in the SPM. Statements in the SPM must stem from the underlying report. Please check, provide references, or delete. Further, other subjects than IP protection seem more important to climate change mitigation.	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28669	SPM	25	11	25	16	Lack of property rights are only one reason for sub-optimal private investments. (They are relevant when it comes to international technology transfer). Another important reason for sub-optimal investments is that "non-climate investments" (e. g. traditional technologies, real estate) promise higher returns - at lower risks. To stimulate private climate-investments the stability of the policy framework (policy instruments) is essential to stabilize expectations (and thus reduce risks). Moreover "climate knowledge" in the private investment-sector should be improved to stabilize expectations / reduce risks and thus stimulate private investments. (cp. chapter 16, p.5, lines 16-24). Please add these important aspects.	Taken into account - text revised.
20219	SPM	25	17	25	21	This pargraph is not correct and should be deleted. There very little evidence to support the claim that emissions reductions in developing countries through subsidy redmoval can be achieved at negative costs.	Rejected - this aspect is important and information on it should be retained.
26926	SPM	25	17	25	21	This paragraph does not accurately reflect the macro-economic effects of carbon taxes and the other numerous carbon-intensive commodites that households consume besides transportation fuel (e.g., electricity). As my comment on Sec. 15.3.2.3, Equity considerations must also include the relatively higher barriers for households currently without modern energy services to access them if a carbon tax is implemented. Complementary policies to support energy access for low-income households are necessary.	Taken into account - text revised.
29323	SPM	25	17	25	21	This paragraph does not accurately reflect the macro-economic effects of carbon taxes and the other numerous carbon-intensive commodites that households consume besides transportation fuel (e.g., electricity). The vast majority of citations in this section apply only to developed country contexts. More references are needed to substantiate claims that fuel taxes are "strongly" progressive in developing countries. The distributional incidence of a carbon tax cannot be equated with the per-capita consumption of a specific fuel (e.g., transportation), but must be viewed across different commodities (e.g., electricity) including macro-economic effects. Equity considerations must also include the relatively higher barriers for households currently without modern energy services to access them if a carbon tax is implemented. Complementary policies to support energy access for low-income households are necessary (see section 4.3)	Taken into account - text revised.
30670	SPM	25	17	25	21	The link between the text on lines 18-21 and the bolded finding on lines 17-18 is not clear. If these are separate points, then suggest a line be added that supports the bolded statement.	Taken into account - text revised.
33619	SPM	25	17	25	21	A confidence statement is missing.	Rejected - in accordance with the IPCC guidance note on the consistent treatment of uncertainty, information can also be presented as statements of fact.
20883	SPM	25	17	25	20	Does this paragraph mean that elimination or reduction of subsidies for fossil energy can contribute to reduce emissions because it promotes to decrease consumption of fossil fuels? How does it link to trends of carbon and fuel taxes of most countries?	Taken into account - text revised.
27046	SPM	25	17	25	21	This paragraph should also note relevant equity issues discussed above. Equity considerations must also include the relatively higher barriers for households currently without modern energy services to access them if a carbon tax is implemented. Complementary policies to support energy access for low-income households are necessary.	Taken into account - text revised.
30459	SPM	25	17	25	21	It would be good to provide more explanation in the paragraph on why this is relevant. For example: Countries that have implemented energy and carbon taxes on fossil fuels have done so in order to reduce the energy demand for fossil fuels and hereby combat climate change (and to raise public revenue). In the case of subsidies the demand for fossil fuels will increase.	Taken into account - text revised. Please note that space constraints are very severe for the SPM. More details are provided in cross-cited report sections.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23961	SPM	25	17	25	21	This is an important message. Unfortuntely it lacks the IPCC qualification on uncertainty. This should be added in the final version.	Rejected - in accordance with the IPCC guidance note on the consistent treatment of uncertainty, information can also be presented as statements of fact.
25288	SPM	25	17	25	21	There are diverse reasons for fossil fuel subsidies. Beyond fossil fuel subsidies, elimination of tariff barriers to clean emergy technologies should also be mentioned.	Taken into account - text revised.
28670	SPM	25	17	25	21	If what is said is true "taxes are neutral or progressive" then why state the need to eliminate or reduce subsidies? The last WEO pointed out that there are a lot of countries with subsidies for fossil fuels.	Noted.
28671	SPM	25	17	25	21	Please, add that reducing subsidies for fossil fuels can not only result in lower emissions but also presents an additional source of revenues that can be used for financing mitigation measures.	Taken into account - text revised.
28672	SPM	25	17	25	21	This is a bit unclear - don't we know who benefits from fossil fuel subsidies?	Taken into account - text revised.
21560	SPM	25	18	25	21	This objective of this part of the paragraph is unclear . Is this finding uniform across developing countries? What is the message for policy makers? Is there no other information available on what the economic, environmental benefits and social impacts in quantitative terms are of reducing these subsidies and possible efficient accomodating measures for specific low income classes that might be affected?	Taken into account - text revised. Please note that space constraints are very severe for the SPM. More details are provided in cross-cited report sections.
28673	SPM	25	18	25	19	"...carbon and fuel taxes are progressive or neutral with the rich paying an equal or greater proportion of their income than the poor." The sentence mixes up taxes on goods that are paid when actually buying this good (e.g. fuel) and taxes that have to be paid regularly on the basis of income. Have the latter taxes any influence on CO2 mitigation if there is no extra tax for CO2 mitigation included? Or do you mean the people in rich countries pay generally higher taxes. Or does it refer to the example kerosene which is taxed higher in high income countries???	Taken into account - text revised.
28674	SPM	25	20	25	20	The last sentence is unclear. Do you mean "Taxes on Kerosene..."?	Taken into account - text revised.
25127	SPM	25	21			Suggest to add after [15.5], "in removing environmentally harmful subsidies for fossil energy, full attention should be paid to the raison-etre of such subsidies, i.e. keep employment, energy independence, unanimous access to energy." Any policy neglecting those points may make removal of EMSs very hard to achieve.	Taken into account - text revised.
32594	SPM	25	3		16	I think this short section could provide a much clearer and more compelling end-point to the SPM if it reflected more directly the structure of the table, and linked these with the last two sentences of the first para (p.24 lines 33-36), and also with the point on subsidy removal. Is not the logic (a) pricing is central in any market economy, the first step would eb subsidy removal but the difficulty of this and the slow progress in carbon pricing attests to the complexity of price instruments. It may be very hard for pricing to provide either the level or the foresight and credibility that would be ideal, and there are other dimensions of the problem that anyway are not centrally driven by price. These comprise (b) where individual, organisations and indeed economies remain significantly short of the best practice frontier, energy efficiency barriers being the most obvious but by no means only examples; and (c) long term developpment of innovation and infrastructure, including regulated assets, where there is documented and systematic underinvestment and price is again not the main determinant of decisions.	Taken into account - text revised.
33617	SPM	25	3	25	8	A confidence statement is missing.	Rejected - in accordance with the IPCC guidance note on the consistent treatment of uncertainty, information can also be presented as statements of fact.
34717	SPM	25	3			The word "always" might as well be deleted from the bolded sentence	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19755	SPM	25	3	25	8	This is true and very important to be mentioned in here.	Noted.
25649	SPM	25	5	25	8	This part should explain that "voluntary agreement" is an effective method to improve energy efficiency and reduce GHG emissions, as described in the section 15.5.7.4. There are successful examples of "voluntary target scheme" in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). <Reference> [1] Yamaguchi et al (2012). Climate Change Mitigation, A balanced approach to climate change, Springer, London [2] Manuel Frondel et al (2010). Economic Impacts from the Promotion of Renewable Energy Technologies: The German Experience, Ruhr Economic Paper #156, Energy Policy 38, 4048-4056. Available at: http://www.rwi-essen.de/publikationen/ruhr-economic-papers/74/ [3] Yamaguchi (2010) . Voluntary CO2 emissions reduction scheme: Analysis of airline voluntary plan in Japan. Transportation Research Part D: Transport and Environment, Volume 15, Issue 1, January 2010, Pages 46-50. Available at: http://www.sciencedirect.com/science/article/pii/S1361920909000856 [4] Martijin G. Rietbergen, Jacco C.M. Farla, Kornelis Blok (2002). Do agreements enhance energy efficiency improvement? Analysing the actual outcome of long-term agreements on industrial energy efficiency improvement in The Netherlands, Journal of Cleaner Production 10 153-163	Taken into account - text revised.
20196	SPM	25	9	25	16	As noted, not all private sector innovations suffer from market failure. No evidence has been provided indicating that investment in non fossil energy production and in efficiency of energy use is affected in any manner by the 'failure' in the market of IP protection.	Taken into account - text revised.
34280	SPM	25	9	25	16	IPR issues should be treated in a balanced way, also including those arguments referred to their implications in terms of technology transfer barriers, particularly for developing countries.	Accepted - text revised.
33618	SPM	25	9	25	16	The importance of the main point (instruments that promote long-term investement are essential) is intuitively clear (from the perspective of limiting long-term climate change), but the explanation given is not (to me at least). Do intellectual property rights hamper investment in long-term mitigation measures/technology?	Accepted - text revised.
25022	SPM	25	9	25	16	Further explanation is required for what is meant by the 'second market failure'. If it is limited to intellectual property, this is too narrow - market failures in innovation are much broader than intellectual property and result from a variety of positive spillovers that cannot be fully captured by business. This also implies that patent holders, or the protection of intellectual property rights, are in effect being blamed for 'less than socially optimal investment'. Suggest that this needs to be more fully substantiated and reviewed.	Accepted - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22382	SPM	25	9	25	16	This entire paragraph should be deleted. Evidence on the impact of IP on promoting technology transfer or investments in non-fossil fuel production is inconclusive to say the least. There are no comprehensive studies to show a general positive relationship. For instance, is there any evidence that IP has promoted technology transfer to African or Latin American countries which are TRIPS compliant or even to those that provide TRIPS-plus protection? It has been shown that 'South Africa has attracted far less FDI than other countries whose IPR system appears to offer potential foreign investors weaker protection' (Kaplan D 'Intellectual Property Rights and Innovation in South Africa: A Framework' in The Economics of Intellectual Property in South Africa WIPO, 2009, p. 4). The study by Mansfield quoted to substantiate the argument of a positive effect of IP on FDI is methodologically weak (based on interviews), outdated (it was conducted almost 20 years ago before TRIPS entered into force); it provides an insufficient basis for the conclusion reached in this section regarding FDI. It is also incorrect to generalize the limited findings of the bibliography quoted in the text. The positive impact of IP on exports, as found by Smith (1999) should not be mixed up with potential effects on technology transfer and FDI. That impact precisely shows that IP owners often opt for the exploitation of foreign markets through sales rather than FDI or technology transfer.	Taken into account - text revised.
35210	SPM	25	11	25	14	The discussion on IPR in this section is not consistent with that of Chapter 15. According to page 40 lines 30-36 in Chapter 15, the protection of IPR may promote cross-country transfer of technology, but in the meantime may also constrain the technology development in developing countries. This conclusion is not currently reflected in the SPM. It is suggested to delete the sentence that "This failure is that of … patent market" due to its redundancy.	Taken into account - text revised.
35211	SPM	25	17	25	18	The argument that "Elimination or reduction of subsidies for fossil energy can result in major emission reductions at negative cost" lacks supportive literature in Chapter 15, thus it should be deleted.	Rejected - section 15.5.2 provides information on this aspect.
41061	SPM	25	17	25	20	Elimination or eradication of fossil fuel subsidies can result in major emission reduction at negative cost. This is a redline text and conclusion to most developing countries as it has direct interference with their sovereign rights to economic development that take into account their special circumstances. Discussion on removal of subsidies is not acceptable altogether. In the underlying reference section, it links subsidy to the success of carbon taxes and market based mechanism, therefore, it is also misrepresentation of the underlying section.	Rejected - this aspect is important and information on it should be retained.
32267	SPM	25	9	25	16	The statement here is not clear about the effect of IPR protection. Strong protection is needed for development of new technology and smooth transfer of technologies particularly led by private initiatives as well written in Chapter 13 9.3.2.	Taken into account - text revised. Please note that severe space constraints for the SPM limit the scope for additional information.
30669	SPM	25	11	25	14	For the sentence "This failure is that of the market for protection of intellectual property rights (for example the patent market)", additional explanation of the failure that's being referred to here could be useful. It is somewhat difficult to understand the paragraph and the link being drawn between the market for protection of intellectual property rights and private investments in non-fossil energy production/energy efficiency.	Taken into account - text revised.
34399	SPM	25	17	25	21	This is a very strong statement based on a single, non-peer-reviewed paper.	Taken into account - text revised.
41026	SPM	25				This table can be removed from SPM.	Accepted - table removed.
41029	SPM	25	17	25	21	Subsidies on other sector – Agriculture shall be also discussed in the context of mitigation.	Rejected - please note that severe space constraints for the SPM limit the scope for additional information.
41027	SPM	25	3			Define firms in the context of mitigation	Rejected - please note that severe space constraints for the SPM limit the scope for additional information.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
41028	SPM	25	9	25	16	Market failure in concluding section of SPM shall be removed or shall be put in more discussion format. Currently it gives a negative signal.	Accepted - text revised.
29751	SPM	25	18	25	20	This is not true. In many cases the rich actually spends a smaller percentage of their income on energy.	Taken into account.
31688	SPM	3		25		The positions are reasonable with respect to: CCS (conveys urgency and need); the value of natural gas; and that all actions are needed. Conveys well the (still) high uncertainty in many aspects, including climate sensitivity and technology.	Noted. But IPCC does not provide positions, but assesses the literature.
31708	SPM	3		25		Overall doesn't feel like it will give much direction or boost to policy debates. Feels a bit like old ground, just with more detail.	Noted.
31709	SPM	3		25		The way in which carbon dioxide easily accumulates in the atmosphere but is very slow to depart means that the system can be likened to a stock pollution problem. Exceeding a given accumulation over the span of this century and next is directly related to the probability of exceeding a given temperature threshold. Further, given the increasing rate of energy use to meet population and development needs and even assuming a best case of a future high but feasible rapid increase in alternative energy production, the projected accumulation of carbon dioxide is very likely to exceed a level related to a 2°C threshold. Simply slowing down annual emissons by improving the efficiency of energy use or through partial substitution with alternative energy sources will never address the fundamental long term accumulation problem. Rather, emissions must be returned to their source through the large scale use of carbon capture and storage.	Accepted. This issue is clearly addressed throughout the SPM.
25190	SPM	3		25		The outline structure of SPM is satisfactory. The subject matter under each heading shall be made more coherent with the theme to be discussed along with crucial data support.	Noted.
25191	SPM	3		4		Emission database: Complete database on which these analyses are made, should be made public and accessible for review.	Noted.
25192	SPM	3		4		Emission database: It is requested to indicate clearly which database was selected for use in emission analysis, which were not selected or rejected, the basis of this selection/rejection.	Noted. We provide a comparison of global emissions databses in chapter 5.
25193	SPM	3		4		Developing countries have provided their GHG emissions in the form of their first and second national communications. These are all documents of the UNFCCC and only authentic public sources from national perspective. Have these been considered in making these emission analysis. If not, why not? This may be clearly stated, including an analysis of differences between the emission numbers from the databases used in this report and those submitted by developing countries.	Noted. The main focus is on the databases used commonly by the scientific community.
25194	SPM	3		4		Similarly developed countries are also providing their annual GHG inventories to UNFCCC. These are officially reviewed every year by Expert Review Teams. Please indicate if this data is used in the present analysis?	Noted. The main focus is on the databases used commonly by the scientific community.
25195	SPM	3		4		Emission database: Was any third-party peer-review conducted for the database selected for this analysis? If so, details of the same may please be provided. If no, why not? Historical GHG emission numbers are very important assessment for global negotiations and use of grey-data is not advised.	Noted. We use database, which are commonly used in the scientific community. They in this sense have undergone multiple peer-review.
25196	SPM	3		4		It is suggested that a snap shot of global GHG inventory may be included for latest year for which official numbers have been reported by most of the developed and developing countries.	Accepted. Our new figure SPM.1 provides trends 1970-2010 and provides more detailed snapshorts for the years 1970, 1990 and 2010.
28325	SPM	3		7		The section "emission trends and drivers" focuses very much on CO2, which is understandable given its key role to climate change, but there should be at least one paragraph explaining the trends and role of CO2 from LULUCF anf of other GHGs.	Noted. Most of the figures in the revised SPM.2 focus on GHG emissions. Figure SPM.2 shows long-term trends in FOLU emissions as well.,

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19629	SPM	3		3		climate change." Actually, the chapter uses the scientific knowledge base to assess potential policies for the mitigation of climate change. This real focus should be made clear to the readers.	This comment seems incomplete and cannot be understood as is.
19630	SPM	3		3		change. This real focus should be made clear to the readers.	This comment seems incomplete and cannot be understood as is.
30384	SPM	3	1	3	21	The SPM could be written more clearly and with key messages being more apparent and clearly formulated. The material could be also be communicated better through the use more accessible figures and more use of tables. The overall tone of the report is obtuse and its poorly structured. A more positive and constructive approach is warranted.	Taken into account - text and figures revised.
30385	SPM	3	1	3	30	This can be significantly shortened as it just introduces the report and should refrain from major judgement on what is crucial or not. The AR4 template should be considered.	Rejected - the section aims to reflect main findings from chapter 1 to 4.
23938	SPM	3	10	3	10	Insert "also" before "adaptation".	Taken into account - text revised.
30588	SPM	3	11	3	16	It is not accurate to state that the approval of the AR4 SYR by governments also represented a decision about the scope of the AR5. Rewording is recommended.	Taken into account - text revised.
30587	SPM	3	11	3	20	It is not clearly explained what these terms in bold are or what they signify.	Taken into account - text revised.
23716	SPM	3	13		17	This is one of the most important statements in the entire report, which we agree with, but it should be highlighted more, especially the part that states "it is thereby crucial to look at ["analyze and mitigate" would be better] climate change within the larger context of sustainable development" and we would suggest adding other "planetary boundaries". We suggest adding language here saying that "mitigating climate change is one major social goal of many identified by various UN agencies and departments that humanity should attempt to achieve over the next century (Rockström et al. 2009 Nature)." This point is emphasized in the draft report on page 8, lines 16-17, which is good. However, these high priorities should be described together with other priorities in contrast to the way in which the long-term mitigation (transformation) scenarios are modeled by IAMs, as described in Chapter 6. To us, the fact that the IAMs are incapable of modeling other SD goals along with climate change mitigation should lead to the report putting much less emphasis on discussing and reporting up front the results for the transformation scenarios reviewed in Chapter 6, especially the economic results, which become meaningless for many reasons, as discussed further below. Otherwise decision makers will refer to the report as describing appropriately well-rounded and desirable mitigation scenarios, and this risk has to be avoided.	Taken into account - text revised.
22725	SPM	3	13		17	This is one of the most important statements in the entire report, which we agree with, but it should be highlighted more, especially the part that states "it is thereby crucial to look at ["analyze and mitigate" would be better] climate change within the larger context of sustainable development" and we would suggest adding other "planetary boundaries". We suggest adding language here saying that "mitigating climate change is one major social goal of many identified by various UN agencies and departments that humanity should attempt to achieve over the next century (Rockström et al. 2009 Nature)." This point is emphasized in the draft report on page 8, lines 16-17, which is good. However, these high priorities should be described together with other priorities in contrast to the way in which the long-term mitigation (transformation) scenarios are modeled by IAMs, as described in Chapter 6. To us, the fact that the IAMs are incapable of modeling other SD goals along with climate change mitigation should lead to the report putting much less emphasis on discussing and reporting up front the results for the transformation scenarios reviewed in Chapter 6, especially the economic results, which become meaningless for many reasons, as discussed further below. Otherwise decision makers will refer to the report as describing appropriately well-rounded and desirable mitigation scenarios, and this risk has to be avoided.	Taken into account - text revised.
31295	SPM	3	16	3	17	We are very pleased with this early and clear statement of the importance of sustainable development for successfully dealing with the challenges associated with climate change	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30590	SPM	3	16			There is no reference list for the SPM, so using this source (IPCC, 2007) would require a reference in a footnote.	Taken into account - text revised.
30589	SPM	3	16	3	17	The statement that it is "thereby crucial" within the larger context of sustainable development implies that the preceding and following statements justify this point, but this is not really the case. Suggest reviewing the language here.	Taken into account - text revised.
31690	SPM	3	16			WGIII is charged with “scientific research”. This is opinion. The text should be consistent with FAQ 3.3. (p62)	Taken into account - text revised.
32084	SPM	3	16			cruciality implies a value judgement and also implies that it is not possible to do otherwise, however, it is possible. Better: It is highly advisable	Unclear comment.
26100	SPM	3	16	3	20	Is there a need to refer to also other aspects of sustainable development, not just the elements of ethics and equity?	Taken into account - text revised.
38909	SPM	3	16	3	20	This does not explain why there is a more significant focus in AR5 on ethics, rights, equity - which would be helpful given that the underlying chapters do not seem to find high evidence/high agreement references in the literature on how climate change affects individual and collective rights and values. The rationale for this focus should be explained here to provide readers with context for this approach in AR5.	Taken into account - text revised.
23491	SPM	3	18	3	18	If one has not read chapter 3 before, it is unclear what is meant by "values" here as they are usually understood as personal values that underpin behaviour/practices. Perhaps make it explicit that it is used in an economic sense here.	Taken into account - text revised.
32085	SPM	3	19			Ethics can be judged, but in addition to the overall critique in No.1 there is need for clarification of what ethics means and which theory of ethics is being followed here. Otherwise, ethics is just a buzzword.	Taken into account - text revised.
28317	SPM	3	2	3	30	Please add a reference to the Glossary upfront as it is essential for policy makers to understand the many specific expressions in the text.	Noted.
31296	SPM	3	28	3	30	Explanations of the treatment of certainty, evidence and confidence should be easy to find in the SPM. Please consider to include a Box about this.	Accepted - footnote 1 explains the use of the uncertainty language.
28319	SPM	3	28	3	30	Please provide information on the uncertainty language including a figure 1 from the "Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties IPCC Cross-Working Group Meeting on Consistent Treatment of Uncertainties, Jasper Ridge, CA, USA 6-7 July 2010." Clear and coherent information on the uncertainty associated with each major statement is essential for policy makers. In addition, the use of uncertainty classifications does not seem consistent.	Accepted - footnote 1 explains the use of the uncertainty language.
19627	SPM	3	3			SPM. Since many policy makers will read only the SPM, the Executive Summary of Chapter 1 also should become the Executive Summary of the SPM. The following development should support the ES. Perhaps the sections of SPM in order and in number could follow the order of the conclusions in the ES.	Rejected - section SPM.1 aims at reflecting main findings from chapter 1 to 4.
19626	SPM	3	3	25	21	The Executive Summary of Chapter 1, pages 3 and 4 of Chapter 1, is clearer and more forceful than the findings of the SPM. Since many policy makers will read only the SPM, the Executive Summary of Chapter 1 also should become the Executive Summary of the SPM. The following development should support the ES. Perhaps the sections of SPM in order and in number could follow the order of the conclusions in the ES.	Rejected - section SPM.1 aims at reflecting main findings from chapter 1 to 4.
30591	SPM	3	30			Suggest that the uncertainty guidance document should have a reference in the footnotes (similar to the WGI SOD).	Accepted - footnote 1 explains the use of the uncertainty language.
31269	SPM	3	32	3	32	UNFCCC and Kyoto Protocol cannot really be considered as « mitigation policies », they rather provide a frame and tools for mitigation policies. It could for example be reformulated as « mitigation policies taken in the context of the UNFCCC and its Kyoto Protocol ».	Accepted. We have deleted the reference to UNFCCC and Kyoto.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30386	SPM	3	32	3	32	“Despite existing mitigation policies” is odd. A factual statement on emissions trends is required here. A table of emission figures would be more convenient with an underlying statement on trend e.g. rates per decade. Provide information on other GHGs e.g. look at how the AR4 presented this information including from Sectors	Noted. We have rephrased this finding.
30387	SPM	3	32	3	32	Reduce text and provide relevant information and statement of facts.	Noted. We have rephrased this finding.
31691	SPM	3	32		33	Suggest: “Despite the work of the UNFCCC and the existence of the Kyoto Protocol”.	Rejected. We have deleted the reference to UNFCCC and Kyoto.
25197	SPM	3	32	3	32	"Despite existing mitigation policies, including UNFCCC, Kyoto protocol,----;"suggest deletion of this part since it looks prescriptive and subjective.	Noted. This is not prescriptive. We have rephrased this finding.
38911	SPM	3	32	3	32	There ought to be mention of the Copenhagen / Cancun pledges here, too. Limiting the discussion to Kyoto is not helpful.	Rejected. We do so in Section SPM3.1, but not here as the focus is on historic emission developments rather than future mitigation.
38912	SPM	3	32	3	41	Use of the word "anthropogenic" should be consistent - you do not use this term after line 37, is that because it does not apply or the use of the term is not consistent?	Noted. We have revised the text.
28320	SPM	3	32	3	32	Since it is the first time that UNFCCC is mentioned in the text, please use the full name "United Nations Framework Convention on Climate Change" and put UNFCCC in brackets	Noted.
28321	SPM	3	32	3	41	The overwhelming role of economic growth as the main driver of emissions besides increase in population should be made clearer. As shown in figure SPM.1 there has been no real decoupling of economic growth and GHG emissions. Also, the need for stringent policies that differ from past policies should be brought out. (Suggestion: Add "Past policies have not changed drivers and trends in a way that has stopped the upward GHG emissions trends. If future policies aim to change the trends and bring emissions down, they will have to be different from past policies." as in the Executive Summary of Chapter 5)	Rejected. This is not the purpose of this finding, where we focus on a description of historic emission trends by gas. We analyse drivers including economic growth later in the section.
28322	SPM	3	32	8	6	The sequence of issues in the discussion of "emission trends and drivers" should be re-arranged, because it could be seen as unbalanced. In particular the prominent mentioning of issues in particular related to developing countries or Asia in the beginning is (politically) sensitive (3 out of 4 paragraphs in the beginning deal with DCs). one should start with more general observations such as stated on p 6/25 line 9, that the "largest share of anthropogenic CO2 is emitted ..."	Noted. We have revised the entire section.
26439	SPM	3	32			Not correct to refer to the UNFCCC and the Kyoto Protocol as "mitigation policies" - these are international agreements that cover a range of matters, inter alia, mitigation. Policies only exist at the national level, or in the case of the EU, at the regional level. Suggest sentence is changed to read "Despite existing national mitigation policies and international agreements, including the UNFCCC and the Kyoto Protocol, ..."	Accepted. We have revised the finding without reference to UNFCCC and Kyoto.
29309	SPM	3	33			Change "…in previous decades" to "any previous decade."	Rejected. Our data does not allow for such a rewording. It only goes back until 1970. We have tried to establish a more precise language.
30592	SPM	3	33			Does "in previous decades" mean all previous decades or just those since the 1970s (per data in the rest of the paragraph). Suggest specifying.	Accepted. We clarify this in the body of the paragraph.
25829	SPM	3	33	3	35	Please provide in a footnote the definition of CO2-eq (gases included, metric used)	Noted. We have added this into a chapeau of the section.
23939	SPM	3	34	3	34	Clarify language: AR4 (covering emissions data until 2004).	Noted. We have included the comparison with AR4 in our finding on uncertainties in emissions data.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23147	SPM	3	35			After “1970” insert “the rate of”	Accepted. We provide the rates for periods 2000-2010 and 1970-2000.
38913	SPM	3	35	3	35	Although it is defined elsewhere in AR5, it would be best, for the benefit of policymakers, to give a brief explanation of the difference between CO2 an CO2eq. Could be done in a very short footnote.	Noted. We add a small chapeau introducing GWP-100 as metric that is used for CO2eq numbers.
28323	SPM	3	35			"all time high… in 2010": this is not true any more, recent emissions have been even higher. Please reformulate.	Accepted. Revised language.
30593	SPM	3	36	3	38	This statement requires supporting data. No decadal growth rates in GHG emissions for the periods referenced (2000-2010, 1990-2000, 1980-1990) are given in the text, and only the rate for 1970-1979 is given in Figure SPM.1.	Accepted. We provide the rates for periods 2000-2010 and 1970-2000 as part of the finding now.
29025	SPM	3	38	3	38	driven' by growth in Co2 is slightly misleading - may imply that Co2 emissions have lead to other emissions increasing. I understand this as Co2 has been the largest contribution to GHG emissions - should make this clear.	Accepted. Revised language.
23940	SPM	3	39	3	40	It needs to be clarified whether WGIII used the 100 yr GWP of the AR4 or those of the AR5.	Accepted. We have added all required information to a chepau of SPM.2
28324	SPM	3	39	3	40	"weighted with 100-year Global Warming Potentials" a reference to an explanation what this weighting means would be helpful (see TS, Box 2, P.8)	Accepted. We add some discussion on the choice of emission metric to the second finding of the new section and refer to Box TS.2 for further information.
26440	SPM	3	39			Given that the IPCC revises GWPs in each assessment report, it is important to provide the IPCC AR reference for the 100-year GWPs that have been used in the analysis. The underlying chapter suggests that in this instance it is AR2 GWPs that have been used.	Accepted. We have added all required information to a chepau of SPM.2. The TS.2 section contains a finding where GWP-100 values from SAR and AR5 are compared.
30584	SPM	3	4	3	6	It is odd to specifically refer to the SRREN here but not other IPCC reports like the SREX or past IPCC documents - is it certain that no others were used?	Taken into account - text revised.
30594	SPM	3	40	3	41	1. A reference to Figure SPM.3 should be included to support this statement. 2. A year - 2010, according to Figure SPM.3 - should be given after the phrase 'At current levels'. 3. The phrase "is emitted" should be changed to "would be emitted" as this calculation is forward looking (i.e. from Figure SPM.3, 2010 levels of ~32 Gt CO2 emissions mean that every 12 years, an amount equivalent to ~390 Gt CO2 would be emitted. 4. The reference to section 5.1 (Introduction and Overview) should be changed to 5.2, consistent with referenced section for this text in the Technical Summary.	Noted. Sentence was deleted during revisions.
24995	SPM	3	40	3	41	Please specify whether "total cumulative emissions before 1970" relates to only fossil fuel CO2 or CO2 in general or all greenhouse gas.	Noted. Sentence was deleted during revisions.
23805	SPM	3	40			I would suggest to delete this last sentence (12 year comparison) as it will change on a yearly basis and is not really relevant unless you have a particular (policy) objective in mind	Accepted. Sentence deleted.
26101	SPM	3	40	3	41	The sentence starting 'At current levels, every 12 years…' is unclear. It is suggested to be changed to: "If emissions growth rate remains at the present level, every 12 years an amount equal to…"	Noted. Sentence was deleted during revisions.
29026	SPM	3	40	3	41	Suggest wording would be clear as ' At current levels, every 12 years the amount of Co2 emitted from fossil fuel combustion is comparable to the total cumulative emissions before 1970' - if that is what is meant.	Noted. Sentence was deleted during revisions.
32086	SPM	3	41			The phrse implies a causality but it dennotes just a probability.	Noted. Sentence was deleted during revisions.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19628	SPM	3	7	3	8	SPM.1, p3: 7-8 says “Working Group III of the IPCC is charged with assessing scientific research related to the mitigation of climate change.” Actually, the chapter uses the scientific knowledge base to assess potential policies for the mitigation of climate change. This real focus should be made clear to the readers.	Taken into account - text revised.
30585	SPM	3	8	3	9	This definition of mitigation excludes many forms of geoengineering, including all forms of solar radiation management and direct air capture of CO2. A footnote is recommended here to make this point clear to readers. The footnote should also make clear whether or not readers can expect discussion of geoengineering in the WGI report.	Taken into account - the glossary provides a more exact definition of mitigation.
23146	SPM	3	8	3	14	In English, “mitigation” means to reduce negative consequences. It is not synonymous with “reduction” (of emissions), which is meant.	Noted.
25188	SPM	3	8	3	8	sources' should be replaced with 'emissions'	Taken into account - text revised.
28318	SPM	3	8	3	11	This definition of Mitigation differs from the one in AR4 WGI and WGII. The second sentence is not consistent with the first (the presentation of adaptation as part of mitigation is not coherent).	Taken into account - text revised.
30586	SPM	3	9	3	10	This sentence is unclear. Suggest avoiding use of the word 'likely' here in first half of the sentence because changes in some extreme events or impacts could also be assessed to be likely. Suggest rewording as follows: Because mitigation reduces the magnitude of climate change and associated impacts, it is part of.....(cont.).	Accepted - text revised.
25189	SPM	3	9	3	11	How does mitigation lowers the effects of climate change as well as risks of extreme impacts, and what are the level of evidence and confidence in this finding? The citing of AR4 finding here which indicated a risk management process, has been made to look like a strong causality. The sentence should be deleted or rephrased to capture the linkages and not causality.	Taken into account - text revised.
21497	SPM	3		8		The section on emissions trends and drivers should be rewritten to focus more on the real drivers in a technical sense and projections with existing measures to give information for policy makers on what the trend would be without additional action. In terms of emission trends, there is little information on sectoral trends, for example, no information on emissions from land use, and deforestation in particular. Neither chapter 5 not 6 provide any details on drivers and the baseline GHG emissions underlying the RCP scenarios. This is a serious omission that needs to be rectified. Similar to the SRES report, there needs to be information on the baseline assumptions, i.e. of the various models used for assessing the RCPs. This requires a separate section, preferably in chapter 5 or 6 and a summary in the SPM. A good example is section 2.3.2 (i.e. Figures 2.4 and 2.5) on page 131-133 of TAR WGIII report. It also lacks detail on specific sectoral trends, for instance very little is being said (basically nothing) on trends in deforestation.	Noted. We included a finding on baselines in SPM.2. In chapter 6 a comprehensive discussion of basline scenarios been added. Furthermore, we added Box TS.6 in the TS, which provides additional information.
31267	SPM	3	31			Did some countries achieve significant GHG emission abtement over the period ? How much ? Is this replicable ?	Rejected. This finding focusses on developments in global emissions during 2000-2010 compared the three earlier decades. It is not focussed on regions or countries. We have findings on developments in emissions by regions and on the effectiveness of Kyoto in Section SPM.4.
31268	SPM	3	31			(also page 5 and page 7)"developing countries" should be defined. In Figure SPM1 three types : indutrialized, developing, lesast developed. In pae 4 line 9 and in page 24 line 7 : developing, developed ; therefore ilmplicitly assuming that LDCs are developing countries and that developed equals industrialized	Accepted. We have clarified the language, but do not use the suggested regional groupings.
26486	SPM	3	25			…after "technologies," include: "social capital and human resource development"	Rejected.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35194	SPM	3	1	25	21	The country grouping is not consistent throughout the entire report. Since IPCC assessment is an intergovernmental process, it is suggested to use a common classification method, which could be either of the following: Annex I and non-Annex I of the Convention, Annex B and non-Annex B of Kyoto Protocol, United Nations Regional Groups or the RCP 5 regions currently used in the IPCC WGIII report (see in Annex II RCP5). However, the current definition of RCP5 needs further revision, as Hong Kong is to be changed to Hong Kong SAR, Macao to be Macao SAR and Taiwan to be Taiwan POC. In addition, It is strongly suggested that no comparison between individual countries and regions should be made. To keep the consistency of country grouping, following revisions should be made in the SPM: replace Figure SPM.1 and Figure 1.4 with Figure 5.2.1; delete Figure SPM.4 to avoid redundancy since Figure SPM.2 and SPM.3(b) have already presented the information on historical emissions.	Rejected. We choose the most appropriate country grouping depending on the underlying scientific question.
35192	SPM	3	18	3	20	It is pointed out in the Introduction section of the SPM that a key difference between AR5 and AR4 is that AR5 emphasizes more on the ethics and equity of climate policy. However, ethics and equity, together with other framing issues including risk management and sustainable development, are not sufficiently reflected in the SPM. It is highly recommended to create a specific section focusing on dual risk management of climate change and mitigation, ethics, sustainable development, equity, and historical responsibilities of developed countries, in order to provide a holistic overview of those issues for policy makers.	Accepted - we added more information on these aspects to section SPM.1.
41030	SPM	3	35	3	39	Historic emission assessment of CO2. Reference is made to CO2 only, while it should also make reference to other GHG, such as methane and nitrous oxide that have much more GWP.	Rejected. We refer to CO2eq based on Global Warming Potential 100. This number includes non CO2 GHGs.
23040	SPM	3	10	3	10	Change "extreme" to "adverse"	Taken into account - text revised.
32349	SPM	3	12	3	20	We wonder whether the paragraph about the SYR AR4 is needed. By deleting these sentences, confusion about the scope of the WGIII contribution could be avoided.	Taken into account - text revised.
24993	SPM	3	16	3	20	Suggest this should reference biodiversity to reflect the environmental component of ecologically sustainable development (ESD). Suggest added wording: "Significant climate change mitigation can be achieved by conserving and managing biodiversity. However, the vulnerability of biodiversity puts this mitigation pathway at risk."	Taken into account - text revised.
32350	SPM	3	29	3	30	"qualitative levels of confidence or evidence and agreement" -- we suggest to clarify that the basis for the confidence assessement is the assessment of the amount of evidence and the level of agreement. This is not obvious from the current statement but is an important component of the AR5 Guidance Note on the Treatment of Uncertainty.	Accepted - text revised.
23032	SPM	3	4	3	6	It would be appropriate if the year the SRREN was approved would be given here	Taken into account - text revised.
32348	SPM	3	9	3	10	"Because mitigation lowers the likely effects of climate change as well as the risks of extreme impacts" -- this statement is presented as a factual statement and as such seems to prejudge one of the key conclusions of the WGIII AR5. To avoid this impression, we suggest to refer back to earlier assessment reports (e.g., AR4) here. In addition, "likely"in "likely effects" should either be given in italics if it is the result of a formal assessment of the uncertainty of the statement or else it should be deleted to avoid confusion with the reserved term from the Uncertainty Guidance Note.	Taken into account - text revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35193	SPM	3	31			The absence of substantial mitigation efforts from developed countries is one of the main reasons why global emissions have been constantly increasing in the past decade. However, whether developed countries have fulfilled their commitment to achieve substantial mitigation under Article 4, principle 2(a) of the Convention is not discussed in the SPM. To maintain a balanced discussion on the reasons for the rise in GHG concentration, it is suggested to add the following sentence at the end of page 4 line 25, “The emission per capita of developing countries is still far behind that of developed countries. Besides the rapid economic growth in developing countries, the absence of substantial mitigation efforts in developed countries accounts for another key reason why global emissions have been constantly increasing in the past decade. Given the fact that developed and developing countries are currently in different stages of development, to ensure the equity for all, developed countries should increase their ambition level in reducing emission per capita and provide effective financial support and technology transfer to developing countries. Meanwhile, developing countries should avoid following the high carbon developing pathway that developed countries have gone through, and maintain a moderate growth in emissions.”	Taken into account. We have a discussion on the effectiveness of the Kyoto Protocol in SPM.4. Moreover, we highlight differences in emissions across regions taking different perspectives,
35195	SPM	3	31			GHG emissions data since 1970 used in this report is mainly from EDGAR database instead of other data sources. However, the data from EDGAR database has systematic deviations for developing countries. The data of China is usually 10% higher compared to other databases (Please see figure 1 in the attached WORD file). It is recommended to add a paragraph to elaborate on data disparity and uncertainties of different databases and the reason why EDGAR database has been chosen.	Rejected. The EDGAR data is only used for emissions from land-use and non-CO2 emissions. Other CO2 emissions come from IEA. Moreover, chapter 5 compares China emissions across databases and does not arrive at the same conclusions.
29308	SPM	3	31			The ordering of the paragraphs inaccurately reflects the main drivers of emissions growth since AR4. For example, embedded CO2 emissions while large, is not more significant than paras on p. 6 beginning with "The largest share of anthropogenic CO2 is emitted by a small number of countries" and "Human settlements accounted for 75-81% of global CO2 emissions between 1990 to 2008"	Noted. We have reorganised the section. It remains doubtful whether the importance of drivers is the only reasonable organisational principle.
38910	SPM	3	31			SPM2 EMISSIONS TRENDS AND DRIVERS - This section focuses entirely on regional and global emissions developments. However, there is really little brought forward from the underlying chapter on sector-level developments. There should be a paragraph or two summarizing sector level trends and their the direction of their evolution. For example, in the energy supply sector recent growth in unconventional oil and in particular gas are having a marked effect on that sector and at least in the US derivatively on other economic sectors and emissions. Even in the following section SPM 3 on mitigation, the SPM does not treat energy supply sector changes and their mitigation implications.	Accepted. We have moved the Figure on historic emission trends of sectors into section SPM.2.
29645	SPM	3	32			Should include in the SPM a graph with sectoral GHG breakdown - industry vs. buildings vs. transportation vs. AFOLU, etc.	Accepted. We have moved the Figure on historic emission trends of sectors into section SPM.2.
29646	SPM	3	32			These paragraphs' ordering does not reflect the primary drivers of emissions growth since AR4. For example, embedded CO2 emissions (while large) are not more significant than paragraphs on page 6 beginning with "The largest share of anthropogenic CO2 is emitted by a small number of countries" and "Human settlements accounted for 75-81% of global CO2 emissions between 1990 to 2008".	Noted. We have reorganised the section. It remains doubtful whether the importance of drivers is the only reasonable organisational principle.
23033	SPM	3	32	3	33	UNFCC and Kyoto protocol have been in existence for s long time yet they have not been effective in capping the GHG emissions. What is required in this explanation is why the failiar and strategies for rectification of the policies to ensure effectiveness	Noted. Section SPM.4 comments on the Kyoto Protocol and its effectiveness.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33886	SPM	3	32			Comment: SPM.2, about Emission Trends and Drivers, could summarize trends with which all humans could identify intuitively, such as sea-level rise. The WGIII SPM starts with a summary of physical changes in the climate. The SPM.2 section, entitled Emission trends and divers, summarizes the increase in greenhouse gas emissions and concentrations for CO2, CH4, and N2O. I think that the information about GHG and their concentrations are quite technical for many humans; i.e., that the concentrations are abstract numbers and thresholds. Furthermore, many climate-change effects are not intuitively “bad” and/or unacceptable, including the effects on ocean temperature and acidity, sea-ice concentration, and polar bear density. Those effects do not have clear social costs for many humans. In contrast, I think that sea-level rise is intuitively unacceptable to most humans, and has substantial economic impact. The WGI report summarizes clearly the rates of sea-level rise. The report starts with two figures, Figure TS.1 and TFE.2, Figure 1, which both graphically illustrate sea-level rise. The following two paragraphs are WGI descriptions of the figures (SPM section TS.2.6 of the WGI SOD). "It is virtually certain that global mean sea level has risen at a mean rate between 1.4 to 2.0 mm yr-1 during the 20th century, and between 2.7 and 3.7 mm yr-1 since 1993. This assessment is based on high agreement among multiple analyses using different methods, and, since 1993, from independent observing systems (tide gauges and altimetry) (see also TFE.2 Figure 1). (p. TS-10, line 54)." "Global mean sea level varied between glacial and interglacial periods, due to changes in continental ice volume. After the Last Glacial Maximum, global mean sea levels rearch close to resent day values several thousand years ago. Since then, it is very likely that the rate of global mean sea level rise has increased from low rates of sea level change during the late Holocene (order tenths of mm yr-1) to modern rates (order mm yr-1) during the 20th century. (TFE.2, Figure 1.)" Again, I think that the WGI information about sea-level rise should be summarized in section SPM.2 of WGIII. With such information, the WGIII appears to resolve an AR5 problem rather than a WGIII problem. Some WGIII sections refer to the need for mitigation as though it were merely a WGIII problem . Two examples are the explanations that Section 5 options can “encourage” the adoption of mitigation (p.3, line 28), and that mitigation efforts “should” be increased (p. 8, line 10). The use of the words “encourage” and “should” without references to WGI give me the impression that mitigation is a WGIII goal rather than an overall AR5 goals. Also, summaries of some WGI information within the WGIII report will help to inform WGI authors about key information to include in the SR. In the TS, please notice that both Figure TS.1 and TFE.2, Figure 1 illustrate apparent acceleration in the rate of change. When I reviewed the WGI SOD I commented on the apparent acceleration, but I do not know how much emphasis AR5 in general will place on apparent acceleration. An implication for WGIII mitigation is that, whatever emission limits are proposed, they might seem insufficient in future decades. For that reason, WGIII could identify types of mitigation for any acceleration.	Rejected. It is important to highlight trends in emissions and their underlying drivers. The space constraints are too severe to re-iterate findings from WG1. This is the task of the synthesis report.
32351	SPM	3	32	3	41	Please include the 2012 total annual CO2 and CO2 equivalent emissions in this paragraph.	Rejected. The global GHG databases used in this assessment do not provide figures for non-CO2 gases and land-use related CO2 emissions. We have added a sentence descriving the trends in fossil fuel related CO2 emissions until 2012.
26277	SPM	3	36	3	38	It is not clear if the growth of emissions "(…) more than twice as fast than during the periods 1980-1990 and 1990-2000." is expressed in absolute or relative terms or if it is considered the rate of growing or the amount of CO2 eq. Tons.	Accepted. Revised language.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29741	SPM	3	36	3	37	Please replace 'any decade' with 'any other decade'. 2000-2010 is also one of the decades since 1970.	Noted.
32352	SPM	3	39	3	40	"weighted with 100-year Global Warming Potentials" -- we suggest to at least flag at the level of the SPM what implications a choice of another GWP would have (e.g., 20 years and 500 years) to avoid the impression that the IPCC is giving precedence to one specific time-scale in the calculation of GWPs (see WGI Chapter 8, Table 8.A.1).	Accepted. We do this now in the second paragraph of the section and refer to Box TS.2, where the reader can find a more substantial discussion on this important topic.
22524	SPM	3	40	3	41	This sentence “at current levels, every 12 years….” is very difficult to understand and does not give a clear message “propose deletion or a more explanatory rewording.	Accepted. Sentence deleted.
20746	SPM	3	11	3	11	pls change "climate impacts" to "climate change impacts"	Taken into account - text revised.
40968	SPM	3	2	3	2	L2,P3: ‘new findings’ SPM shall lists all new findings instead of discussing on issues those raised during AR4.	Accepted - we strengthened the focus on evidence that is new since AR4.
40967	SPM	3	9	3	9	L9,P3: ‘Likely’: SPM shall explicitly define the evidence of climate change effects not as ‘likely’	Taken into account - text revised.
24994	SPM	3	31			The paragraph and ordering and argumentation appears to emphasise the enduring responsibility of developed countries for current and historic emissions while not adequately describing the significant changes in patterns of emissions that have taken place particularly since AR4. Suggest the following re-ordering the paragraphs (and making some changes within two of the paragraphs) in section SPM2 to put them in the following order: 1. Paragraph beginning “Despite existing mitigation policies…” (Page 3, lines 32-41). 2. Paragraph beginning “Emissions growth from consumption continues to outpace…” (currently page 7, lines 6-17) 3. Paragraph beginning “In total, developing countries have higher…” (currently page 4, lines 17-25) - And swap the order of the first two sentences within this paragraph, so that the paragraph begins with the sentence “Since the AR4, … developed countries (Annex B).” (currently at page 4, lines 19-21) – This sentence better reflects the central point of this paragraph. 4. Paragraph beginning “Asia’s current emissions trajectory…” (currently page 5, lines 9-18) - And delete the first sentence of this paragraph (currently at page 5, line 9), so that the paragraph begins with the current second sentence (“Since the AR4 … has taken place in Asia.” currently at page 5, lines 10-11), which better reflects the central point of this paragraph. (The current first sentence can be deleted as it is repeated later in the paragraph.) 5. Paragraph beginning “The largest share of anthropogenic…” (currently page 6, lines 9-13) 6. Paragraph beginning “Developing countries tend to be net exporters…” (currently page 4, lines 9-16) 7. Paragraph beginning “Human settlements accounted for…” (currently page 6, lines 14-17) 8. Paragraph beginning “Uncertainties associated with estimates…” (currently page 6, lines 18-25)	Noted. We have rewritten most of the section.
40970	SPM	3	32	3	40	Emission trends have been illustrated based on ‘regions’, however WG-III AR5 refers emission trends based on sectors. Emissions trends per capita shall be discussed here.	Rejected. The paragraph does neither refer to emission trends by region nor by sector. It focuses on global emission trends by greenhouse gas. We continue to do so and show emissions by region and sector later - including per capita emissions by regions.
40788	SPM	3	32	3	33	To recognize the fact that GHG emission have not reduced but rather increased even under the current UNFCCC regime, is very important, because we have to recognize the fact and act the best way we can. Therefore, to recognize the fact, this expression should be maintained.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20747	SPM	3	34	3	34	pls replace the brakets with "which used 2004 data"; define anthropogenic	Noted. We have included the comparison with AR4 in our finding on uncertainties in emissions data.
30671	SPM	31				This section could provide more details on scenario's assumptions regarding population and GDP growth.	Accepted. We added a finding on baseline scenarios at the end of Section SPM.2. However, there is limited space for discussing underlying assumptions in a SPM. We have extended the underlying section in chapter 6 in this regard though.
30600	SPM	4				To better support the text on page 3 lines 36-38, suggest that decadal growth rates be added to this Figure, and rates for other periods, be removed, other than for the specific time periods (events) represented by the coloured bars.	Accepted. Decadal growth rates were added to one of the revised figures. SPM.1 was completely revised (new Figure SPM.4).
33531	SPM	4				Please put periods of major global economic recessions in chronological order in the top left legend.	Noted. We removed the economic recessions from the regional emission trend figure.
31692	SPM	4				Definitions of developed and developing countries needs to be clear and consistent throughout the text. In some places, it refers to Annex B (L11), but that includes many countries which are no longer developing (eg S Korea, Qatar, S Korea). Figure SPM1 uses G20 LDCs, DC-other. The report overall looks at future emissions and impacts, ie to 2030 and beyond. Discussion on developed versus developing countries needs to take into account that many countries or regions will grow and no longer fit into these definitions within the timescales covered in the report.	Noted. We used different regional classifications depending on the underlying scientific questions throughout the report.
23806	SPM	4				Financial crisis of 2007? Maybe 2008?	Accepted. We removed the economic recessions from the regional emission trend figure.
23807	SPM	4				Why this selection of countries in the figure? Different to all other figures.	Noted. We used different regional classifications depending on the underlying scientific questions throughout the report. Moved towards more common economic region classification.
23808	SPM	4				DC-G20 has a few unusual spikes (1982? And 1997?). These don't seem realistic to me. I would suggest to check to make sure there is no data issue in there.	Noted. Spikes are related to large emissions from land-use change. Moved towards more common economic region classification.
23573	SPM	4				The vertical axis should be more precise "GHG emssions (Gt CO2 eq./year)	Accepted.
25207	SPM	4		4		China is such an outlier, it should be shown separately	Rejected. Author team decided not to provide information on individual countries at SPM level.
26104	SPM	4		4		Please explain to the reader that these production-based emissions are reported under the UNFCCC.	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28330	SPM	4		4		Figure SPM.1 refers to different country groups (G20, IC, LDC) than the text (Annex B, Non Annex B), but the terms "developed/developing countries" are used in both of them. This is confusing, please use consistent country groups in the text and figures.	Rejected. We used different regional classifications depending on the underlying scientific questions throughout the report. Moved towards more common economic region classification.
28331	SPM	4		4		Please give an explanation or at least a reference for the definition of the regions. A list of countries of the UNFCCC-Annexes (I, non I, and B) should be added in AR5_WGIII_Annex_II.	Accepted.
28332	SPM	4		4		figure SPM.1: the latest global trend shown for global GHG emissions of 1,6%/yr is a straight line from 2008 to 2010, is there no value in 2009?	Noted. Of course, there is a value for 2009 underlying the trend representation.
28333	SPM	4		4		figure SPM.1: the latest global trend shown for global GHG emissions of 1,6%/yr. starts in 2008, but has no ending. Since the timeline ends at 2010, you might add 2010, or explain, why this period has no ending.	It is not clear what the reviewer means. The trend ends in 2010.
28334	SPM	4		4		figure SPM.1: title of the vertical axis: please add CO2eq in the brackets (GT CO2eq/yr)	Accepted.
28335	SPM	4		4		legend of figure SPM.1: please put the symbols for the periods of economic recessions in a chronological order	Noted. Recessions were removed from regional figure.
28336	SPM	4		4		the time horizons to describe the relative annual GHG trend in %/yr are arbitrary (1970-1980; 1980-1997; 2000-2007, …). Time horizons should have the same length, e.g.. a decade.	Accepted. They are not arbitrary, but show the periods between recessions. Recessions were rmoved from regional figures. Decadal information is shown now.
22370	SPM	4		4		The country groupings contained in this Figure SPM.1 in which G-20 membership is used as a grouping criterion are not consistent with the traditional country groupings used by IPCC (which are either UNFCCC Annex I (e.g. OECD 1990 countries and Economies in Transition) and non-Annex I (e.g. Asia, Middle East and Africa (MAF or AFM), Latin America (LAM)) countries). Figure SPM.1 should be changed in order to reflect the traditional IPCC country categories or groupings rather than create new ones which are not even recognized as such in the UNFCCC regime. Providing for consistent country groupings within and across chapters will also allow for more scientifically rigorous comparability among country groupings. Figure SPM.1 should be replaced, instead, by Figure 5.2.1 from Chapter 5, as Figure 5.2.1 is consistent with traditional IPCC practice in relation to country groupings.	Noted. We moved towards a more commonly used definition of economic regions.
26714	SPM	4	0	4	8	Figure SPM.1 is very informative. However, it could be useful to note the reasons for the drops in emissions 1982-1984, 1987-1988, 1992-1993 since these are of the same magnitude as the drops already illustrated in the figure If no explanations can be given for these drops it could be mentioned in the figure text.	Noted. We have dropped this figure. The focus in the early discussion of the section is on a description of observed trends in GHG emissions.
31270	SPM	4	1			The classification in major economic regions should be clarified. What ise the refrence year for defining them : 1970 or 2010 ? Why not the geographic classification used in subsequent SPM figures ?	Noted. We use regional groupings depending on the question under consideration.
25830	SPM	4	1			Provide in a footnote the list of countries included in the different regions considered.	Rejected. We provide the lits of countries in an Annex to the report. As we have multiple regional classification with more than 200 countries and regions, this cannot be provided in footnotes cleanly.
25832	SPM	4	1			I have the impression that in the caption the description for dotted and full lines are inverted.	Accepted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25833	SPM	4	1			Please use the same abbreviations in the figure than in the caption of EIT/REF countries.	Accepted. The figure is now presented according to economic regions.
20532	SPM	4	1			The growth rates (horizontal lines) should be in line with what is stated in the paragraph before (page 3, l 36 - l 38). There the increase of the growth rate is discussed on 10years terms, whereas the graph shows different time periods (e.g. 1980-1997, 17 years; 2000-2007, 7 years; 2008 - 2010, 2years). It is understood that the grwoth rates in the figure refer to major economic crises. However it is felt that this should be in-line with statements made in the text. Especially as this are key figures.	Accepted. We have a new figure SPM.1, where this is the case.
25198	SPM	4	1	4	8	Rationale for grouping of countries used in figure SPM1	Noted. It is important for IPCC Working Group III to classify countries economically in order to understand emission trends and drivers properly. As a response to review comments we switched to the economic classification provided by the Worldbank.
29310	SPM	4	10			Change "A considerable share" to a range of estimates.	Accepted. Imprecise language has been removed.
25831	SPM	4	10	4	12	Specify that the annex of the Kyoto Protocol is referred to.	Noted. We changed from Annex B to Annex I.
23809	SPM	4	10			"A considerable share". Please quantify.	Accepted. Imprecise language has been removed.
25200	SPM	4	10	4	10	change 'impact' to 'events'	Rejected. This line or paragraph does not contain the word "impact".
23941	SPM	4	11			the term "non-Annex B" countries should be defined in the glossary.	Noted. We changed from Annex B to Annex I.
22371	SPM	4	11	4	12	The references to "Annex B" should be clarified as to whether they refer to "Annex B of the Kyoto Protocol" or "Annex I of the UNFCCC"	Noted. We changed from Annex B to Annex I.
26442	SPM	4	11	4	12	"non-Annex B" and "Annex B" are used without any reference as to what or where these annexes are. No doubt it is Annex B to the Kyoto Protocol that is being referred to. However, we would question the need to include the references to non-Annex B and Annex B asthe exisiting text already refers to developing and developed countires repectively. Suggest "non-Annex B" and "Annex B" are deleted.	Accepted. We changed to Annex I and non-Annex I.
25201	SPM	4	12	4	12	"less" - this word is general and subjective, some explanation is desirable	Accepted. Revised language.
25202	SPM	4	12	4	14	The sentence needs clarity . The correct statement should be "Less……..as a result of import of energy intensive goods and services from developing countries"	Noted. We revised the entire finding.
38919	SPM	4	12	4	14	This sentence implies that it is the import demand of developing (rather than developed) countries that is responsible for reduced CO2 emissions in developed countries. It seems much more complex than this. Do the underlying studies and evidence show this? Should this be rephrased to indicate that it is the demand for imports by developed countries and produced in developing countries that is driving this shift in the location (and likely volume) of emissions?	Rejected. This is not what the paragraph says, which provides a descriptive statement. We revised the entire finding.
23492	SPM	4	13	4	14	should it read "as a result of developed countires' import demands"?	Noted. This is correct. The entire finding was revised.
23942	SPM	4	15	4	16	It is noted that according to the 1996 IPCC Inventory Guidelines countries do not necessarily report their territorial emissions but e.g. the data related to fossil fuels sold in the country. Those data need not match, in particular for smaller countries. The term "Territorial emissions" should also be explained in the glossary.	Accepted. Important point that has to be clarified.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26443	SPM	4	15	4	15	Ambiguous what 'their' refers to.	Accepted. Language of entire finding revised.
29647	SPM	4	17	4	25	In this wording, the final sentence in this paragraph seems to contradict the preceding sentences. Recommend new paragraph on "A growing number of developing countries show per capita CO2 emissions…" to differentiate between growing emissions from economic growth developing countries and growing emissions from international trade and demand due to globalization and developed countries.	Accepted. Revised entire finding.
30389	SPM	4	17	4	25	It is useful to have figures for per capita emissions rather than relative statements. This section should be reworked to provide facts and figures rather than statements.	Noted. Revised entire finding.
30390	SPM	4	17	4	25	The definition of import and export of co2 needs to be defined. Provide a table of regional emissions data. It should be note that emissions belong to the countries that emit them.	Accepted. We revised finding. Detailed explanations of different tpyes of emission accounting cannot be presented in a SPM though.
31297	SPM	4	17	4	20	This sentence does not read easily. Please consider to make it more understandable. E.g. we suggest that the term "territorial" is replaced by domestic. Furthermore, the way the term consumptiobased is used here can easily be misunderstood. One option could be to explain the Consumtion-based emissions in the body of the text below. Another option could be to link the findings of consumption-based emissions with the findings in the previous paragraph (line 9 to 10).	Accepted. Revised entire finding.
29311	SPM	4	17	4	25	The final sentence refers to developing countries with high per capita CO2 emissions, which contradicts the thesis statement. Recommend new paragraph on "A growing number of developing countries show per capita CO2 emissions…"	Rejected. The group of developing countries is large so that both statements remain correct as one refers to the average group and the other to individual countries within the group. Entire finding was revised.
30597	SPM	4	17	4	17	Suggest adding the word "now" after "developing countries", or provide a date from which this statement is true.	Noted. Entire finding revised.
30596	SPM	4	17	4	25	In general, the text in this paragraph is not well supported by the referenced Figure (Fig SPM.2) because the text refers to developing and developed countries whereas the Figures divides the world into 5 regions. This makes it very difficult to link statements to evidence in the Figure. Is the reader to assume that developed countries are represented only by the OECD 1990 countries?	Accepted. We have worked towards a closer linkage between text and figures throughout SPM.2.
21499	SPM	4	17	4	19	The split between developed and developing countries is not informative for policy makers on how emission profiles per capita compared. It would be of more interest to show the high differentiation within these groups between major emitting countries and regions. Should be adapted to be more informative for policy makers	Accepted. We changed towards an economic region definition and provide more information about in-group variation.
34245	SPM	4	17	4	19	Isn't this statement based on the fact, that the fastest growing economies are China, Brazil, India – three countries with a rather huge territory? So the above rather general statement would not hold true, when these three countries are excluded?	Rejected. It is a descriptive statement, which highlights the fact that since AR4 developing countries have overtaken developed countries in total emissions. This was not the case before. To avoid misinterpretation we also provide information on a per capita basis. Entire finding revised.
23943	SPM	4	17	4	19	This statement should include a reference to the years investigated. The underlying text could be interpreted that this statement is valid for 2010 - however more clarity would be helpful.	Accepted. Entire finding was revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25204	SPM	4	17	4	17	Explain territorial and consumption based emissions as a footnote, since these two terms are new in the IPCC reports.	Noted. We clarified the text. More detailed information about the concept are provided in the underlying report.
25203	SPM	4	17	4	19	Change the formulation of the sentence to "The aggregate territorial and consumption based CO2 emissions of developing countries as a group is higher than the developed countries, but……"	Noted. Entire finding revised.
28329	SPM	4	17	4	25	See also comment on chapter 1, p 19, l 15-20: The following changes are suggested (in capital letters):"In total, developing countries have higher territorial and consumption-based CO2 emissions than developed countries, but their per capita contributions remain IN AVERAGE considerably lower – particularly in the case of least developed countries (robust evidence, high agreement). Since the AR4, territorial and consumption-based CO2 emissions from fossil fuel combustion of developing countries (non-Annex B) surpassed those in developed countries (Annex B). On a per capita basis, in 2010 developed countries' CO2 emissions were approximately four times higher than developing countries' emissions. BUT THE variations existing within these groupings ARE VERY LARGE (Figure SPM.2). ALL SEVEN COUNTRIES WITH THE HIGHEST PER CAPITA EMISSIONS ARE NOW DEVELOPING COUNTRIES (NON-ANNEX-B), AND A NUMBER OF DEVELOPED COUNTRIES HAVE LOWER PER CAPITA EMISSIONS THAN SOME OF THE LEADING DEVELOPING COUNTRIES. A growing number of developing countries show per capita CO2 emissions within the range of industrialised countries from a territorial and consumption perspective. [1.3, 5.5]	Accepted. We revised the entire finding and provide information about variability of emissions within a particular group.
29027	SPM	4	17	4	17	Would be useful to have the phrase "consumption-based CO2 emissions" defined as to what it includes/ does not	Noted. We clarified the text. More detailed information about the concept are provided in the underlying report.
25111	SPM	4	17			Territorial-based CO2 emissions should be shown as territorial-based (production-based) CO2 emissions. Ref. p. 6. Lines 10-11	Noted.
23810	SPM	4	18			"but their per capita contributinos remain CONSIDERABLY lower". I suggest to drop "considerably" as this is just an attempt to place responsibility on one over the other when it is not necessary. And this is also a changing dynamic with the per capita emissions in some developing countries much higher than in some developed countries. This use of "considerable" sends an incorrect message. In fact, in lines 23-25 you even contradict your statement?	Rejected. We are not placing responsibility on anyone, but present emissions trends and drivers from multiple perspectives. How policymakers assign responsibility cannot be resolved scientifically even though we provide information about underlying ethical discussions in the framing chapters 3 and 4 of the underlying report. We revised the finding and provide also information on variability within groups.
30598	SPM	4	19	4	19	Suggest adding after "Since the AR4" the date to which data in the AR4 were current.	Noted.
23811	SPM	4	19	4	21	This really requires a year to specify when it occurred	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40791	SPM	4	19	4	25	The uncertainties of the CO2 emission amount is a very important issue from the viewpoint of the pledge and review process. The needs for more intensive research have to be described either in SPM or TS.	Rejected. There is an entire paragraph in the SPM on uncertainties, which we further elaborated. However, it provides an adequate summary for a SPM. More detailed information can be found in the underlying report (chapter 5).
25205	SPM	4	20	4	21	Are all non annexe B countries indeed developing countries?	Noted. We changed to Annex I/ non-Annex I grouping.
38920	SPM	4	20	4	20	The text should be revised to read "combustion in developing countries", not "combustion of developing countries"	Accepted. Revised entire finding.
26105	SPM	4	22	4	25	The notion of the very large variation of developing countries' emissions could, if added, clarirfy the bolded lead sentence of the paragraph (lines 17-19).	Noted. We show the variability within regional groupings in the revised version. The entire finding was revised.
30599	SPM	4	23		25	This statement would benefit from further elaboration about the size of the developing countries in question - are they small countries with high per capita emissions but still low total emissions? Or are they large developing countries with growing per capita emissions and by association very large total emissions?	Accepted. We revised the entire finding and provide information about variability of emissions within a particular regional group.
34693	SPM	4	23	4	23	Unfortunately the Figure SPM.2 doesn't show anything about the very large variations existing within the groupings. Maybe an additional graph be developed to illustrate these variations. The next paragraph talks about Asia as a group, but knowing more about variations within this group would be helpful.	Accepted. We revised the entire finding and provide information about variability of emissions within a particular regional group.
25206	SPM	4	23	4	25	This is a very generic statement provide data for latest year, to show how many developing countries have higher /capita emissions than industrialized countries	Accepted. We revised the entire finding and provide information about variability of emissions within a particular regional group.
29028	SPM	4	23	4	25	It would be useful to note here which developing countries are approaching developed countries per capita emissions.	Rejected. The author team decided against the provision of information at the country level. However, we provide transparent information on varaibility of emissions within each regional group.
20078	SPM	4	24	4	25	The affirmation that a growing number of developing countries show per capita emissions within the range of developed countries, is absolutely not visilble in the following figure, SPM2, and therefore there is a contradiction between the textual and visual message. Does it mean that within a low average or per capita emission some developing countries have high emission patterns ? Could be made clearer in the text	Accepted. We revised the entire finding and provide information about variability of emissions within the different regional groups.
26441	SPM	4	3			In the figure caption, please reference the GWPs appropriately (as per the above comment)	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23536	SPM	4	9	4	10	The distinction between importers of CO2 and exporters of CO2 is confusing. CO2 is neither exported nor imported. Goods or services that produce CO2 as by-product are imported or exported. But that obscures where the CO2 is emitted. Also, given the high volume of production done outside developed countries in outsourced work and in globally dispersed production chains that follow inexpensive labor and relatively limited regulation, I find it prima facie implausible that developed countries are the main exporters of goods and services involved with producing C02 as by-product.	Rejected. There is a considerable growth in the literature on consumption based emissions. This is a major development in the literature on emission trends and drivers that needs to be achowledged in the SPM. Note that we are not talking about outsourcing, which may not be defensible.
30388	SPM	4	9	4	16	Not clear on added value of this. Language use is difficult use Annex B seem odd. UN definition ions and classification and should be use. This can be shortened!	Accepted. Language revised and shift to Annex I/non-Annex I grouping.
30595	SPM	4	9	4	16	More clarification on the idea of net exporters and importers of CO2 emissions is needed here. This idea of net exporters and importers of GHG emissions may be coherent to experts with an economics background, but not those with a non-economics background.	Accepted. Language revised, but space limited. Comprehensive explanations are provided in the underlying chapters.
24147	SPM	4	9	4	16	Reasonable analisis on goods and services. So, please take carefully into consideration of a concept of scope 3 emissions and scope 1&2 as well.	Noted. Consumption based emissions include all scope 3 emissions.
30440	SPM	4	9	4	25	Under the UNFCCC emissions are reported at the source and and not where products are consumed and therefore these paragraphs can be confusing. We therefore suggest deleting these paragraphs or at the least move them to page 8 at the end of this section.	Rejected. The IPCC assesses the literature and highlights important developments. The growth in literature on consumption-based emissions is one major development in the area of emission trends and drivers.
21498	SPM	4	9	4	16	Is the methodology used to estimate consumption-based GHG accounting sufficiently robust? The repeated use of the split between consumption based and territorial in the document seems to conclude yes, but is this truly the case? Overall the continued use of the two ways of measuring emissions seems rather more confusing than informative from a policy makers perspective. If the methodology is deemed sufficiently robust then it should be focused in one relevant paragraph or figure (as SPM.1) and should not be used throughout the SPM.This paragraph needs quantification/qualification as it stands and overall seems inappropriate as such in the SPM. International trade seems to account for little of certain emissions trends, see for instance figure SPM.2 and the assertion included in page 5 line 12 which points out that with or without trade, emissions would have increased strongly in certain regions. This bullet without quantification opens the door to exaggeration of the role or trade in the increases of emissions in certain regions .	Accepted. We have only one figure and one paragraph in the revised version of SPM.2. The larger uncertainties are highlighted compared to territorial emission trends, but at the high regional aggregation level the author team considers results as robust. This may be very different at more detailed country and sector levels. Note that this does not say anything about the role of trade as emission driver.
24381	SPM	4	9	4	10	Please carefully define net exporter and importer of carbon emissions. The following lines don't do that clearly enough in my opinion.	Accepted. We tried a cleaner language given the tight word constraints of a SPM. Details are provided in underlying chapters.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32087	SPM	4	9	4	25	As criticezed above, these comments do not yeild to reserach integrity. Exports and Imports are business models with economic explanations and flows of capital.	Noted. We reworded the paragraph to explain the concept of emission embodied in international trade carefully.
25199	SPM	4	9	4	16	The grouping of countries here is different from those in figure SPM 1. SPM uses "developing countries and developed countries" as well as" developing countries and industrialized countries", is there any difference between these two terms?	Noted. We use multiple regional classifications depending on the underlying research question. We attempted a more consistent language in the draft.
26103	SPM	4	9	5	18	A comment on the interaction between the figures and the text: It might read better, if the first paragraph after Figure SPM1 would more directly reflect the content of the figure: now it discusses matters which are partly in Fig SPM 2. Plus the paragraph does not refer to any figure directly. The same comment applies to other figures as well.	Accepted. We worked on linking Figures and text even closer in our revisions.
38914	SPM	4	9	4	16	Net importers/exporters: this is an important concept, as it looks at sectoral responsibility for CO2 emissions. This is a vital distinction for determining policy responses, and the political interests of the dominant parties for chapter 13. Yet importer/exporter of co2 emissions seems to be the wrong term. I'm not sure what is better.	Noted. We are not discussing responsibility, but show emission trends from different perspectives found in the scientific literature.
38915	SPM	4	9	4	16	This draws a series of conclustions not supported by underlying text or the graphic. In particular, it assumes that exports are primiarly to devloped countries. It also does not break out countries and assumes regions as a whole are uniform rather than being highly variable. And there's not indication that the supply chain portion is suppored by the text. Recommend deleting or supporting this paragraph.	Noted. We have revised the text on consumption and territorial emissions completely.
38916	SPM	4	9	4	16	The broader story of regional contribution to global emissions based on the most well understood and accepted methodologies (territorial or production-based) is not described here, and is an important element of the description of trends. An assessment of regional and/or groupings of country contributions is critical. This paragraph should describe those trends, rather than focus on a less well-understood metric of consumption.	Noted. We continue to focus on regional contribution from a territorial and consumption based perspective.
38917	SPM	4	9	4	16	The categories of countries used here "Annex B" and "non-Annex B" are not up to date and not consistent with categories used in the underlying chapters (including G20 IC and DC, etc..., as well as Annex I and non-Annex I). Annex B refers to countries with commitments under the Kyoto Protocol, but these categories are not the most relevant when speaking of categories of countries now and in the future. In general use of Annex B/non-Annex B should be avoided. Use of any terms should be defined in the SPM.	Accepted. We switched to Annex I and base further insights on economic regions.
38918	SPM	4	9	4	25	The focus on (energy) CO2 flows and per capita framing is too heavy relative to the underlying text. Additionally, these are but two ways of viewing the discussion. It's also worth noting that such a heavy focus on primarily energy CO2 does a disservice to addressing climate change, when those emissions only account for 61% of total GHG emissions globally (see Fig. 1.3)	Noted. The literature on consumption based emissions is largely focussed on fossil fuel related emissions. However, we have reworked the balance of the entire section SPM.2

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40789	SPM	4	9	4	16	Defining developing countries as “net exporter” and developed ones as “net importer” could be misleading. This report should clearly explain the calculation method of consumption-based emissions, by incorporating viewpoints such as industrial structure, international division of labor and technology transfer. Besides, it should be emphasized that i) developing countries should take the responsibility to reduce GHG emissions from production processes, and ii) consumption in developing countries, especially those in Asia would increase rapidly towards the future, and result in increased energy-originated CO2 emissions. For example, Table 8 (page 23) of “Middle Class Size in the Past, Present, and Future: A Description of Trends in Asia” (Asian Development Bank, 2010) shows that the total number of people in high income/expenditure category in “Developing Asia” will exceed that in OECD in 2030. Since climate change is an issue to be addressed from a long-term perspective, it is misleading to focus only on the recent trend. Besides, specific figure of carbon leakage, which appears Chapter 5 Page 42 L30 should be described in this part.	Noted. We provide a clear explanation of consumption based emissions, but the details cannot be provided in a summary for policymakers. We do not speak about emissions responsibility, but ways of analysing emission trends from different perspective as found in the scientific literature.
28327	SPM	4	9	4	16	Please differentiate between country groups as done in the following paras, for example in Fig. SPM.2. (LAM is a developing country, but also net importer of emissions).	Noted. We have the paragraph and the Figure SPM.2.
28328	SPM	4	9	4	16	The definition of developed countries as Annex B countries (text in the brackets) is unfortunate. Reference to Annex I would be better (exclusion of USA in Annex B, dynamic in CP2 Kyoto). Another Option would be to use "OECD1990". This would make the text more coherent with regard to Figure SPM.2 as well.	Accepted. We moved from Annex B to Annex I.
28326	SPM	4	9	5	18	Move these sections further down in the sequence of information. A WG3 SPM that starts with consumption vs. production based emission accounting is a) going to confuse readers and b) seems arguably not to be the most important finding of AR5 WG3. Starting with recent historical emission trends is good, but the distinction into consumption vs. production based accounting can come later and could be shortened.	Noted. The entire section was restructured and revised.
34028	SPM	4	14	5	15	Evidence regarding the association of income with emissions has not been presented in the preceding figures or that immediately after. This statement is therefore unsubstantiated.	Noted. The entire finding was removed during the revisions.
34026	SPM	4	17 21	4	19 23	Evidence of total CO2 emissions from developed and developing countries has not been provided. This statement is therefore unsubstantiated. SPM 2 which is meant to support the statement in line 21-23 does not show aggregate developed and developing country emissions (consumption and territorial).	Accepted. We have revised text and figures to provide all required information to the reader.
34025	SPM	4	17	4	19	Need to state here when this occurred as it has implications for cumulative emissions and responsibilities for emissions reductions, particularly asthis statement is in bold.	Noted. Entire finding revised.
41031	SPM	4	10	4	12	Emissions sources in developing countries. A negative of presentation of the emission profile. This is against the rights of developing countries to pursue their sustainable development. It has implication on all emerging developing countries, especially those that need to diversify their economy to build resilience to adapt to the impact of climate change and the adverse impact of response measures.	Rejected. In this paragraph it is higlighted that a growing share of emissions in developing countries are released to produce goods and services consumed in developing countries. We have revised the finding as part of the section revision.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24223	SPM	4	17	4	25	"Developing countries have higher and consumption-based CO2 emissions than developed countries…" I find missleading such statement. This is true when CHN and IND are included as developing countries but if considered as "emerging economies" the story looks different. I think it is moment to start including CHN and IND in a different categorie. Most models have CHN and IND as independent regions...why keep doing a meaningless regionall aggregation? IND and CHN are very different (economically, socially, politically and environmentally different) to each other as they are different to other developing countries.	Noted. We have revised the regional aggregation as well as the entire finding.
32693	SPM	4	9	4	16	We propose to place this paragraph after the current paragraph in page 4, lines 17 to 25.	Taken into account - entire section revised.
22527	SPM	4				Strange countries classification not matching other usual grouping of countries for comparatives statistics.	Accepted. We moved towards a more common regional economic grouping.
32694	SPM	4	14	4	16	Unclear content of this sentence: there is a mix between the total GHG emissions of the global supply chain and the individual GHG emissions from individual developed countries: “often” and “their territorial emissions”: for which developed country or countries?	Aceepted. Language of entire finding revised.
23034	SPM	4	17	4	19	This statement is not clear and need further clarification	Accepted. Entire finding was revised.
20012	SPM	4	9	5	8	Consider replacing "Figure SPM.2" with the two bottom panels of "Figure 1.4" of chapter 1 (p.20 line 2-11) to be more consistent with the main text.	Accepted. But the underlying figure in chapter 1 changed as well and we used that new version now.
22525	SPM	4	9	4	10	This comment applies for SPM. The sentence is not clear and accurate. Possible new language: "Developing countries tend to be net exporters of goods and services with the related CO2 emissions, while developed countries tend to be net importers of those products."	Taken into account. We revised the entire finding.
40971	SPM	4	1	4	8	Classification of Regions as per Figure SPM 1 shall mention the basis of this regional grouping (as per Annex II) Countries included in each of the region shall be presented as Annex or in a Box in the SPM.	Noted. We use multiple regional classifications, which are described in detail in the Annex to the report.
40973	SPM	4	17	4	23	The emission trends as presented in Figure 1.5 of WG-III AR5 shall be presented in SPM instead of reference made towards territorial or consumption based emissions from developing countries.	Noted.
20748	SPM	4	17	4	19	pls rephrase the first sentence to clarify the meaning of territorial and consumption-based	Accepted. Entire finding was revised.
40790	SPM	4	17	4	18	The fact that the consumption base emission of GHG of developing countries have exceeded those of developed countries is important because it shows the change in the phase. Therefore, this expression should be maintained. Here, it should be better to deal LDC and emerging countries (e.g., G20-DC), separately, because their developing stage is different as reported in Chapt.5.	Noted. We have changed towards economic regions for the finding in the revised finding.
40972	SPM	4	9	4	16	Instead of referring developing countries as net exporter. Classification as non-Annex B and Annex B shall be eliminated as Regions shall be presented as per Annex II only.	Accepted. We stop referring to Annex B throughout SPM.2 and switch to Annex I also in this finding.
24996	SPM	4	9	4	25	These paragraphs are a bit confusing for policy makers without specific expertise, and would benefit from an explanation of what is meant by countries being importers or exporters of emissions, and of the terms 'territorial' and 'consumption-based' emissions.	Taken into account. We revised the language and merged the two findings into a single new one.
32839	SPM	4		4		What is the point for separating into G20 and non-G20 members? Also, it is not done in later figures.	Accepted. We moved towards a more common regional economic grouping.
32247	SPM	5				REF in the figure needs to be changed to EIT/REF or EIT for the consistency with the note under the figure.	Noted, but regional classification changed in revisions.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30602	SPM	5				Suggest adding to top of each panel the descriptors "Total Emission" (left panel) and "Per Capita Emissions (right panel). Also note that in the Figure caption for this Figure, Territorial emissions should be described by the blue dashed lines and consumption emissions by the red solid lines.	Noted. New figure has only one panel, but corrects the issue with solid/sashed line reference.
21500	SPM	5				This figure would be more informative if some large emitters within regions are also represented. For instance, this type of graph says little on how emissions compare between those with relatively low per capita emitters in the group of the OECD countries and high-emitting or large countries in some of the regions.	Accepted. We have added a new figure SPM.4, which also shows within region variation for different regional groupings.
25524	SPM	5				The caption detailing the line types appears to be inconsistent with the line types available in the graph.	Accepted and corrected.
32088	SPM	5				Import-Export: see Nos. 2 and 6: the figures imply that there is no flow of capital	Rejected. Flows of capital are included in calculations of underlying scientific literature.
25208	SPM	5		5		The figure needs to be represented correctly in text and mention be made of long term dominance of emissions from OECD countries and recnet catching up of the same level by asia	Rejected. This is done by Figure SPM.3, which is Figure SPM.2 in the revised version of the SPM.
28343	SPM	5				If possible, please extent the x-axis of the graph until year 2012.	Rejected. We base this on publications with data until 2010.
28341	SPM	5		5		figure SPM.2: Please give an explanation or at least a reference for the definition of the regions. How is the region REF defined? Are there overlaps among groups?	Accepted. Reference to Annex II of the report added.
28342	SPM	5		5		figure SPM.2: Why are the regions in this figure different from those in fig.1? Would be good to provide consistent information.	Rejected. Different regional classifications are useful for understanding different types of scientific questions.
26444	SPM	5				Useful for the y-axis heading on the left-hand panel to say "Total emissions of CO2 [GtCO2 year-1]". This would be consistent with the language in the caption.	Accepted. Y-axis label adjusted.
24997	SPM	5	1	5	8	Suggest specifying that the decline and subsequent increase in emissions are related to the GFC and recovery.	Rejected. We do not interpret figures in the caption.
38921	SPM	5	1			Suggest deleting SPM.2. Figure 2 conversely conflates individual country roles with that of regions. We don't need 2 figures that deals with consumption and production in SPM. SPM.4. is more accurate representation of what each country's contribution. For SPM.4, suggest rounding to nearest whole %. Verify the level of precision is not substantiated by the confidence of the data.	Noted. We revised figure SPM.2 and deleted figure SPM.4.
38922	SPM	5	1			Fig. SPM.2 is problematic for the following reasons and needs to be revised heavily or replaced altogether: (1) this only shows the import/export of energy CO2, 60% of total GHG emissions; the MATCH database (www.match-info.net) and associated references (such as Hohne et al., Climatic Change, 2011: DOI 10.1007/s10584-010-9930-6) are much better resources as they include CO2, CH4 and N2O from all major sectors for all nations from 1750-2100. Additionally, literature such as Pongratz & Caldeira (Environ. Res. Lett., 2012: doi:10.1088/1748-9326/7/3/034001) illustrate how historic LULUCF emissions are significant and should not be ignored in discussions of historic responsibility, (2) the figure grossly overstates our certainty about these numbers as if proper uncertainty were included, the import & export lines would almost certainly overlap substantially, (3) goods are sold on a global market where they are sold on a supply chain that implicitly assigns a lifecycle value (whether fully accurate or not) to that product, so any cost of carbon could be embedded in that product if the producer chose to include it.	Rejected. There is no comprehensive time series evidence on consumption based emissions for GHG emissions. This is also not provided in the indicated references. Further note that CO2 emissions from fossil fuel consumption have been driving the majority of emission growth between 2000 and 2010.
38923	SPM	5	1			If this figure is to be retained, explain territorial and consumption-based somewhere briefly	Accepted. We revised the text of the underlying finding to make this clear.
28337	SPM	5	1	5	1	Figure SPM.2: in the brackets - please use the consistent writing for "per year" by using the "/"	Accepted.
26446	SPM	5	10	5	10	"Since the AR4" is ambiguous.	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26447	SPM	5	12	5	13	Suggest a slight redrafting to make this sentence easier to read and understand: "…of which roughly 83% and 72% can be attributed to Asia from a territorial and a consumption perspective respectively."	Noted. Finding removed.
23812	SPM	5	13	5	14	Do you have evidence for this. Is it energy intensity by itself, or is it energy intensive with coal for electricity production? For example, what would happen if China hypothetically used only hydropower and not coal?	Noted. Finding removed.
23813	SPM	5	13	5	14	Why is this an important comment? Is it relevant? Does that mean that Asia does not need to mitigate because that is what the OECD did? This seems to be a value judgement. In addition, it does not seem that this statement is quantified. Is it based on a hard data analysis or a visual inspection. Based on my visual comparison, Asia exceeds the OECD growth rates pre 1970? I think a better approach is to put decadal growth rates of each of the regions in a table, and let the reader make the value judgements they want to make.	Accepted. Finding removed.
33533	SPM	5	14	5	15	Unclear. Please rephrase “This … income.” e.g. as: “Prior to 1970 OECD countries also experienced energy intensive industrialization, but back than energy use per unit of income was even higher.”	Noted. Finding removed.
24998	SPM	5	15	5	17	The sentence including 'The OECD countries contributed most to the pre-1970 emissions…' could be misleading as, consistent with data presented, OECD countries contributed most to pre-2009 emissions of CO2 (i.e. 61.9% vs. Asia's pre-2009 contribution of 19.2%). Suggest that this is amended to reflect the data.	Noted. Finding removed.
38924	SPM	5	15	5	18	This statement would be improved by providing further context with information on the relative contribution to overall historical cumulative emissions from 1750-2010, not just pre-1970 and the current 2010 emissions. Additionally, see comments on historic responsibility in Chapters 3 and 5.	Noted. Finding removed.
28340	SPM	5	15	5	15	What is meant with "equivalent income"?	Noted. Finding removed.
22372	SPM	5	15	5	18	The statement should present a complete accurate picture of the situation as presented in Figure SPM.3, by rewording it as follows: "The 1990 OECD countries contributed most to the pre-1970 emissions and since then have continued to contribute a significant share of global emissions (approximately 12-15 GTCO2e GHG emissions per year), even as, since 1970, developing countries' share of global emissions in both absolute and percentage terms have risen over time to constitute a major share of global emissions."	Noted. Finding removed.
31398	SPM	5	16	5	16	"a major share" - please consider to use a more specific term that quantifies better	Noted. Finding removed.
29312	SPM	5	16			Change "a major share" to a range of estimates.	Noted. Finding removed.
30601	SPM	5	16			A "major share" is quite vague. Suggest clarifying.	Noted. Finding removed.
25210	SPM	5	17	5	17	change "In total, developing countries" to "All developing countries taken together"	Noted. Finding removed.
31299	SPM	5	2			This Figure uses the definition of ASIA which means Asia except from Japan. This should be clarified in the Figure Caption, in order to avoid misunderstandings.	Noted. We changed this figure to apply a economic region classification.
31298	SPM	5	2	5	2	We can not find any red dotted lines in the figure, and the blue lines are dotted.	Accepted.
20749	SPM	5	2			Is it possible to give a short definition of Reforming Economies? Also Economies in Transition in following figures	Noted. We changed this figure to apply a economic region classification. All classification are described in-depth in the Annex of the report.
20533	SPM	5	2			The lines should be made in black and distinguised only by 'line' and 'dotted'. As the colors are misleading then with the net import and net export colors. Secondly the color of the lines is hard to recognize. Alternativly the lines could be made bolder to distinguish the colors better. The acronym EIT is mentioned in the text (p.5, l 6) but not in the figure, where only REF is indicated. Additionally it would interesting to know, why within the REF countries the per capita emissions have been strongly decreasing until ~2000, with an increase afterwards.	Accepted. We have removed inconsistencies in the figure. Note that we moved to an alternative regional classification based on economic regions

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26715	SPM	5	2			Editorial: blue lines are dotted and solid lines are red.	Accepted.
23574	SPM	5	2	8	2	Figure caption replace "Territorial (blue lines) versus consumption-based (red dotted lines) CO2 emissions" by "Territorial (blue dotted lines) versus consumption-based (red lines) CO2 emissions"	Accepted. Removed inconsistency between figure and caption.
28338	SPM	5	2	5	2	Error in the description of the figure, correct version : "territorial (blue dotted lines) versus consumption-based (red lines)"	Accepted. Removed inconsistency between figure and caption.
26445	SPM	5	2			To be consistent with the way the figure is drawn, the caption should read "Territorial (blue dotted lines) versus consumption-based (red lines) CO2 emissions….." not "blue lines" and "red dotted lines".	Accepted. Removed inconsistency between figure and caption.
29325	SPM	5	25			"There is no best policy". But there are better and worse policies, which could be emphasized in this section.	We allocate this finding to section 2 nor page 5. It seems to refer to a finding in section 4, but we cannot be sure with incomplete information.
33532	SPM	5	6	5	6	EIT does not appear in fig. SPM.2. Please remove “EIT/” from the caption, so that REF represents both Economies in transition and Reforming Economies.	Accepted. But changed to alternative regional classification based on economic regions.
30391	SPM	5	9	5	9	The reference to Asia is odd and its better to provide regional trends not make statements.	Noted. Finding removed.
20079	SPM	5	9	5	10	I am not sure this reference to the 70's add someting to the chapter, all the more that it is "medium confidence" only. Would delete.	Noted. Finding removed.
23944	SPM	5	9	8	6	Given the relevance of emissions from AFOLU in the global context it would be helpful to include also some information including the AFOLU sector in the context of that assessment related to fossil fuel emissions.	Noted. Finding removed. Emissions from (A)FOLU are included in new finding and new figure SPM.2.
25209	SPM	5	9	5	18	This finding has a medium confidence and level of evidence is not indicated. The write up does not talk about per capita very low emissions from Asia and only talks about high emission growth, although the figure has both the numbers provided. It also does not say anything on growth from a low base. This section therefore writes an incomplete story which is putting Asia in a different light than the reality is. Moreover as this has only medium confidence, why include this in the SPM where in more important and relevant aspects could be included, that are supported by more robust evidence and high confidence.	Noted. Finding removed.
26106	SPM	5	9	5	18	This paragraph provides analysis behind the trends. How about adding some thoughts on the role of globalization?	Noted. Finding removed.
40792	SPM	5	9	5	18	SPM Page5 line 9-18 lacks citation of concrete Asian CO2 burden, which is only described to be similar to pre-1970 OECD.) The sentence needs evidence of what is "similar" supported by numerical data of CO2 emissions. Figure SPM.3 figure (b) shows that emissions have increased in Asia but we recommend the addition of Figure 1.7(e) from Chapter 1 page 26.	Noted. Finding removed.
34027	SPM	5	11	5	13	Evidence of CO2 emission growth has not been provided to support this statement in the figures preceding or immediately following it. This assertion is therefore unsupported.	Accepted. Finding removed.
28339	SPM	5	11	5	13	The attribution of the 33% increase in global emissions between 2000 and 2010 to Asian production and to Asian consumption (alternative way of taking the Asian trends into account) needs a better explanation in the SPM. The sentence is hard to understand in isolation.	Noted. Finding removed.
34029	SPM	5	17	5	25	It should be noted here as well that overall, OECD is responsible for 61% of cumulative emissions from 1790-2010, while Asia is responsible for 19.8% (Fig SPM 3) . Please see attached calculations.	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35196	SPM	5	15	5	17	This conclusion mixes the concepts of stock and flow. It is not appropriate to compare cumulative emissions with one year emission data in 2010. The saying that “The 1990 OECD countries contributed most to the pre-1970 emissions” is incomplete. Actually, OECD countries still account for most GHG emission stock. It is suggested to revise the sentence as follows, “The 1990 OECD countries contributed most to the pre-1970 emissions, and are still the main contributors up to 2010, with a share of 61.1% in the total cumulative emissions over 1750-2010". In addition, it is also recommended to add a bar within figure SPM.3 to give the whole picture and indicate the cumulative emissions over 1750-2010. (The revised figure 2 can be found in the attached WORD file)	Noted. Finding removed.
32696	SPM	5	18	5	18	Why not dedicate a paragraph to the other regions (in addition to the one dedicated to Asia)?	Noted. Finding removed.
32353	SPM	5	2	5	8	Figure SPM.2 caption: blue lines are dashed, red lines are solid not dotted.	Accepted.
23041	SPM	5	6	5	7	Lete the abbreviations be bracked after the full name	Noted.
32695	SPM	5	9	5	13	Could it be possible to have a longer period of time in the past (e.g. 1000 years)? Cf. Ting Wei et al. 2012, and Pongratz and Caldeira 2012.	Rejected. Standard datasets do not go back further. However, we added land-use related CO2 emissions to the finding.
29742	SPM	5	9	5	9	Please replace 'that which' with 'what'	Noted.
40974	SPM	5	9	5	16	Asia as a region shall be defined. While the sharp emission rise in Asia has been discussed, it shall be mentioned that emission from OECD continues to increase as in Figure SPM 3.	Noted. Finding removed.
32840	SPM	5	15	5	15	What is meant with “per capita equivalent income”?	Noted. Finding removed.
32239	SPM	6				In the Figure (b), Cumulative (1750~1970 needs to be changed to Cumulative (1850~2009) for the consistency with the Figure SPM.3.(a) and Figure 5.2.2.	Accepted. We made figure and caption consistent (1750-2010).
33534	SPM	6				We would value additional panels for per capita consumption, domestic consumption and export-import. We would also like to see this information per country in the TS or chapter 5.	Rejected. This cannot be provided as not all of this information is available in the scientific literature. We have added emissions from land-use change.
21501	SPM	6				If cumulative emissions are included, then it would be necessary also to inform on what on average baseline projections predict for periods that include forward-looking projections, for e.g. up to 2030. It could also be useful to indicate the extent to which this picture changes if GHG emissions are included other than those from fossil-fuel combustion.	Accepted. We included a finding on baseline projections.
19424	SPM	6		6		Panels (a) and (b) are inconsistent. Economies in transition: visual integration of panel (a) over 1970-2009 gives more than 10%, rather 15%, whereas number in panel (b) is 3.8%. This means that also some other percentage in panel (b) is wrong, probably contribution of Asia, which is evidently larger than what visual integration of panel (a) provides.	Accepted. Inconsistency removed during revision of figure.
23814	SPM	6				What is the justification for the time periods 1750, 1970 in cumulative emissions? I could imagine 1990 based on the UNFCCC and Kyoto. Is 1750 because that is when the data starts? Is it ethical to allocate less emissions to developing countries, because the developing countries of 200 years ago did not know about climate change? Why 1970 and not 1960 or 1980? It is generally okay to have these sorts of figures, but care is needed to make sure that they do not give pre-determined value judgements. A better approach is to perhaps plot the figure as a function of time from different starting points (like figure a, but cumulative proportions). Or maybe a bar chart with decadal splits (xxxx, 1950-1960, 1960-1970, etc).	Accepted. We have revised the right-hand panel of the figure.

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32089	SPM	6		7		SPM has to make clear what legislation can influence: production	Rejected. Legislation can equally influence consumption as done frequently via taxes. However, we do not focus on policy in this section, but a description of emission trends and drivers.
26126	SPM	6				The figure should display cumulative emissions for 1992-2009 instead of 1970-2009 as this would reflect the Kyoto term.	Rejected. This is not the purpose of the figure.
38931	SPM	6				Because the scales of each column are so different in terms of Gt, it would be helpful to compare timescales of a similar magnitude. This could be done by adding in cumulative emissions from 1750-2010.	Noted. We have revised the figure comprehensively.
28357	SPM	6				The presentation of the different periods (cum. 1750 - 1970) and cum. 1970 - 2009) and the year 2010 might be misleading.	Accepted. We have revised the figure.
28358	SPM	6				The sequence of the regions should be the same in a) and b), i.e. exchange orange and green.	Accepted. We have taken this into account in the new figure.
28359	SPM	6				Which countries belong to "economies in transition"?	Rejected. Country mappings are provided in the report Annex as highlighted in the caption.
28355	SPM	6		6		Figure SPM.3 (b): If these are the same regions as in fig 2, please use the same abbreviations, and give a reference to the definitions of the regions. The lengths of the time periods considered is different (120y, 40y and only 1 year.) This is misleading and should at least be mentioned in the caption.	Accepted. We have worked on consistency throughout the section.
28356	SPM	6		6		Figure SPM.3 (b): please add vertical axis title "Cumulative Percent of CO2 emissions"	Noted. Figure concept changed during revision.
25112	SPM	6				May need another figure not based on fossil fuel related CO2 emissions but based on GHG emissions including LULUCF (Ref. to Hohne et al. Contributions of indivisual countries' emissions to climate change and their uncertainty, Climate Policy Sept. 2010 DOI 10.1007/s10584-010-9930-6) or at least it will be necessary to make note saying that, though uncertainty increases, contribution portion of each country will be substantially different i we count CO2 emissions from LULUCF.	Accepted. CO2 emissions from land-use changed added to revised figure.
22373	SPM	6		6		The arrangement of the regional bars in the columns in Figure SPM.3(b) should be similar to the arrangement of the regional groupings in Figure SPM.3(a) - i.e. from bottom to top, they should be consistently arranged as follows - OECD90, REF, ASIA, LAM, MAF. This will allow for improved cross-figure comparison of the two figures, and would also allow for easy aggregation and comparison between Annex I (OECD90, REF) and Non-Annex I (ASIA, LAM, MAF) aggregate emissions. As it is now, the columns in Figure SPM.3(b) are not consistent with the regional arrangement in Figure SPM.3(a).	Taken into account during revision of figure.
26716	SPM	6	0	6	8	It is a mismatch of the reference years. The figure text refer to cumulative emissions form 1850 whereas panel (b) starts with 1750. It could be clarified that the right bar in panel (b) shows annual emissions. Add “Annual” above 2010 at the bottom of the panel.	Accepted. Figure and caption made consistent.
31300	SPM	6	1			This Figure uses the definition of ASIA which means Asia except from Japan. This should be clarified in the Figure Caption, in order to avoid misunderstandings. Please use the term OECD90 in the Figure Caption.	Noted. Figure revised. Regional classification changed to economic regions.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24999	SPM	6	1	6	8	It is important to make a distinction between changes in annual or decadal contributions to global emissions and changes in cumulative contributions (which are related but not the same), particularly as the latter is a key factor in attributing responsibility for current warming and apportioning differentiated mitigation burdens. While Asia has overtaken other regions as the most significant contributor to annual CO2 emissions, it still accounts for only 19.2% of cumulative emissions while OECD countries account for 61.9%. For this reason, presenting a 'snapshot' of current (2010) emissions against cumulative emissions data should be undertaken with caution. It is suggested that the preceding paragraph (Page 5, Line 15-17) is amended to: "While the OECD countries contributed most to the historical emissions (pre-2009), in 2010 a major share of global annual CO2 emissions were associated with developing countries, and Asia in particular (Figure SPM.3)."	Accepted. Reft-hand panel of Figure changed. Additional panels were added for land-use change related emissions.
38925	SPM	6	1			The authors should review our comments on historic responsibility in Ch 3 and 5, as well. This figure only shows energy CO2 emissions - 60% of total GHG emissions, and even less of a percentage historically (see Fig. 1.3). It is grossly misleading to include a graphic that suggests that Annex I nations accounted for 75% of cumulative emissions from 1750-1970. Indeed, as Fig. 1.3 shows, energy CO2 in 1970 was barely 50% of the total GHG picture! In addition, an overall framework for thinking about atmospheric commitments should logically include not only past and current emissions, but also decisions that put in place infrastructure that commits a nation to future emissions (i.e., the idea of infrastructure lock-in as discussed in, e.g. Davis et al., 2010: “Future CO2 Emissions and Climate Change from Existing Energy Infrastructure” Science, 329(5997). A policy-neutral presentation of cumulative emissions would not only include all gases and all sectors, but should also reflect commitments to future emissions. With respect to a source for non-energy CO2 emissions, the authors should strongly consider utilizing the MATCH database (www.match-info.net) and associated references (such as Hohne et al., 2011: Climatic Change, DOI 10.1007/s10584-010-9930-6) as they include CO2, CH4 and N2O from all major sectors for all nations from 1750-2100 under various IPCC scenarios. Additionally, literature should be cited and its underlying data employed (such as Pongratz & Caldeira, 2012: Environ. Res. Lett., doi:10.1088/1748-9326/7/3/034001) to illustrate how historic LULUCF emissions are significant and should not be ignored in discussions of historic responsibility and cumulative emissions. If retained in some heavily modified form, the panel on the right in SPM.3 is also misleading and should be shown in absolute numbers, not percentages as it will likely lead the common policymaker to make inaccurate conclusions. Finally, the panel on the right uses 1970 as a cut off year. A far more relevant year to make the cut-off would be 1990 or 1992.	Noted. We comprehensively revised the figure and added CO2 emissions from (A)FOLU. Non-CO2 gases could not be added due to their different lifetimes in the atmosphere. Future emissions in capital stocks are dealt with in section SPM.3, but the referred publication cannot be used as it makes very specific assumption and is not representative for insights for a broader set of scenarios.
30603	SPM	6	10	6	10	There is inconsistency between reference to 70% of global CO2 emissions in this text, and to 75% of global CO2 emissions in the accompanying Figure (Fig SPM.4).	Accepted. Finding revised and figure removed.
26130	SPM	6	10	6	13	The text mentions EU27 and refers to SPM4. However, EU27 is not portrayed as a group in figure SPM4.	Accepted. Revised version of finding focuses on countries only without mentioning any.
28347	SPM	6	10	6	12	„if the 27 members of the EU are treated as a whole“: rather talk about ten regions or similar, not ten countries when this assumption is made	Accepted. Revised version of finding focuses on countries only without mentioning any.
30604	SPM	6	11			This statistic refers to EU countries as a whole, but Figure 4 lists EU countries separately - this is a little confusing.	Accepted. Revised version of finding focuses on countries only without mentioning any.
30605	SPM	6	13	6	13	Should date be 1751 as in Figure SPM.4?	Noted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28348	SPM	6	13	6	13	In the TS this sentence is followed by "This suggests that while all countries have important roles to play in climate change mitigation, if climate change mitigation goals are to be achieved, the mitigation effort may be concentrated in these few countries". Why isn't there any interpretation of these assessment results in the SMP?	Noted. Sentence removed from TS.
29643	SPM	6	14	6	17	Discussion on human settlements is too limited given the essential importance of urbanization as a driver of emissions growth, and thus the essential importance of mitigation strategies specific to human settlements. Further, this paragraph includes numbers that are very definitionally subjective, potentially misleading, and covered in more detail in Chapter 12. Focus instead should be on urbanization as a driver, urban growth trends, and urban mitigation pathways as opportunities to reduce greenhouse gas emissions in the long run. I propose adding the following language, taken mostly from the executive summary of Chapter 12: "Urbanization will be a major driver of emissions growth through 2050, with the increasing concentration of population in cities requiring significant urban mitigation efforts. As of 2008, the majority of global population now lives in urban areas. Between 2009 and 2050, urban areas are projected to absorb the entire world's population growth while the rural population will begin to decline around 2020. Urban population growth will be concentrated in Asia (1.7 billion) and Africa (0.8 billion). There is robust evidence that low carbon human settlements have the following characteristics: (1) high population and employment densities that are co-located; (2) compact urban form; (3) mixed land uses; (4) high connectivity; (5) destination accessibility; and (6) integrated multi-transport modes. Furthermore, there is robust evidence that planning strategies as growth management, public transit investments transit-oriented development, integrated transportation planning, and land value capture can achieve the above characteristics. However, there is little consensus on the optimal set of strategies that could effectiveness reduce GHG emissions or the exact magnitude of the effect. [12.1, 12.4, 12.5, 12.7]"	Taken into account. We have devoted an entire section on the role of human settlements and infrastructure in the context of climate change mitigation.
23537	SPM	6	14	6	15	Is "urban" defined in the glossary? It should be. What defines an urban area? See Neil Brenner's recent work at Harvard GSD Urban Theory Lab for thesis on planetary urbanization. Cite lecture: http://opengeography.wordpress.com/2011/11/09/neil-brenners-inaugural-lecture-at-harvard/	Noted. There is a clear discussion on different perspectives on what determines an "urban area" in the underlying chapter 12 of the report.
30393	SPM	6	14	6	17	Rework this to provide a clear message for policy.	Noted. Finding removed.
31301	SPM	6	14	6	14	The term "Human settlements" is unclear. From the body text, we understand that it includes both urban and rural areas, but what is the source of the remaining emissions? Land-use (change), International transport, industrial emissions?	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26923	SPM	6	14	6	17	Discussion on human settlements is too limited given the essential importance of urbanization as a driver of emissions growth, and thus the essential importance of mitigation strategies specific to human settlements. Further, this paragraph includes numbers that are very definitionally subjective, potentially misleading, and covered in more detail in Chapter 12. Focus instead should be on urbanization as a driver, urban growth trends, and urban mitigation pathways as opportunities to reduce greenhouse gas emissions in the long run. I propose adding the following language, taken mostly from the executive summary of Chapter 12: "As of 2008, the majority of global population now lives in urban areas. Between 2009 and 2050, urban areas are projected to absorb the entire world's population growth while the rural population will begin to decline around 2020. Urban population growth will be concentrated in Asia (1.7 billion) and Africa (0.8 billion). There is robust evidence that low carbon human settlements have the following characteristics: (1) high population and employment densities that are co-located; (2) compact urban form; (3) mixed land uses; (4) high connectivity; (5) destination accessibility; and (6) integrated multi-transport modes. Furthermore, there is robust evidence that planning strategies as growth management, public transit investments, transit-oriented development, integrated transportation planning, and land value capture can achieve the above characteristics. However, there is little consensus on the optimal set of strategies that could effectiveness reduce GHG emissions or the exact magnitude of the effect." (12.1,12.4,12.5,12.7)	Taken into account. We have devoted an entire section on the role of human settlements and infrastructure in the context of climate change mitigation.
29322	SPM	6	14	6	17	A more accurate description of urbanization and relevant drivers for climate change: "As of 2008, the majority of global population now lives in urban areas. Between 2009 and 2050, urban areas are projected to absorb the entire world's population growth while the rural population will begin to decline around 2020. Urban population growth will be concentrated in Asia (1.7 billion) and Africa (0.8 billion). There is robust evidence that low carbon human settlements have the following characteristics: (1) high population and employment densities that are co-located; (2) compact urban form; (3) mixed land uses; (4) high connectivity; (5) destination accessibility; and (6) integrated multi-transport modes. Furthermore, there is robust evidence that planning strategies as growth management, public transit investments, transit-oriented development, integrated transportation planning, and land value capture can achieve the above characteristics. However, there is little consensus on the optimal set of strategies that could effectively reduce GHG emissions or the exact magnitude of the effect."	Taken into account. We have devoted an entire section on the role of human settlements and infrastructure in the context of climate change mitigation.
30607	SPM	6	14		17	It is counter-intuitive and may confuse readers to start with the smaller share (urban areas) followed by the larger share (rural areas). Suggest switching these so that rural comes first, followed by urban, followed by the point about urban having been responsible for most of the overall increase.	Noted. Finding removed.
30606	SPM	6	14	6	14	What constitutes a human settlement in this definition? Suggest clarifying if possible.	Noted. There is a clear discussion on different perspectives on what determines an "urban areas" and human settlements in the underlying chapter 12 of the report.
33535	SPM	6	14	6	17	What is the remaining category (outside 75-81% human settlements)?	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27043	SPM	6	14	6	17	This discussion on human settlements should be substantially revised. The current discussion is too limited given the essential importance of urbanization as a driver of emissions growth, and thus an essential lever for mitigation. Firstly, "human settlements" is a fairly meaningless term, encompassing all of human inhabitations. Second, the numbers cited in this paragraph are inherently subjective, potentially misleading, and covered in more detail in Chapter 12. This paragraph should be revised to focus instead on the importance of urbanization as a driver of emissions trends, summarizing important future urban growth trends/forecasts, and describing urban mitigation pathways as opportunities to reduce greenhouse gas emissions in the long run [as per Chpt 12 discussions]. I propose adding the following language, taken mostly from the executive summary of Chapter 12: "Urbanization will be a major driver of global emissions trends through 2050 and must be viewed as a important area for mitigation. As of 2008, the majority of global population now lives in urban areas. Between 2009 and 2050, urban areas are projected to absorb the entire world's population growth while the rural population will begin to decline around 2020. Urban population growth will be concentrated in Asia (1.7 billion) and Africa (0.8 billion). There is robust evidence that low carbon human settlements have the following characteristics: (1) high population and employment densities that are co-located; (2) compact urban form; (3) mixed land uses; (4) high connectivity; (5) destination accessibility; and (6) integrated multi-transport modes. Furthermore, there is robust evidence that planning strategies as growth management, public transit investments, transit-oriented development, integrated transportation planning, and land value capture can achieve the above characteristics. However, there is little consensus on the optimal set of strategies that could effectiveness reduce GHG emissions or the exact magnitude of the effect [12.1, 12.4, 12.5, 12.7]."	Taken into account. We have devoted an entire section on the role of human settlements and infrastructure in the context of climate change mitigation.
21502	SPM	6	14	6	16	It might be unclear for a policy maker what emits anthropogenic GHG other than human settlements. Is it necessary to include this additional category? If not clarification, as in the original texts in 12.3.3, should be made between emissions from rural areas and emissions from agricultural activities	Noted. Finding removed.
20534	SPM	6	14			Confidence missing	Noted. Finding removed.
32205	SPM	6	14	6	17	it is not 75-81% but 29.9% to 35.7%. So ???? Suppress this paragraph, nothing to do in SPM	Noted. Finding removed.
23815	SPM	6	14			These ranges 75-81, 29.9-35.7, 43.2-45.5 seem extremely accurate. Is that data really that solid?	Noted. Finding removed.
25525	SPM	6	14	6	17	These lines are a bit confusing. It would help defining which other contributors are to be added to get to 100%. With the shares of rural versus urban contributions provided, the reader is left in doubt about which contributions has contributed less in relative terms over the reported period.	Noted. Finding removed.
25217	SPM	6	14	6	14	The human settlement accounting for 75 to 81 % of global CO2 emission is not clearly explained.	Noted. Finding removed.
38928	SPM	6	14	6	16	Suggest rephrasing the second half of this sentence as the 56% in parentheses interrupts the flow. This is the first time that the increase in global CO2 emissions from 1990 to 2008 appears. It does not provide the emission totals for those years (28.5 GT and 36.9 GT respectively from 12.3.3), which could be helpful to orient the reader as nearby figures SPM.3 and SPM.4 call out 2010 with 31.9 GT of (energy?) CO2 emissions.	Noted. Finding removed.
38926	SPM	6	14	6	17	Are these direct emissions or indirect? Please specify.	Noted. Finding removed.
38927	SPM	6	14	6	17	It is unclear where authors are presuming the increase in emissions share is happening if not from rural to urban. Here it says rural contributes the same percentage but urban increases dramatically. It would be helpful to clarify where the shifts are happening (from where to where?). Also, the summary suffers from a lack of clarity as to what "urban" means in all of these different analyses.	Noted. Finding removed.
28349	SPM	6	14	6	17	It should be clarified that there are also human settlements in rural areas, otherwise the last sentence in this paragraph could be misunderstood. ("The share of emissions from settlements in rural areas…")	Noted. Finding removed.
28351	SPM	6	14	6	17	The headline states "Human settlements account for 75-81% of global CO2 emissions." Addition of 29,9 and 43,2 results in 73,1% as lower bound and addition of 35,7 and 45,5 results in 80,2% as upper bound. Please clarify the references of the percentages given.	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28350	SPM	6	14	6	18	Please consider revising the paragraph in regard to emissions from Human Settlements. It is currently very confusing of what exactly is referred to with the 75-81% and the 29.9% to 35.7% ranges and why these two ranges differ.	Noted. Finding removed.
26449	SPM	6	14	6	17	Having made the distinction earlier in the SPM between territorial-based emissions and consumption-based emissions, this paragraph needs to be clear what it is referring to I.e. either. territorial-based or consumption-based emissions.	Noted. Finding removed.
25218	SPM	6	16	6	16	Referring to emission in a single year does not make much scientific sense because of year-to-year variability. Better to mention a mean annual emission in a decade e.g. (2001-2010).	Noted. Finding removed.
28352	SPM	6	16	6	16	To improve comprehensibility please write "…, and for 56% of the 8.3 Gt increase…" either the 4.7 or the 56% are redundant	Noted. Finding removed.
21503	SPM	6	17	6	17	What is the message for policy makers that is intended with the statement that emissions from rural settlements have not changed? Have others changed a lot, and if so what other?	Noted. Finding removed.
30394	SPM	6	18	6	19	Uncertainties are normally to increase with aggregation. This should be clarified. What is the policy relevant information. This could be included a figure with uncertainty bands	Rejected. Uncertainties tend to decrease with aggregation (less detail) and increase with disaggregation (more detail). This is a basic finding of the literature. But we highlight uncertainties in Figures wherever possible.
30395	SPM	6	18	6	19	Uncertainties normally increase with aggregation. This should be clarified. What is the policy relevant information. This could be included a figure with uncertainty bands.	Rejected. Uncertainties tend to decrease with aggregation (less detail) and increase with disaggregation (more detail). This is a basic finding of the literature. But we highlight uncertainties in Figures wherever possible.
20535	SPM	6	18	6	19	Confidence missing (if required?)	Noted. Finding revised.
23816	SPM	6	18			Are the uncertainties intervals (+/-10%) or ranges (10%)? You seem to use both, one will be half the other if you assume symmetric errors	Accepted. Text revised for clarity.
38929	SPM	6	18	6	25	This section omits discussion of a critically important point from Chapter 1, p. 28, lines 24-26: that wide uncertainties in social systems (i.e., human behavior) are likely to be a much larger factor in determining ultimate impacts on warming from human emissions (than uncertainties in the physical system - whether climate impacts or emissions inventories themselves)	Rejetced. Human behaviour plays a major role in assessment of uncretainties when looking forward. Climate impacts are focus of Working Group 2. They will be brought together with Working Group 3 material in the synthesis report.
38930	SPM	6	18	6	25	Black carbon should be mentioned as an important warming forcer with major emission and impact uncertainties. There are mitigation option issues as well, since many sources of particulates emit reflective as well as black carbon emissions.	Rejected. Black carbon is covered in the WG3 report (chapter 5), but not component of the basic datasets and literature covered in Working Group 3. Historic trends are already covered in Working Group I SPM (Figure SPM.5). Note that black carbon is included in future scenarios of Working Group 3.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28353	SPM	6	18	6	25	To which time period to these statements refer?	Noted. Text revised and uncertainty bars added in Figures wherever possible.
26450	SPM	6	18	6	25	Line 20 refers to a 10% uncertainty for CO2 emissions from fossil fuel combustion. Line 23 states that the uncertainty range of CO2 emission trends reduces to +/- 5% if LULUCF emissions are excluded. This is very confusing as the 10% doesn't include LULUCF. Perhaps these are two separate things, but if they are, what is the uncertainty range of global CO2 emission trends including LULUCF?	Accepted. Text revised for clarity.
30608	SPM	6	19			"level of …aggregation" is confusing. Suggest simplifying if possible.	Accepted. Text revised for clarity.
28354	SPM	6	19	6	21	Please insert "uncertainty" to increase clarity: "..individual national total fossil-fuel CO2 emissions uncertainty ranging from"	Noted. Text revised for clarity.
25213	SPM	6	2	6	2	It does not include landuse related emissions	Accepted. FOLU emissions added.
25211	SPM	6	2	6	8	Grouping of countries is different for different figures and for different sections of SPM. Is it possible to harmonize this?	Rejected. Different regional groupings are useful to answer different scientific questions.
25212	SPM	6	2	6	8	Caption of Figure SPM2:There are no blue solid lines and no red dotted lines in the figure. Better to just mention solid and dotted lines.	Accepted and corrected.
25214	SPM	6	2	6	8	Messages from figures will depend on what period is shown. Shorter duration (1990 to 2010) shown in this figure magnfies the rise in Asian emissions. Change the x-axis from 1970 to 2010 so it is consistent with figure SPM1	Rejected. This Figure uses long-term emission data consistent with WG1 in the revised version. It carries different insights than Figure SPM.1
40793	SPM	6	2	7	1	About the figure SPM.4 of cumulative emmisions of greenhouse gases, Match Project presented datasets of CO2 including LUCF, CH4 and N2O(Hoehne et al., 2011). As it has already been written in the text, CO2 including LUCF, CH4 and N2O have some uncertainty, but the cause of global warming is not limited to CO2 from fossil fuel. So, the outcome of match project which include LUCF, CH4 and N2O should be mentioned additionally in the figure as well, describing about the uncertainty of these data, which is more objective. Reference Hoehne N., H. Blum, J. Fuglestvedt, R.B. Skeie, A. Kurosawa, G. Hu, J. Lowe, L. Gohar, B. Matthews, 7 A.C. Nioac de Salles, and C. Ellermann (2011). Contributions of Individual Countries' Emissions to Climate Change and Their Uncertainty. Climatic Change 106, 359–391. (DOI: 10.1007/s10584-010-9 9930-6).	Noted. We add CO2 from FOLU, but not the short-lived gases due to their different lifetimes in the atmosphere.
30609	SPM	6	20			This uncertainty reference (with confidence interval) is a little confusing, since it differs from the standard IPCC terminology	Rejected. This is a standard way of describing uncertainties - also in the IPCC.
23493	SPM	6	21	6	21	Does "ranging from a few per cent to more than 50%" refer to uncertainties or per cent of global emissions?	Taken into account. Language revised for clarity.
40794	SPM	6	21	6	24	CO2 emissions related to land use, …. emissions are excluded. is not a representative summary of the corresponding paragraph in Chapter 1 (page 19, lines 30-42), and should be replaced with "The uncertainty range in global total emissions was estimated at +-5% excluding LULUCF and +-10% including them." (same as page 19, lines 39-40)	Noted. The entire paragraph was revised based on a new comprehensive section in chapter 5.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29030	SPM	6	21	6	23	Statement on uncertainties – it is not clear for policy makers reading the report what the impact of this might really be. Is this a problem only for historic emissions, which has been resolved for assessing the impact of current and future emissions? Are the writers stating that they do not know enough about LULUCF related emissions to make an accurate statement about or forecast of current and future emissions too?	Accepted. We have revised the key finding to highlight the main insight that can be derived from this. FOLU emission uncertainty only refers to the past and is in line with WG1 estimates.
29031	SPM	6	21	6	23	±50% is a significant uncertainty. Useful to have a clear explanation here of the size of LULUCF related emissions compared to other sources to help policy makers understand impact of uncertainty.	Rejected. This cannot be provided in a SPM. But we have extended the underlying section in chapters 5 and 11. This provides also all the relevant original sources for consultation. The uncertainty assessment is consistent with Working Group I.
26451	SPM	6	21			Many countries (both developed and developing) have fossil-fuel CO2 emissions much higher than the "more than 50%" quoted here. Suggest that the range is increased to "more than 80%". For example countries that would fall at or above this level include (but are not limited to) the UK, the US, South Africa, China, Qatar and Singapore.	Rejected. This sentence refers to the uncertainty of emission estimates and not the relative share of fossil fuel related emissions (if we understand the reviewer correctly). We have revised the finding for clarity.
25219	SPM	6	22	6	22	Suggest using AFOLU instead of LULUCF	Accepted. We switched to FOLU in line with chapter 11 of the underlying report.
26717	SPM	6	23			The uncertainties in the LULUCF sector are known to be large. However using relative uncertainties in relation to carbon stock changes is difficult, i.e. the absolute uncertainty may be the same regardless of the size of the stock change. That means that if the net removals happens to be small the relative uncertainty become large even if the relative uncertainty in the gross emissions and gross removals is still very small. Suggest to express the uncertainty as an interval if possible.	Noted.
26718	SPM	6	23			The uncertainties in the LULUCF sector are known to be large. However using relative uncertainties in relation to carbon stock changes is difficult, i.e. the absolute uncertainty may be the same regardless of the size of the stock change. That means that if the net removals happens to be small the relative uncertainty become large even if the relative uncertainty in the gross emissions and gross removals is still very small. Suggest to express the uncertainty as an interval if possible.	Noted.
30392	SPM	6	6	6	13	Consider either countries or regions do not mix up.	Accepted. Revised finding.
34246	SPM	6	9	6	10	Why do they always use these three year old figures? The BP Statistical Review of June 2012 gives 2011-figures (so June this year it will be 2012-figures)? Is this still a sign, that the private sector is more efficient and faster than the public sector? This is really a pity, since you can end up with complete disastrous policies relying on too old figures: Three years ago, the economy looked different, North Korea was not seen as a nuclear threat, Fukushima did not happen, Maggie Thatcher was alive, the Pope was German and the EUA price was higher than 3 €/t.	Accepted. We added more recent information for CO2 emissions from fossil-fuel combustion to the section.
25216	SPM	6	9	6	13	The explanation shall be more critical if mentioned like; In 2010, only four countries of the world produces more than 50 percent of CO2 emission	Noted. Finding revised.
25215	SPM	6	9	6	9	Define "current trajectory". Does this refer to 2000-2010 period.	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28346	SPM	6	9	6	13	This message is not clear: if you treat the EU member states as one country you have to adjust figure SPM.4, where single EU member states appear. Please indicate also which 10 countries accounted for 70% of the global emissions. The EU should not be the only country to be named. Four other countries account for more than 50 % of the emissions.	Accepted. Revised version of finding focuses on countries only without mentioning any.
29029	SPM	6	9	6	12	Which 10 countries accounted for 70% of global emmissions. What would the rationale be for considering the entire EU bloc as one country? Please replace with "9 countries plus the EU" to make accurate.	Accepted. Revised version of finding focuses on countries only without mentioning any.
26448	SPM	6	9	6	13	Three comments: (1) 'The largest share' is ambiguous in this context; (2) The choice of 'ten' countries and 70% seems arbitrary and is inconsistent with Figure SPM.4, which shows 75%; (3) The purpose of this paragraph is not immediately obvious - it would be good to suggest to the reader why this distribution and the different time periods presented are of particular interest.	Noted. Finding revised and figure removed.
34031	SPM	6	14	6	17	Would be useful to state what the source of the remaining emissions was - natural causes, as it is not attributable to urban or rural human settlements?	Noted. Finding removed.
24011	SPM	6	18	6	19	SPM.2 Emission trends and drivers. 'Uncertainties associated with estimates of historic anthropogenic GHG emissions vary by gas and tend to decrease with increasing level of country or sector aggregation.' Question: Does this uncertainty vary on a regional scale?	Noted. We have revised the finding and aimed for a clearer language.
34032	SPM	6	18	6	25	Are lines 19-20 and 23-24 saying the same thing, that global CO2 emissions from fossil fuel combustion (and without LULUCF) are known to +/-5% confidence level? If so these sentences should be combined.	Taken into account. Finding and uncertainty ranges were thoroughly revised in line with WG1.
24010	SPM	6	9	6	10	SPM.2 Emission trends and drivers. 'The largest share of anthropogenic CO2 is emitted by a small number of countries (high confidence).' Question: Would it be appropriate here to mention these countries?	Rejected. It does not add to the insights of the finding.
34033	SPM	6	9	6	13	The figure referred to does not show the aggregate EU 27 emissions or individual country emissions of the EU 27 to be able to determine the aggregate. There are only selected EU 27 countries represented in the bar chart like GBR, FR and DEU. The assertion therefore is not supported by the bar chart. For balance, the 2010 per capita consumption and production emissions for these countries should also be shown.	Accepted. Revised version of finding focuses on countries only.
28344	SPM	6	9	6	13	Counting the 27 members of European Union as one country may make sense for reducing the complexity of statistics. However, one of the core messages of the whole Summary for Policy Makers, i.e. the statement "...largest share of anthropogenic CO2 is emitted by a small number of countries...", is then not longer of real significance.	Accepted. Revised version of finding focuses on countries only.
28345	SPM	6	9	6	25	The order of paragraphs should be adjusted to make this information available early in the SPM: the 3 paras from page 6, line 9 to 25, should be moved in front of para on p.4 line 9.	Noted. We restructured the entire section in our revisions.
24224	SPM	6		6		This aggregation makes more sense than that done in SPM.2 (see previous comment).	Noted. We use multiple regional classifications depending on the underlying research question.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35198	SPM	6	14	6	17	There are 3 reasons to challenge the reliability of the accounting result in this paragraph: 1) Most key data, figures and tables used in this section come from two submitted yet not published papers (Müller et al., 2013 and Marcotullio et al, 2013), the full content of which is not accessible. As a result, detailed definitions, methodologies and data sources of these two papers are not verifiable. 2) EDGAR database, which is frequently referenced by this paragraph, only provides geo-referenced CO2 emission data, which cannot differentiate between emissions from urban and rural areas. 3) The result referenced in this section comes only from one study, ignoring many other important literatures (IEA, Cities, Towns & Renewable Energy, 2009; IEA, World Energy Outlook 2008; UN HABITAT, Global Report on Human Settlements 2011: Cities and Climate Change) that have systematically evaluated the energy consumption and CO2 emissions of cities in the world and hold a different result. For instance, in the section it is said that the GHG emissions from urban population accounts for 29.9-35.7% of global total emission from 1990 to 2008; however, according to a UN HABITAT report in 2011 (UN HABITAT, Global Report on Human Settlements 2011: Cities and Climate Change.), from perspective of production, GHG emissions from urban population account for 40 – 70% of global total emissions; and 60 -70% from perspective of consumption. It is suggested to add these arguments to fully reflect the fact that the accounting results for GHG emissions from urban and rural areas vary dramatically from each other, which is the result of different definitions of rural/urban boundary and different accounting methodologies.	Noted. Finding removed.
41032	SPM	6	18	6	24	High certainty of CO2 historic emissions compared to other gases would lead to bias in the action for mitigation to be focused only on CO2. Emissions from other GHG have resulted in greater impact on global warming given their GWP.	Rejected. This paragraph does not talk about mitigation action. It attempts a summary of literature on uncertainty associated with available emission data used in this report. Gases do not only differ in their specific GWP-100 values, but also by their lifetime in the atmosphere. Moreover, the choice of metric is a source of undertainty in itself.
35197	SPM	6	9	6	13	EU is actually a regional organization instead of a sovereign state. Thus, it is suggested to take EU as 27 member states when analyzing GHG emission contribution of countries.	Accepted. Revised version of finding focuses on countries only.
24225	SPM	6	9	6	12	As this finding is very important, it should be highlighted by being mentioned before. Perhaps in page 4 line 9.	Noted.
32354	SPM	6	1	6	1	Figure SPM.3: are these Cumulative CO2 emissions in the figure consistent with the WGI report, Chapter 6?	Accepted. They were not fully consistent, but have been made consistent during revision of the Figure (now new Figure SPM.2).
32355	SPM	6	10	6	12	"in 2010 ten countries..."… "if the 27 members of the EU are treated as a whole" -- we don't understand this paragraph. Are you counting all EU as ONE country and then the EU is one of the ten countries that accounted for 70%? If so, is it appropriate to count the EU as a single country?	Accepted. Revised version of finding focuses on countries only without mentioning any.
32698	SPM	6	14	6	14	Are these "… global CO2 emissions" annual or cumulated?	Emissions were annual, but finding removed.
32697	SPM	6	14	6	17	Rephrase the paragraph avoiding to mix relative quantities (%) and absolute values (Gt).	Noted. Finding removed.
32356	SPM	6	14	6	17	Please make sure that the number provided for urban and rural CO2 emission fractions add up, exactly equalling 71-81% of the total.	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32699	SPM	6	18	6	25	The whole paragraph is unclear: are these uncertainties referring to “historic” (e.g. from 1750 to present) GHG emissions or to current methodological limitations (e.g. because fluorinated gases are mentioned, which are emitted only since recently)?	Noted. Paragraph revised and uncertainties also highlighted in relevant Figures.
23035	SPM	6	21	6	23	Uncertainties in LULUCF can easily be reduced if the three sectors, landuse, landuse change and forestry are treated seperately. Otherwise a 50% uncertainity as provided here is not useful for any policy decision.	Rejected. Assessment is consistent with the main sources in the literature on the aspect and with Working Group I assessment.
32357	SPM	6	21	6	21	Please replace "a few percent" with a quantitative term for the lower end if possible.	Accepted. We deleted this imprecise language.
40977	SPM	6	14	6	17	Discussion on emissions from human settlements may not be necessary in SPM as this could mislead trends in urbanization as rapid urbanization is occurring in mostly developing countries.	Noted. Finding removed.
40978	SPM	6	18	6	25	Uncertainty of emission estimates shall be presented in each of the paragraph instead keeping the discussion as standalone and disjointed section.	Accepted. In principle, we would agree to do this throughout the summaries, but the literature on uncertainties is too limited for that. We added uncertainty in Figures and text wherever possible.
40979	SPM	6	18	6	25	References in regard to data uncertainty shall be sourced from original reviewed articles. Also estimate of uncertainty shall be given in each section or sector discussion as currently it stands as a separate section and greatly disjointed.	Accepted. In principle, we would agree to do this throughout the summaries, but the literature on uncertainties is too limited for that. We added uncertainty in Figures and text wherever possible. A more detailed discussion can be found in chapter 5 where all original sources are also summarized.
40975	SPM	6	9	6	10	L9-10, P6 Production vs. consumption-based emission In order to give balance information, highest consumption-based emission and trends in last four decade.	We do not understand what the reviewer is suggesting.
32248	SPM	7				The decimal point of countries' shares should be synchronized. For example, Poland in cumulative production (2% -> 2.0%?), Korea in consumption 2010 (2% -> 2.0%?).	Noted. Figure removed.
24148	SPM	7		7		It seems a good figure but I DO NOT understand all names of countries. So, need explanatory note of abbreviation.	Noted. Figure removed.
22871	SPM	7		7		why EU is not grouped? On aggregate it is a large emitter and it has to be apparent here.	Noted. Figure removed.
21504	SPM	7				Is the methodology used to estimate consumption-based GHG accounting sufficiently robust? Can similar information for production-based cumulative emissions be given for average baseline projections up to 2030?	Noted. Figure removed.
23817	SPM	7				This is just CO2 emissions, but the label says CO2e which could be confusing	Noted. Figure removed.
25220	SPM	7		7		It is largely China	Noted. Figure removed.
25221	SPM	7		7		Separate China	Noted. Figure removed.
40797	SPM	7				From the viewpoint of consistency with the description in page 6 (“in 2010 ten countries accounted for 70% of global territorial-based (production) CO2 emissions from fossil fuel combustion, if the 27 members of the EU are treated as a whole”), Figure SPM.4 should be revised by incorporating the aggregated emissions from EU27. It should be noted that total population of EU is about 500 million, and it is less than China (1300 million) and India(1200 million) and comparable to the USA (300 million).	Noted. Figure removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28366	SPM	7				Column 2 and 3 unclear: Please replace "consumption 2010" with the words "consumption based attribution of emissions 2010" and replace "Production 2010" with "emissions 2010".	Noted. Figure removed.
28369	SPM	7				Please change the label from "Production" to "Territorial" emissions in order to be consistent with figure SPM.2. Alternatively, explain the difference.	Noted. Figure removed.
28372	SPM	7				The graph does not show the fact that only ten countries account for 70% of global territorial-based CO2 emissions from fossil-fuel combustion (with the EU as a whole). Therefore, change the figure in order to illustrate the text with the members of the EU treated as a whole.	Noted. Figure removed.
28370	SPM	7		7		Please include TS, page 8, line 42. "Emissions are driven by technological, infrastructure and behavioral choices.	Noted.
28367	SPM	7		7		Figure SPM.4: is "production based" equal to "territorial" emissions? Is it correct that emissions from both consumption and production are 31.9.Gt? Left columns x axis mentions "cumulative", but not the middle and right column - correct?	Noted. Figure removed.
28368	SPM	7		7		Figure SPM.4: please check the vertical axis title, because the title says CO2e, but the description only mentions CO2	Noted. Figure removed.
28371	SPM	7		8		The caption refers to a "four factor decomposition" there are 5 respectively 3 lines in the figure, it is not clear, which factors are relevant. Also the text on p.7 does not really clarify the figure. There are four factors mentioned but the wording in the figure is different.	Taken into account. A simpler Figure SPM.6 provided in new draft.
22374	SPM	7		7		The visual arrangement of the columns creates the visual impression that all three columns represent a temporal continuum in which one sees the shares of global emissions for some countries are rising while that of other countries are decreasing, when in fact, the middle and right columns are variations of how 2010 emissions can be allocated to countries depending on whether consumption or production-based emissions are reflected. A more accurate graphic would be to have the 1751-2009 column as is, create a new "Production 2010" column beside it whose height is to scale relative to the 1751-2009 column (i.e. it would be shorter) and then this shorter "Production 2010" column could then be connected to another graphic that shows country shares of 2010 production-based emissions. The same treatment could also be provided for the "Consumption 2010" column. See, e.g., attached "Rearrangement of Figure 1.7A"	Noted. Figure removed.
25222	SPM	7	0	7	5	The empasis in the SPM on highlignting total emissions at country levels gives an incorrect picture of origin of emissions. The SPM should give due emphasis to the emissions on per capita basis across countries. E.g. Figure SPM.4 (Page 7) should be represented on per capita basis for countries rather than total emissions which gives incorrect picture of the diversity of emissions contribution by the people across countries.	Noted. Figure removed.
30610	SPM	7	1			Figure SPM.4: The acronyms are not identified and may not be known.	Noted. Figure removed.
30611	SPM	7	1			Suggest giving all the EU countries the same colour, in order to help the reader match the text on page 6 lines 9-13, with the results in this Figure.	Noted. Figure removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38932	SPM	7	1			There are several problems with this figure. It needs to be heavily revised or removed from the SPM altogether. (1) It is very misleading to show these as percentages since in the SPM (p. 3, lines 40-41) it states that "at current levels, every 12 years an amount of FF CO2 is emitted comparable to the total cumulative emissions before 1970". Heavy revision - if not total exclusion - of this figure is warranted. (2) this only shows the import/export of energy CO2, 60% of total GHG emissions; the MATCH database (www.match-info.net) and associated references (such as Hohne et al., Climatic Change, 2011: DOI 10.1007/s10584-010-9930-6) are much better resources as they include CO2, CH4 and N2O from all major sectors for all nations from 1750-2100. Additionally, literature such as Pongratz & Caldeira (Environ. Res. Lett., 2012: doi:10.1088/1748-9326/7/3/034001) illustrate how historic LULUCF emissions are significant and should not be ignored in discussions of historic responsibility (3) The y-axis should not be in units of CO2e when all this is showing is energy CO2. It should be in units of CO2; (4) if retained, this should be shown in absolute numbers, not percentages as it will likely lead the common policymaker to make inaccurate conclusions, and 53) goods are sold on a global market where they are sold on a supply chain that implicitly assigns a lifecycle value (whether fully accurate or not) to that product, so any cost of carbon could be embedded in that product if the producer chose to include it."	Noted. Figure removed.
40795	SPM	7	1			Y axis is cumulative percent of "CO2e", but it should be "CO2" as it is supposed to indicate global anthropogenic Co2 emissions, not GHGs. The same problems in TS (Figure TS.4) and Ch.1 (Figure 1.7(a)).	Noted. Figure removed.
40796	SPM	7	10	7	12	Calculation according to Kaya identity does not add up to 47%: 4-23+43+31=54%. Perhaps, "4% increase in CO2 intensity" should be "4% decrease"? Still it would not quite add up exactly: -4-23+43+31=46%	Noted. Text revised for clarity.
20080	SPM	7	11	7	11	"4% increase in CO 2 intensity in energy resources". I personnaly don't understand easily what it means, perhaps say "energy mix" ?	Noted. Text revised for clarity.
30441	SPM	7	11	7	11	Suggestion: Delete the word "modest" in the sentence describing a 4 % increase in CO2 intensity in energy resources. As it is now, it appears as if a larger increase was expected.	Accepted.
21505	SPM	7	11			Delete the word "modest". This seems to be a value judgement. This is a reversal of a trend and as such even the word "modest" seems inappropriate.	Accepted.
28365	SPM	7	11	7	14	CO2 intensity in energy resources = carbon intensity of energy? if yes, please use one expression.	Accepted.
23700	SPM	7	12	7	15	Is any word or phrase missing here? Why for the first time, if coal has been responsible for CO2 emissions in highly industrialised countries in the past (pre-2000), according to the next sentence, line 15-17?	Noted. Text revised for clarity.
20822	SPM	7	15	7	17	The carbon intensity of energy of highly industrialized world owes to not only natural gas and renewables but also nuclear energy. "to natural gas and also to renewables" should be amended into "to natural gas, renewables and also to nuclear".	Noted. Text revised for balance.
25364	SPM	7	15	7	17	Only the shift to natural gas and renewables is mentioned as the reason of CO2 emission reduction in the industrialized world. Effects of nuclear power generation and improvement of thermal efficiency of coal thermal power plants should also be described.	Noted. Text revised for balance.
25591	SPM	7	15	7	17	Nuclear power should be mentioned in addition to renewables as it has great effect for reduction of GHG.	Noted. Text revised for balance.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25629	SPM	7	15	7	17	This part should explain that nuclear power has contributed largely to reduce CO2 emission in the world and has a merit to reduce CO2 emission more economically than renewable energy, as described in the section 7.5.4 (page 28, line22) and (Weisser, 2007, page1). <Reference> [1]Weisser, D. (2007). A guide to life-cycle greenhouse gas (GHG) emissions from electric supply technologies. Energy, Volume 32, Issue 9, Pages 1543-1559.	Rejected. We do not discuss merits of any technology here.
34247	SPM	7	15	7	17	High likelihood for false conclusions as a result from using too old figures.	Rejected. Two years of additional data is not expected to lead to fundamentally different findings.
34248	SPM	7	15	7	17	· In Europe, generally more coal is used, since hard coal prices went down and gas prices are stable. CO2-prices also went down – consequently more imported hard coal is used. The whole effect of shale gas is not considered.	Noted.
34249	SPM	7	15	7	17	· In Germany, the most interesting climate effect by the energy turnaround was the increasing use of lignite.	Noted.
34250	SPM	7	15	7	17	· Recession effects in Europe unconsidered	Noted.
34251	SPM	7	15	7	17	· This makes it in general very difficult to find this report useful: It may be necessary, that all states agree to the CO2-emission data, but neglecting some above mentioned effects, also means, that the reader will most likely not take the report for serious, since he knows, that some important changes are not considered. As no-one is interested in a newspaper published 3 years ago, this report will also have its difficulties to be attractive for the reader.	Rejected. We use data up to 2012 in the report. However, the IPCC has to evaluate broad evidence. For recent years, data situation is always more fragile.
25226	SPM	7	15	7	17	In order to provide better perspective, this statement should also include quantitative values of renewable's share which contributes in the declining ratio in case of highly industrialized world.	Rejected. This section is focussed on emission trends and drivers. Role of energy supply technologies is covered in Section 3.2.
20796	SPM	7	15	7	17	ADD. Addition is needed for the description of "nuclear" in the phrase of "to natural gas and also to renewables.". New sentence is "By contrast, across the highly industrialized world this ratio has been declining due to the shift away from high carbon fuels (notably coal) to nuclear, to natural gas, and also to renewables.". In fact, there is the shift away from high carbon fuels to nuclear, natural gas, and renewables in the highly industrialized world. Other parts of this SPM, there are similar "nuclear "descriptions, so consistency is needed.	Noted. Text revised for balance.
25223	SPM	7	2	7	2	It also does not include landuse based emissions	Noted. Figure removed.
25224	SPM	7	2	7	8	Figure SPM3: In panel (b), in 3rd column, it would be better to show the decadal average for 2001-2010 than for single year 2010 for consstency sake. Use of a single year dramatises the recent rise in emissions from Asia. Similar issue in figure SPM4	Noted. Figure removed.
30396	SPM	7	25	7	25	The key messages on coal use should be higher profile maybe at lines 13/14. Main message that carbon intensity of energy has increased.	Rejected. It is true that this effect changed its sign, but it is small in absolute terms and should therefore not be over-emphasized. We have used very careful language in our revisions.
31693	SPM	7	6		7	Text should reflect that this is standard Jevon's paradox effect. Energy efficiency in absence of other driver, eg CO2 price, creates increased demand. And be made consistent with the text on rebound effects on page 15, lines 23 to 29.	Rejected. From this descriptive decomposition you cannot derive such an implication.
32700	SPM	7	6	7	6	To what is referring the word "consumption" in the heading: from private persons, from firms?	Accepted. Text revised for clarity.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25225	SPM	7	6	7	17	It is not clear whether the word "consumption" in the title talks about consumption of product and services, or consumption of fossil fuels. Previous section (page 4) talks about thr former. May be a more clear presentation would improve the undertanding conveyed here.	Accepted. Text revised for clarity.
38933	SPM	7	6	7	6	The text here should be changed to "consumption" from the current "combustion"	Rejected. The text does say "consumption".
28360	SPM	7	6	7	17	Holds especially true for long-distance road freight transport - double-digit improvements in efficiency have effectively been eaten away by increased weight per transport, increased distances, and increased total transport demand.	Noted.
28361	SPM	7	6	7	17	The first sentence/heading (bold text) of this paragraph seems misleading. No reference to "emission growth from consumption" is made in the longer text, although it is prominent in the heading. Instead it might be clearer to use the sentence in Chapter 5, page 5, lines 24-27: "the improvements in energy intensity at a global level and the slight reduction in the carbon content of energy resources have not been sufficient to overcome the increasing per capita income and population trends leading to a substantial increase in GHG emissions".	Accepted. Language has been revised for clarity.
28362	SPM	7	6	7	7	This is an important message.	Noted.
23698	SPM	7	7	7	17	The paragraph does not correspond to Figure SPM5 very well. Overall, what is the key message?	Accepted. Figure has been changed. See new Figure SPM.6.
33536	SPM	7	7	7	9	The combination “maintained a stable upward trend” suggests a constant annual growth, while annual growth did vary. We suggest to delete “stable”.	Taken into account. Finding comprehensively revised.
26452	SPM	7	8			Suggest "fossil energy" is replaced with "fossil sources of energy" or simply "fossil fuels"	Noted.
23699	SPM	7	9	7	15	Is the 4% modest increase in CO2 intensity recorded for the recent decade only, rather than two decades, If carbon intensity has contributed … for the first time since 1970?	Noted. Text revised for clarity.
38934	SPM	7	9	7	9	The authors should add "driven almost entirely by emerging developing countries of the G20" to the end of the sentence on this line.	Rejected. We focus more strongly on the global picture in revision.
28363	SPM	7	9	7	12	2 changes to clarify the sentence: "..a modest 4% increase in CO2 intensity of energy resources, 24% decrease in energy intensity per unit of GDP"	Noted. Text revised for clarity.
28364	SPM	7	9	7	15	It would much improve clarity to separate the mitigating factor (solely the 24% decrease in energy intensity on the downward side) from the aggravating factors (increase in CO2 intensity in energy resources, increase in GDP/cap and increase in population).	Noted. Text revised for clarity.
34030	SPM	7		7		Production or territorial emission? Figure states production while caption states territorial.	Noted. Text revised for consistency.
41033	SPM	7	6	7	17	Emission growth from consumption outpaces emission savings form efficiency improvement. Unnecessary negative representation of energy efficiency efforts. It should talk about the achievements and the potential for future growth. Of course efficiency alone can’t offset the increase in emissions, but it does play an important role to mitigate emission.	Noted. Revised language.
24226	SPM	7	6	7	17	This "decomposition analysis" is not straight forward at all. Although a fantastic scientific insight, I think it does not add too much info to policy makers. In fact I find it extremly complicated for people with no background in energy modelling. It makes sense in the technical report, but in the SPM only adds confussion. Besides, I find oit not self explanatory; re-writting should be considered.	Rejected. This decomposition summarizes important insights gained since AR4. However, we simplified the language and used a simpler figure.
30167	SPM	7		7		The transition between OECD dominant CO2 emmissions and and the shift to Asia in 2009. What proportion of the reductions in CO2 in OECD can be attributed to shifting to cleaner technology vs simply shifting the production base. Would also be interesting to link to the 2007-2008 stock market crash.	Noted. Figure has been comprehensively revised.
29743	SPM	7		7		Please give the full names of abbreviations used in the Figure	Noted. Figure removed.
32701	SPM	7	11	7	11	Delete the word “modest”.	Noted. Text revised for clarity.
23042	SPM	7	17	7	17	Change "renewables" to " renewable energies"	Noted. No longer part of finding.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30168	SPM	7	21	7	23	"…(LULUCF) have very large uncertainties attached in the order of ± 50%". These uncertainties are stagaring, it might be worth while to add a line about the source of the uncertainties (e.g. types of uncertainties).	Rejected. This is a summary document. A detailed account is provided in the underlying chapters 5 and 11.
32358	SPM	7	7	7	7	"robust evidence, high agreement" -- could this be expresssed as high confidence?	Noted. Yes, could also be expressed as high confidence. IPCC guidance allows for both.
40980	SPM	7				Cumulative amount of emission of CO2 shall be presented in absolute amount rather than as %. Cumulative production during a long time horizon shall be presented in a separate panel. Similarly, both production and consumption-based emission in 2010 shall be presented in absolute amount.	Noted. Figure removed.
40982	SPM	7	13	7	15	While the dependence of coal emerged during 1970 in developing countries, a number of developed countries increased dependency on nuclear for electricity during the same decade and hence reduced emissions from electricity sector. The historical emission trends from electricity sector shall also be discussed here.	Rejected. We discuss sectoral emission trends elsewhere in SPM.2.
40981	SPM	7	6	7	17	This section shall elaborate more based on regional emission trends and drivers. The statement 'emission growth from consumption continues to outpace emission savings from efficiency improvements' shall be justified in each regional context.	Rejected. While we agree about the importance, this is not possible within the constrained space of a SPM. We have therefore further focussed in the revision on providing a comprhensive global picture. Regional detail is covered in chapters 5, 7 and 14.
32842	SPM	7	6	8		When you compare GDP and consumption across countries, information about the metric is needed: are numbers given in terms of purchasing power parity or market exchange rates?	Noted.
30615	SPM	8				Suggest having the legend for the 4 factors (coloured lines) outside the LAM panel, preferably at the side or top of the entire Figure so it is prominently displayed. What are the insets in each panel? These are impossible to read and there is no reference to them in the caption.	Noted. New figure providde (new Figure SPM.6).
33537	SPM	8				Colour legend should be placed more prominently/visibly (now it's hidden in second panel). Change "Energy CO2/Energy" into "CO2/Energy". Energy CO2 (territorial) is not explained, nor in figure caption, nor in text. Suggest renaming it to "CO2 emissions" and mention in fig caption that only energy related CO2 emissions are shown. It's logical that each panel shows data for that region only; if that's the only meaning of "territorial", better omit it, since it causes more confusion thatn clarity. Same figure as TS.5	Accepted. New, simplier figure provided (Figure SPM.6).
26159	SPM	8				Legend may be applied to all graphs here.	Noted.
25526	SPM	8				The figure currently lacks a detailed and precise labelling and units. For instance, population at a global level (apparently represented by blue lines) adds up to a number between 1.5 and 2 by 2010. It is unclear which units this would be in. I suppose it could be growth rates that are reported, but this is not made explicit in the figure or caption.	Noted. New figure provided (new Figure SPM.6).
25231	SPM	8		14		The SPM 3 title i.e. Long term mitigation scenario may be relooked in consonance with the discussion within	Noted. Changed the title to "Mitigation pathways and measures in the context of Sustainable Development".
26108	SPM	8		8		Please cut + paste the legend re population/GDP.. etc from the LAM panel to the side of the whole figure	Noted. New figure provided (new Figure SPM.6).
28384	SPM	8				Check that the label for the Africa and Middle East Region (MAF) is consistently used throughout the report. Either AME or MAF, but not both. Alternatively, explain the difference between AME and MAF.	Noted. New figure without regional detail provided (new Figure SPM.6).

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28385	SPM	8				The figure is much too small, and hard to read and to understand. A number of changes would facilitate understanding for readers: Try a bigger font size, especially for the small graphs with Gt CO2. Write out LULUCF Land Use, Land-Use Change and Forestry so that the figure can stand by itself. Show the legend with the colored lines at the right (outside the graphs) rather than inside the graph LAM. Also, adding titles to the y-axes would improve clarity.	Accepted. New, simplier figure provided (Figure SPM.6).
26453	SPM	8				The presentation of this figure needs to be improved. For example, the font size needs to be increased in the small panels that sit inside each of the larger panels. The legend needs to be removed from inside the LAM pane and placed alongside the figure or underneath.	Accepted. New, simplier figure provided (Figure SPM.6).
25227	SPM	8	0	8	6	Historical cumulative emissions by countries (Figure SPM.5) should be computed not till 1970 but till year 1990 which is year used for benchmarking emissions in the Kyoto Protocol.	Rejected. This figure does not provide an account of cumulative emissions.
31302	SPM	8	1			This Figure uses the definition of ASIA which means Asia except from Japan. This should be clarified in the Figure Caption, in order to avoid misunderstandings.	Noted. New figure does not have regional detail.
38935	SPM	8	10	8	12	The phrase "asymmetry of future states of nature" is exceptionally esoteric and needs to be revised to clearly describe the concept being addressed.	Noted. Finding removed.
28376	SPM	8	10	8	15	Messages are difficult to understand. What is meant with "asymmetry of future states of nature", "low-carbon capital stock"? Please improve language and use expressions that can be understood by informed lay persons. The term "stringent policy" is used twice in the para, but in quotes the second time.	Noted. Finding removed.
29032	SPM	8	10	8	12	asymmetry of future states of nature' - what does this mean? Can "nature" be replaced with something more desciptive eg scenarios?	Noted. Finding removed.
31306	SPM	8	11	8	15	The term "state of nature" is not a very well known term for Policy Makers. Please consider to rephrase and use more commonly known wording.	Noted. Finding removed.
25000	SPM	8	11	8	12	Please specify what is meant by 'future states'	Noted. Finding removed.
23148	SPM	8	11			“Asymmetry”? What is meant? Explain! Readers won't know. I don't know.	Noted. Finding removed.
25230	SPM	8	11	8	11	The words "should be" are very strong and policy perspective.	Noted. Finding removed.
31307	SPM	8	12	8	12	Could "aggregation of low-carbon capital stock and technological knowledge" be simplified to, for instance "investment in and research on low-carbon solutions"?	Noted. Finding removed.
28377	SPM	8	12	8	15	Please, rephrase this sentence! Its readability is very low and its comprehensibility hence questionable.	Noted. Finding removed.
22809	SPM	8	13			where do the "short term economics gains" come from? They appear suddenly here.	Noted. Finding removed.
29314	SPM	8	14			Perhaps reword '"stringent climate policy" state of nature'	Noted. Finding removed.
25114	SPM	8	15	8	15	After 'needed', please add, "Those are what literatures tell us especially when models use CEA. However, this is yet to be proved by evidences. In reality, there will be cases where investors hesitate to invest because of future uncertainties."	Noted. Finding removed.
30400	SPM	8	16	8	25	A simple definition of SD can included in a box	Noted. Finding removed.
31308	SPM	8	16	9	3	The bold text here is a definition, and the body of the paragraph is focused on methodology. Please consider to substitute it by the key findings of the assessment of Chapter 4.	Noted. Finding removed.
30614	SPM	8	16	8	25	Consider moving this paragraph to page 12 as there is a strong link to the text on lines 10-17 on page 12 that refer to using climate policy to achieve a broader set of non-climate objectives. If space is an issue, this paragraph could be deleted, or parts of it could be merged with lines 10-17 on page 12.	Noted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now.
32583	SPM	8	16	8	17	Surely the bold point should be a more consequential rather than a terminological point? SD implies that some directions of development are preferable over those whcih reduce the options future generations or put them at greater risk?	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33540	SPM	8	16	9	3	The upper half of this paragraph, including the bolded section consists of definitions, which we think is not appropriate for the main text body of an SPM. We suggest to footnote definitions consistently across the report, but at least in the SPM. The lower half of this paragraph does not provide information that assists in decision making. We suggest to replace it by the following: “Climate change mitigation policies implemented in the context of sustainable development[footnote]Sustainable development is a framework for describing and analyzing multiple (development) objectives as well as for tailoring measures to realize those objectives. Sustainable development has been defined as a development that preserves the interests of future generations, preserves natural and environmental resources, or balances economic, social and environmental interests.[/footnote] need to reflect the synergies and trade-offs between such varied objectives as development, alleviation of poverty, biodiversity and combating climate change. Global climate change mitigation may assist in achieving different objectives that together constitute sustainable development, but climate change affects each region, sector, and group differently, and thereby their possibilities for achieving sustainability.	Noted. Finding removed.
24149	SPM	8	16	9	2	"Co-benefit" should be included in this sentence. Any action integrated with climate change is generally required al least for economical co-benefit. (See Chapter 5)	Noted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now. There it is presented side-by-side with a finding on co-benefits.
30078	SPM	8	16	8	25	Given texts and discussions later in the SOD, the multiple objectives include water and land use aspects (e.g. food, feed, fuel, fibre). This should be made more explicit here as the linkages between different objectives and systems may not be well-known for policymakers.	Noted. Finding removed.
28380	SPM	8	16	8	17	It should be added that Sustainable Development is a "Guideline for action" as well (and not only describing and analyzing).	Noted. Finding removed.
28381	SPM	8	16	9	3	The paragraph on sustainable development should be extended. Executive Summary of Ch. 4, p. 5, line 38-49 states a very important aspect that should be included in SPM (also in TS).	Noted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now.
29033	SPM	8	16	9	3	This paragraph does not fit well here - perhaps later in the SPM with other paragraphs on Sustainable development.	Noted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now.
25002	SPM	8	17	8	20	Suggest this section should reference biodiversity to reflect the environmental component of ecologically sustainable development (ESD). Significant climate change mitigation can be achieved by conserving and managing biodiversity. However, the vulnerability of biodiversity puts this mitigation pathway at risk.	Noted. Finding removed.
27337	SPM	8	17	8	20	In the SPM, the reference to sustainable development being "variably conceived" does not acknowledge the consensus reached on important international conferences, such as the Earth Summit (United Nations Conference on Environment and Development) and Rio+20 (United Nations Conferenfe on Sustainable Development"), which have stated the three dimensions of sustainable development - social, economic and environmental - as essencial to the full development of societies.	Noted. Finding removed.
32090	SPM	8	17			What does "ethical" mean?	Noted. Finding removed.
31303	SPM	8	2			We think that this figure contains too much information and is so small that much of the text is almost unreadable. The figure should be revised focusing on the main message.	Accepted. A simpler Figure SPM.6 has been included in new draft.
30612	SPM	8	2	8	6	Figure caption: Suggest rewording the title of this Figure to "Territorial fossil energy CO2 emissions (solid black line) decomposed into four factors (solid coloured lines) at the regional level and for the world.	Noted. New figure included in new draft of SPM.
22654	SPM	8	2	8	2	"Four factor decompostion" is jargon and should be expained in plain language.	Taken into account in revisions of figure, text and caption.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20536	SPM	8	2			The legend in the smaller boxes is not readable and can be shown as one unifying legend. Also the legend (purple line) "Energy CO2/Energy" is not 100% clear. Does this mean "Energy CO2/Energy total"?	Accepted. A simpler Figure SPM.6 has been included in new draft.
25228	SPM	8	2	8	6	It also does not include landuse emissions, rationale not clear- the grouping of countries is different for this figure	Rejected. Such decompositions cannot be easily devised for multiple types of emissions.
26454	SPM	8	2			Replace "fossil energy" with "fossil fuel"	Taken into account in revisions of text.
28382	SPM	8	20	8	23	Development is no objective; what are the possible conflicts between managing climate change and elimination of poverty?	Noted. Finding removed.
28383	SPM	8	23	8	25	Please include adaptation aspects as another objective: "A consideration of multiple development objectives and the associated synergies and trade-offs as well as adaptation aspects are needed when choosing among combinations of interrelated climate mitigation options within the context of SD"	Accepted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now. In this revised finding we also frame adaptation in the context of SD.
33538	SPM	8	4	8	4	EIT does not appear in fig. SPM.5. Please remove “EIT/” from the caption, so that REF represents both Economies in transition and Reforming Economies.	Noted. The new figure does no longer provide regional detail.
30398	SPM	8	7	8	7	It may be better to consider short, medium and long term mitigation scenarios here: rather than only long term scenarios	Noted. The title of the section simply refers to one fundamental characteristic of the models providing the scnerios: they all take a long term perspective, which is crucial for climate change mitigation.However, the section include information on short- and mid term requirements of meeting long-term atmospheric conentration levels.
25553	SPM	8	8	8	15	The discussions are based on the inappropriate tables (Table TS.1 and Table 2.2) which only the LAs gather the related literatures without systematical treatments, and therefore the discussions are also inappropriate and should be deleted. Also see my comments to Table TS.1, Section 2.4.2, and Table 2.2 for the reasons in detail.	Noted. Finding removed.
30377	SPM	8	8	8	10	This seems a rather policy prescriptive statement, which I didn't think was the role of IPCC. Surely whether to accelerate mitigation efforts or not is a political judgement so not one that IPCC would or should make. Also I think the statement is rather sweeping and may be taken to apply to all mitigation tools and methods, which conflicts with some of the evidence presented in the underlying chapters. For example on bioenergy in particular the evidence presented in Chapter 11 was rather complex and my reading of it would be that it does not automatically follow that the appropriate response to uncertainty is to accelerate mitigation through this particular method.	Noted. Finding removed.
30399	SPM	8	8	8	10	reword for clarity, it would seem that the message is that risk is not an excuse for inaction.	Noted. Finding removed.
31305	SPM	8	8	8	10	This key finding is important and efforts should be made to make this easier to read. Please consider to rephrase to "The appropriate response to most of the relevant uncertainties is to accellerate mitigation efforts, compared to what would be most appropriate in the absence of such uncertainties" as it would make it a little clearer and easyier to read.	Noted. Finding removed.
29313	SPM	8	8	8	10	This sentence is impenetrable. Recommend changing to: "Delaying action tends to increase the costs of mitigation once uncertainties about future policy stringency are taken into account."	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30613	SPM	8	8	8	15	This is a difficult paragraph to understand. For one thing, this paragraph is now divorced from the table (Table TS.1) where the various sources of uncertainty are referred to. The reader does not know what "relevant uncertainties" are being referred to. The phrase "asymmetry of future states of nature" is incomprehensible. Reference is made to scenarios ("cases"?) which the reader has no information about. Delete paragraph?	Noted. Finding removed.
20081	SPM	8	8	8	15	What means a “stringent climate policy” state of nature ? Sentence unclear. A point is missing ?	Noted. Finding removed.
32582	SPM	8	8	8	10	Seems clumsy wording of a key point. It basically seems to be saying that uncertainty amplifies the risks - and hence appropriate degree of mitigation - as compared with full knowledge	Noted. Finding removed.
33539	SPM	8	8	8	15	This paragraph uses some words that allows it to be considered policy prescriptive and we would advocate to avoid these words. Further, the entire paragraph is very difficult to comprehend. We suggest to replace it by the following: "Uncertainties, such as those in the exact response of the annual global average surface temperature to greenhouse gas concentrations, may be dealt with through taking measures at such pace that the objective always remains within reach. As uncertainty deminishes over time, this pace may be relaxed, provided that the response turns out to be less than earlier worst realistic expectations (critical path approach). Since according to most studies the cost of excess mitigation to limit climate change to 2°C at most is out weighted by the damage resulting of mitigation shortage, more rigorous mitigation than in the absence of uncertainty is advocated in some of these studies. Delayed policy implies that technology push that results from a developing market, kicks in so much later. The shorter period available to implement such technologies on the necessary scale is not conducive with the optimal timing of replacement investements and so raises the cost of climate change mitigation considerably.”	Noted. Finding removed.
21507	SPM	8	8	8	15	This paragraph is unclear and very difficult to understand. The first part of the paragraph seems a very difficult way of expressing the precautionary principle and should be redrafted to be clear. It would be good to give background to what kind of uncertainties it is referring to (is it for instance uncertainties of costs related to mitigation or rather to costs related to climate change itself including irreversibilities, tipping points or catastrophic risks (WGII). If it is the former, the paragraph could be enhanced by referring to findings that early action will reduce the cost of meeting a given target compared to delayed action (for targets of 450ppm and 550ppm, evidence is given later in the chapter for the importance of early action). The second part of the paragraph is simply copy and paste from the chapter and is out of the context. For instance what is really meant by a 'no policy' case (including or even excluding existing policies, etc.)	Noted. Finding removed.
22655	SPM	8	8	8	15	This paragraph begins the discussion of long term scenarios with a focus on the implications of one type of uncertainty on "what would be most appropriate" without discussing what actually would be appropriate. This picks one particular effect -- perhaps a third order effect -- to justify a precautionary approach, however, other risks are not mentioned. Suggest that this first discuss (first order) what is appropriate based on some basis (for example cost benefit) , and then discuss (second order) the implications of impact uncertainty on decision framework (adaptive management), and then have a balanced discussion of the effect of impact uncertainty on and well as policy uncertainty as in section 2.4.2.2 (it makes sense to go slow with untested policies). Such a balanced discussion of uncertainty then an important basis for the discussion of adaptive management which should appear in the SPM.	Noted. Finding removed.
22660	SPM	8	8	8	8	I could not find a "balance of evidence" statement in chapter 2 to form an assessment basis for this statement.	Noted. Finding removed.
22807	SPM	8	8		10	this sentence cannot be understood. Does is say "It is better to do anything than to do nothing" in very complicated words?	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22806	SPM	8	8		15	This whole paragraph is very difficult to understand. The second part is simply copy&pasted from the chapter and is out of the context. What is e.g. the "no policy case"? There is no further specification. Is it completely without policies, also without fossil fuel subsidies, taxes or e.g. the EU ETS? Or is is simply a counterfactual "baseline" without any constraints in the models?	Noted. Finding removed.
22451	SPM	8	8	8	15	This passage (and a similar one in the TS; both passages are not well written and partly unclear to me) sounds somewhat prescriptive, in the sense that it tells policy makers what to do when they face uncertainty. How to react to uncertainties/ risks seems to be a highly normative question	Noted. Finding removed.
23945	SPM	8	8	8	10	This statement is policy prescriptive and is not qualified by the IPCC uncertainty language. It is strongly recommended to rewrite this statement in order to address both concerns.	Noted. Finding removed.
25229	SPM	8	8	8	10	The "balance of evidence" is subjective, is a strong political statement and provides a biased opinion on the issue. How was this evidence arrived at? Does balance indicate that there were almost similar views in literature on both sides (to accelerate and not to accelerate)? In that case, rather than indicating balance of evidence, it would be better to indicate level of evidence and confidence for this statement. Balance of evidence may also indicate that there is only medium confidence and medium evidence to this statement. In such a situation, this should be clearly indicated.	Noted. Finding removed.
26109	SPM	8	8	8	15	These three sentences are very hard to grasp.	Noted. Finding removed.
40798	SPM	8	8	8	10	Even if suggested by the "balance of evidence" , the word "appropriate response" is not appropriate expression in SPM, because it suggests the "right direction to go" and would be policy prospective.[?]Thus, such an expression should be deleted.	Noted. Finding removed.
40799	SPM	8	8	8	15	This sentence describes that AR4 WG2 discussed "with the conclusion that focus on potentially catastrophic low probability high-impact events is important when choosing climate change targets". However, such a description is misleading in that it might lead to a policy prospective. Furthermore, Table 2.2 where this paragraph cites is not complete to judge this result (see our comment on Table 2.2. for detail) . Above all "balance of the reports (which authors found) " is very hard to say "balance of evidence", and possibly mislead readers to wrong understanding. So this paragraph is not appropriate for SPM and please delete this paragraph from here.	Noted. Finding removed.
28373	SPM	8	8	8	10	Message is difficult to understand. Maybe easier with two sentences.	Noted. Finding removed.
28374	SPM	8	8	8	15	The paragraph does not convey the urgent need for action in the light of what is already known. The discussion of future policy stringency could be shortened. Concerning temperature targets, a suggestion is to add the wording from Chapter 2 (Exec. Summary): "If one sets a temperature target, inclusion of climate uncertainty leads to decade-scale earlier recommendations for investments into mitigation technologies." Also, the paragraph should mention the difficulty that many decisions focus on short-term benefits as in Chapter 2, Exec. Summary: "Decision-makers often misperceive climate change risks and consequences and place weight on short-run outcomes when making mitigation or adaptation investment decisions (high confidence)."	Noted. Finding removed.
28375	SPM	8	8	8	8	What is exactly meant by "balance of evidence"?	Noted. Finding removed.
25113	SPM	8	8	8	10	1) Change 'the balance of evidence' to "Model calculations". 2) After 'uncertainties' in line 10, please add, ",though it differs whether models are based on cost-benefit analysis or cost-effective analysis".	Noted. Finding removed.
26455	SPM	8	8	8	15	This paragraph is very difficult to understand. It could be helped by giving more context about the approach taken to modelling these long-term mitigation scenarios and by defining some of the technical terms, such as 'policy stringency' and 'asymmetry of future states of nature'	Noted. Finding removed.
22808	SPM	8	9			what are the "asymmetries of future states of nature"? I don't understand	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28378	SPM	8	13	8	14	"the associated short-term economic gains would be more than outweighed by the potential for substantial economic losses if a “stringent climate policy” state of nature were realized and extremely rapid decarbonization were then needed". Does this mean: the associated short term economic gains would be more that outweighed by the potential TO AVOID substantial economic losses if a stringent climate policy state of .....???	Noted. Finding removed.
23818	SPM	8				I think this section needs some reordering. The section jumps backwards and forwards between seemingly unconnected issues, before settling on the pathway work. I suggest to make this section about pathways, and introduce the other issues in another section.	Accepted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now.
28379	SPM	8	16	9	3	In context with this para, the TS offers data on global resource and energy use: TS p. 9, line 21 to 36. The theme of SD pops up at this point in the SPM (e.g. in SPM 4.3, but also earlier, p. 12, line 10 - it should be merged in SPM 4.3.	Noted. Finding removed.
31271	SPM	8	7			The transition should be discussed	Rejected. We do not understand what is meant by this comment.
26487	SPM	8	21			...after "elimination of poverty," include: "job creation"	Noted. Finding removed.
24227	SPM	8	10	8	12	Given the importance of this statement, it should be high lighted by being mentioned before. Perhaps, it should also be located in page 4. This ois the kind of information policy makers have to know and fully understand.	Noted. Finding removed.
41036	SPM	8	12	8	15	Not policy short term economic gain vs. long term economic cost of accelerated action. Very complicated and presumptuous conclusion that needs to be verified and supported by numbers.	Noted. Finding removed.
24228	SPM	8	13	8	15	Too complicated to say that doing nothing is more expensive. I would recommend to rephrase.	Noted. Finding removed.
35199	SPM	8	16	9	3	Equity and sustainable development are two major concerns of all developing countries, but these issues are currently not fully reflected in the SPM. It is suggested to reflect main conclusions from Chapter 4 in a more balanced manner and add the following texts: (1) the broader objectives of equitable and sustainable development provide a policy frame for an effective, robust, and long-term response to the climate problem, and building both mitigative capacity and adaptive capacity relies to a profound extent on the same factors as those that are integral to equitable and sustainable development (high agreement, medium evidence)(Ch.4, page 6,line 47-50) (2) climate change is a classic commons problem (Ch.4, page 16, line 34), and an effective solution relies on collective action, which is more likely to be agreed and effectively implemented if it is perceived to be fair in both its terms and the procedures through which they were decided(Ch.4, page 5, line 2-4).	Noted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now.
24229	SPM	8	16	8	24	Very strange to put this paragraph in here. This paragraph evidently does not follow the logical flow of the previous paragraphs. At this moment, it does not add anything to the text as it is not optimally contextualized. SD very important, but at this point of the summary becomes irrelevant.	Noted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now.
23106	SPM	8	17	8	20	Substitute text by reference to definition of SD in Brundtland Commission report.	Noted. Finding removed.
41034	SPM	8	2			Four sector decomposition The use of Kaya equation assumes that each of the four factors has a similar effect on greenhouse gas emissions when in practice, some may make more of a difference than others. So simple equations like the Kaya probably underestimate the effect of one factor versus another, and such errors are then passed on into the calculated emissions totals, and the projected climate impacts that are based on them.	Taken into account. Changed to figure, which is based on index decomposition. Note that future projections come from different models and are not linked to Kaya results, which stem from a different body of literature.
41035	SPM	8	8	8	10	Response to uncertainties by accelerating mitigation. This is a prejudgment to address mitigation projection uncertainty by accelerating mitigation. This can't be a scientific approach that lacks facts and verified conclusions, considering the social and economic costs of mitigation.	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33952	SPM	8	8	8	10	not clear	Noted.
31304	SPM	8	7			Please consider to include a description of the scenarios in the Chapter.	Accepted. We included a finding on baseline projections in SPM.2 and further generic information on the scenarios in the first finding on SPM.3. More detailed information are available in a dedicated box in the Technial Summary (Box TS.6)
32702	SPM	8				The figures are too small. Impossible to read them in the current format.	Accepted. New, simplier figure provided (Figure SPM.6).
32359	SPM	8	1	8	6	Figure SPM.5: Assuming that the "/" means divided by, please clarify what "Energy CO2/Energy" means. Please add y-axis annotations. The caption has to be considerably expanded to provide necessary figure details.	Accepted. Figure revised and caption provided.
21506	SPM	8				This section should be more explicit on the type of efforts required in the time frame up to 2030. This time frame is most relevant for policy makers to be concrete. It should include information on emission pathways needed at regional and large emitter level to achieve certain scenarios and cannot limit its information at cost data on regional and large emitters level (see figure SPM.10). This gives very little information to what these cost estimates relate	Rejected. This section outlines the short and long-term requirements for achieving different atmospheric concentration levels in the long-term. The sector sections (new SPM.3.2) contain a discussion of available mitigation options that can be reaped in the short-run.
32361	SPM	8	16	9	12	If length is an issue, this paragraph defining sustainable development could be deleted and the text be included in the Glossary.	Accepted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33887	SPM	8	7			Comment: SPM.3 contains important information about the consequences of delayed decisions. The SPM summarizes information about the slow progress on emissions migration. It explains that GHC emissions have grown more rapidly since preparation of the Kyoto Protocol than during the previous decades (p. 3, line 32). Concern about the slow pace of climate mitigation was expressed also by speakers during the 2012 UN Foundation Conference on Climate Change (UNFCCC). An example was the comment of the U.K. Secretary of State for Energy and Climate Change, the Rt. Hon. Edward Davey M.P. During a briefing, he said: "In the recent months, we've seen scientific reports about the polar ice caps and rising sea level . . . . . Science has shown us that global warming is getting worse more quickly than we expected, but our global negotiations are progressing more slowly than we previously had hoped that they would. That divergence creates a huge challenge! Let no one have illusions about what that will mean for every single country in the world." Because of the slow pace of negotiations, the WGIII information about the consequences of delayed decisions is especially important. Information about delay is summarized within section SPM.3, entitled Long-term Mitigation Scenarios. Information on delay is mainly on SPM pages 9 to 13. The following five sentences are some examples: --Delay translates into a higher probability of temporarily exceeding the 2oC limit (p. 9, line 30) that is recommended in WG!. --Delay renders ambitious mitigation levels such as 450 ppm CO2eq by 2100 physically infeasible (p. 10, line 26) --Delay increases the costs of mitigation several-fold (p. 10, line 34). --Many integrated models cannot produce scenarios that meet a concentration of 450 ppm CO2eq by 2100 even with overshoot when there is a delay in global mitigation efforts or delays by a large component of the world's emissions (e.g., by the OECD countries or the non-OECD countries) . . . (p. 10, line 28). --Long-term mitigation pathways that are commensurate with GHG concentrations of 550 ppm CO2eq or lower require institutional progress of a scale and pace that is unprecedented in human history (p. 13, line 9). Again, I think that WGIII information on the consequences of delay is very important and should be included in the SR and SR/SPM. The information might help to demonstrate the hidden costs of delayed decision to policymakers and the general public.	Noted. We agree that detailed information on the consequences of delayed mitigation is one of the major developments in the scientific literature since AR4.
20993	SPM	8	8	8	15	Please explain what is meant by "asymmetry of of future states of nature" and rephrase this paragraph. It s not clear what "the … case" refers to, and it is not clear whether you attribute the potential economic losses to the "no policy" option or the rapid decarbonization.	Noted. Finding removed.
32703	SPM	8	8	15		The whole paragraph does not provide a clear message. The heading refers to "relevant uncertainties" (presumable including policy uncertainties?) while concluding that the "appropriate response" is to "accelerate mitigation" (which is a policy). Furthermore, there is a mention to a "no policy" case, which is now no more the situation after the Cancún Agreements (many or all countries with mitigation policies). The expression of "asymmetry of future states of natures" is also unclear.	Noted. Finding removed.
32360	SPM	8	8	8	10	Suggest to avoid being policy prescriptive: this sentence on the "appropriate response" should be reconsidered and at least be phrased conditional.	Noted. Finding removed.
32845	SPM	8		14		In many cases the level of confidence about the finding in each paragraph is missing.	Noted. But the IPCC guidance leaves this option when "statement of facts" are concerned.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32844	SPM	8	8	8	15	The clarity of this message and the reasoning is very vague. It seems, however, to bring up the precautionary principle in the presence of uncertainty. Why not naming it so? Also, the paragraph falls short for weighing pro's and con's as the explanation provides only an (obvious) example for a case where the precautionary principle might be indeed a good advise.	Noted. Finding removed.
40983	SPM	8				All information in the figure shall be legible.	Accepted. New, simplier figure provided (Figure SPM.6).
32843	SPM	8		8		It would be very instructive and transparent to include uncertainty ranges into the figure.	Rejected. There is a lack of information to include uncertainty ranges in this figure.
40986	SPM	8	10	8	11	L10-11, P8 Mitigation efforts shall be increased in the short-term This argument stands alone as there is no justification with reference.	Noted. Finding removed.
40987	SPM	8	12	8	15	L12-15, P8 define ‘no –policy’, low-carbon capital stock’, ‘stringent climate policy’ These phrases have not been defined in the section.	Noted. Finding removed.
40988	SPM	8	16	8	25	This section does not have any relevance when discussing long-term mitigation scenario. It stands alone in its current form. Definition of ‘synergies’ and ‘trade-off’ require further elaboration.	Noted. We removed this finding and frame the SPM in the context of SD right from the start in SPM.1 now.
25001	SPM	8	16			The discussion of sustainable development is not particularly useful for general policy makers and should be reframed with a view to the needs of policymakers.	Noted. Finding removed.
26399	SPM	8	16	9	3	Sustainable development includes efficient, effective, and fair access to financial services such that all global stakeholders have similar access to secure financial services. This supports effective financial management of funds, economic distribution mechanisms, and transactions of goods and services associated with mitigating climate change. Furthermore, fair access to financial services for all who choose to mitigate climate change decreases transactions costs, allows risk management tools to be applied, and can, under certain circumstances, bend the cost-curve to favor mitigation activities over GHG generating activities.	Noted. Finding removed.
40989	SPM	8	23	8	25	While SD has multi-objective and multi-dimension, it often considered local in nature. A holistic view towards SD may bring question of ‘burden sharing’ Examples of synergies and trade-offs are missing.	Noted. Finding removed.
26131	SPM	8	7	9	21	Some of the paragraphs of this section (e.g. the first three paragraphs) do not seem to fit under the heading "long-term mitigation scenarios".	Rejected. All insights are derived from integrated modeling scenarion with a time horizon until 2100.
40985	SPM	8	8	8	9	Clarification is required what does it mean ‘balance of evidence’	Noted. Finding removed.
22814	SPM	9		11		sometimes a "temporary overshoot of temperature" is mentioned. Is it possible to relate this to ppm targets, e.g. of the kind: a scenario with x ppm above 450ppm leads to an overshoot of 0.1 °C.? Or at least a quantification of the temperature overshoot would be good, e.g. is it 0.1 °C or 0.5°C? In that context, Fig. 6.11.(d) might be very useful.	Accepted. We have added a new table SPM.1 summarizing the link between emission budgets, radiative forcing and temperature changes across forcing categories. This also covers the issue of temperature overshoot.
22817	SPM	9		13		it might be an idea to include a summarizing table for comparing 450 with 550ppm. There is much in the text, but a comprehensive overview of the differences is missing	Accepted. We have added a new table SPM.1 summarizing the link between emission budgets, radiative forcing and temperature changes across forcing categories. This also covers the issue of temperature overshoot.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28418	SPM	9				Climate Engineering is presented as if technologies would be at hand and available, and thus overshooting scenarios with negative emissions would be a realistic option to reach ambitious mitigation scenarios. This is however not the case.	Accepted. We have highlighted in the revision that the availability and scale of CDR options are uncertain. SRM technologies are not covered.
28419	SPM	9				Climate Engineering: It is not justified to present CRD methods as BECCS, because it suggests that all CDR-methods are comparable to BECCS. Via the (ostensibly) non-controversial and acceptable BECSS-technique, CDR, and more generally climate engineering, is introduced in scenarios, as an option to reach ambitious mitigation scenarios.	Accepted. We have added a paragraph in the Technical Summary highlighting the difference across CDR technologies. Moreover, we highlight which CDR technologies are referred to in scenarios.
34696	SPM	9	1	9	7	It is of absolute importance that this paragraph is accompanied with the explanation, that these aggregate macroeconomic costs represent only direct mitigation costs and do not take into account important co-benefits or adverse side-effects of mitigation actions, such as health benefits from reduced air pollution or changes in landscapes, and further, that the costs do not capture the benefits of reducing GHG concentrations and limiting climate change. In other words, the figure says very little about the true costs of action. Furthermore, instead of the figure "less than 4 percent", the para should deference to the full scale given in Chapter 6: 1.1 - 3.9 %.	Accepted. We have revised the finding where we highlight that these costs do not consider the benefits of mitigation from the reduction of climate impacts.
28392	SPM	9	11	13	20	Are IAMs economic models? Please define model concepts, assumptions, scenarios etc. How about the assumptions for 450 ppm? (again the reference to the underlying report is missing.)	Noted. We have added a few introductory sentences to the long-term scenarios, but cannot provide what is asked for by the reviewer within the limited space of a SPM. We added box TS.6 and TS.7 for background in the Technical Summary.
28393	SPM	9	11	13	20	This para sends a very negative message on the feasibility of low emissions scenarios, please modify language to give a more balanced message. The para does not sufficiently explain the assumptions, for example about the incentives for emission reduction or infrastructure requirements. In addition to the explanation of assumptions, information is on the options to overcome barriers.	Noted. Finding revised and language more descriptive. However, authors do not feel that the paragraph was negative. The literature highlights the ambitious technological, economic and institutional requirements of low mitigation scenarios.
28391	SPM	9	11	9	12	"…two important perspectives - the process through which decisions are made and the outcomes of such processes -…" This ends rather abrupt. A short explanation what distinguishes outcomes and processes should be added.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
20537	SPM	9	12			The statement 'and many different methods for assessment' is not clear and should be specified	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
28395	SPM	9	12			The last paragraph of the Executive Summary of Ch. 3 (p. 8, line 1-3: "Achieving strong mitigation will require major technological, STRUCTURAL and behavioral changes. Markets, left to their own devices, will underprovide technological change, even in the presence of a carbon price. Studies suggest that environmental and technology policies work best in tandem.") should be included for example in SPM (p. 9, following paragraph line 4-12).	Accepted. We added a finding on the relationship between market-based and technology policies to section SPM.4.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28394	SPM	9	12	9	12	"…and many different methods for assessment." Make new sentence and add some few examples which assessment methods this might be, e.g. from Ch 3, sec 3.5 cost-benefit analysis.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
28396	SPM	9	12	9	12	The second reference in the bracket is wrong. It should be "3.3" rather than "3.10".	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
31272	SPM	9	13	9	13	The scenario « without explicit efforts to reduce emissions » is quite unclear. A short explanation is needed.	Noted. Baseline scenarios can also have emission reductions built-in. Our language tries to distinguish emission reductions in baseline from those additional reductions resulting from climate policy. This is a common procedure in scenario analysis.
30402	SPM	9	13	9	17	What is current atmospheric GHG concentration (CO2 Eq)	Accepted. We have added this information to a new baseline finding added at the end of section SPM.2.
31309	SPM	9	13	9	21	This is an important and clear key finding. However, the text in line 15 to 16 could be made easier to understand.	Accepted. We have revised the language and moved the paragraph to the end of section SPM.2
30617	SPM	9	13	9	14	The corresponding text in Ch. 6 page 5 lines 26-29 have associated with them a confidence level of medium, not high, as indicated here.	Accepted. Writing processes run in parallel and it is sometimes difficult to synchronise the revisions fully. We have established consistency in confidence statements.
23719	SPM	9	13		14	Even when forecasting emissions, and not economic results, there is great uncertainty built into the IAMs at many levels. Thus, I would say that this statement, particularly for 2100 has “medium” not “high” confidence.	Noted.
33542	SPM	9	13	9	14	It seems that "explicit efforts to reduce emissions" are already undertaken, and for clarity we suggest to rephrase this bolded sentence by: "Without an increase in the pace of projected emission reductions, GHG concentrations will exceed 450 ppm CO2eq before 2030 and 850 ppm by 2100 (high confidence).	Rejected. This language is introduced to distinguish emission reductions from climate policy to baseline emission reductions in the models. This is important conceptually. We try to convey this even clearer.
24150	SPM	9	13	9	14	I DO NOT see why GHG concentration will exceed 850 ppm by 2100. You should show, for instance, "majority of scenarios will exceed XXX ppm by 2100" instead of 2 lines with bold letters.	Accepted.Revised language.
25004	SPM	9	13	9	14	In the SPM, the text currently states: 'Without explicit efforts to reduce emissions, GHG concentrations will exceed 450 ppm CO2eq 13 before 2030 and 850 ppm CO2eq by 2100 (high confidence).' The AR4 WGI report 2007 (Chapter 1) conversely states: 'The total CO2 equivalent (CO2-eq) concentration of all long-lived GHGs is currently estimated to be about 455 ppm CO2-eq, although the effect of aerosols, other air pollutants and land-use change reduces the net effect to levels ranging from 311 to 435 ppm CO2-eq (high agreement, much evidence). The statement in the SPM needs to be clear about what the figure of 450ppm CO2eq includes.	Rejected. The models here take into account effects of aerosols, other air pollutants and land-use. So there is no problem. We have added estimates for current concentrations consistent with the estimation methodology used in the scenarios.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30442	SPM	9	13	9	21	1) Suggestion: Move this paragraph to after the two subsequent paragraphs (line 22-32 and line 33-37). The paragraph is the first mentioning specific GHG concentrations. It would be easier to read if the paragraph explaining the link/connection between GHG concentrations and temperature (line 22-32) is presented first. 2)It would be informative if the projected baseline GHG concentrations of 1000 ppm in 2100 could be related to a temperature increase (in probability terms). This would ease the understanding of the consequences when comparing to concencentrations of 450 ppm and 550 ppm.	Rejected. It is important to start off with baseline scenarios. We have added a revised paragraph to the end of section SPM.2. We have added a table SPM.1 providing a summary of the link between emission budgets, radiative forcing and temperature changes.
22929	SPM	9	13	9	21	To my understanding, the pathway of 850ppm CO2 eq by 2100 is a relatively high emission path (90 percentile of the scenarios published at the time of AR4).Please check the sentence "the GHG concentrations will exceed 850 ppm CO2 eq by 2100 without explicit efforts to reduce emissions with high confidence".	Rejected. It is a rather low baseline trajectory in terms of 2100 concentrations. However, we used more precise language in the revised paragraph.
23149	SPM	9	13	9	14	At present CO2 is increasing about 1.5 ppm/year. That extrapolates to 420 ppm in 2030 and 525 ppm in 2100. Even allowing for the other GHG, the figures given are not credible (especially because CH4 and N20 are short-lived, so do not accumulate linearly with time).	Rejected. All models assume economic and population growth. This will increase energy demand substantially driving GHG emissions in an unabated world.
22872	SPM	9	13	9	14	There are baseline scenarios with low emissions. For example SRES B was one of example. The sentence need more careful wordings.	Accepted. Language revised.
22657	SPM	9	13	9	13	Important to give a clear definition of CO2eq as used here. Also this paragraph should state the value of the current CO2eq.	Accepted. Clarified what anthropogenic emissions this includes.
24384	SPM	9	13	9	13	Please define what is meant by a CO2 equivalent target for the atmosphere when first used. Presumably here equivalent includes all anthropogenic emissions, not just greenhouse gases, in which case it should be close to the actual CO2 ppmv value.	Accepted. Clarified what anthropogenic emissions this includes.
25528	SPM	9	13	9	21	For clarity, an indication of which RCP this would most closely correspond to would help the reader understanding cross-working group insights. Furthermore, as providing concentrations inferred from emissions is as little a working group III issue as would be temperatures, I suggest, either providing emissions only, or providing all information through to the estimated temperatures.	Accepted. We have added this information.
22728	SPM	9	13		14	Even when forecasting emissions, and not economic results, there is great uncertainty built into the IAMs at many levels. Thus, I would say that this statement, particularly for 2100 has “medium” not “high” confidence.	Noted. These are not forecast, but scenarios describing different types of worlds with different socio-economic make-ups.
40800	SPM	9	13	9	14	Figure 6.4 in Chapt.6 indicates that most of BAU scenarios scatter between 650 and 850 ppm. Please mention this also in SPM.	Rejected. This is not what chapter 6 shows. The ranges are representative for the large underlying scenario ensemble.
28397	SPM	9	13	9	14	Please give a temperature range for these concentrations. Temperature ranges are also given for the categories in Table 6.1 in chapter 6. Why are these not used? And how do these results compare to those of WGI? Please use RCPs as labels.	Noted. We have added a new table SPM.1, which allows to do that.
28398	SPM	9	13	9	14	The concept of "ppm" should be explained much earlier. It might be helpful to change the paragraph comprising lines 13-21 with the paragraph comprising lines 22-32.	Noted.
28401	SPM	9	13	9	19	Why are 2 different figures for 2100 given? (850 ppm and 1000 ppm)	Accepted. Revised finding for consistency.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28399	SPM	9	13	9	21	This is a very important paragraph! However, it should be clarified for policymakers. For UNFCCC-negotiators the question is: will the 2 degree target be met, which will be assessed in the Review 2013-2015. Hence, in this paragraph should be explained what is meant by 450 ppm or 550 ppm, that is: Is the 450 ppm scenario compatible with the 2 degrees? Please add also Table 6.1. from Chapter 6. Please use RCPs as labels.	Accepted. We added a new table SPM.1, which links emission budgets to forcing and temperature changes across forcing categories.
28400	SPM	9	13	9	21	This very contentful paragraphs reads very technical and abstract. Please ensure 1) readability, 2) putting results into perspective. What does 850ppm and 1000ppm mean in terms of temperature? Please use RCPs as labels.	Accepted. Language revised.
20823	SPM	9	14	9	16	It is true that the emission growth wouldn't be mitigated by technologies if we consider their improvement from the standpoint of nowadays technological system. However, transferring best available technology to developing countries made it possible to largely reduce GHG emission all over the world. Therefore, it is important to improve current technologies as well.	Noted. This finding is about baseline scenarios, where emission reductions will only be driven by unguided technological progress in the absence of climate policy. Subsequent findings focus on scenarios based on mitigation policies.
23701	SPM	9	14	9	14	The opening sentence is not sufficiently supported by the paragraph: 850ppm in line 14 but 1000ppm in line 20.	Accepted. Revised finding for consistency.
28402	SPM	9	14	9	15	"Economic growth will continue to drive emissions growth at a global level." This stands in conflict with the idea of "green growth", maybe better "Economic growth like in the past ..."	Rejected. This is qualified by the start of the finding "without explicit efforts to reduce emissions".
29035	SPM	9	14	9	19	Is there an inconsistency here 2100 CO2 Eq levels - line 14 states 850ppm and line 19 states 1000ppm?	Accepted. Revised finding for consistency.
30618	SPM	9	15	9	16	This sentence is confusing and would benefit from revision. The word "ameliorated" may not be the correct word choice - suggest "reduced" instead. The meaning of the "nature of remaining fossil fuel sources" is also unclear.	Noted. Finding comprehensively revised.
25592	SPM	9	15	9	16	This sentence had better be deleted as it seems to have negative impression. Whatever the level of baseline is, only we can do to tackle the grobal warming is using technologies.	Noted. Finding comprehensively revised.
33543	SPM	9	15	9	16	We think "… the nature of remaining fossil resources." is difficult to comprehend, so we suggest replacing it by: "fuel shift."	Noted. Finding comprehensively revised.
33544	SPM	9	15	9	16	"This emissions growth will not be meaningfully ameliorated by autonomic improvements in technology or by scarcity of remaining fossil resources." Reasoning: substiantial improvements in technology (innovation) could meaningfully decrease emissions, but without a specific push for innovation of the emissions aspect and sustainable energy, the autonomic rate of technology improvement would probably not meaningfully decrease emissions.	Noted. Finding comprehensively revised.
20870	SPM	9	15	9	16	Later in this SPM, technological improvements are explained as one of the means for emission reduction. (ex. fuel carbon intensity close to zero written in SPM. 4.2.2.) Therefore, I hope to delete this sentence.	Rejected. This is no contradiction as the finding addresses technology developments in a world without climate policy.
21508	SPM	9	15	9	19	This sentence seems to indicate that some baseline projections do meet a 550 ppm CO2-e scenario. Taking into account the next sentence indicating very high concentration levels by 2100 for most baselines, doesn't this create unnecessary confusion? Suggest to delete this sentence.	Accepted. We have revised the finding.
30619	SPM	9	16	9	19	Should the word "existing" be inserted before the words "scenarios literature"? The new scenario process includes the development of new baseline socio-economic and emissions scenarios (the "SSPs") and these may or may not be consistent with lower stabilization scenarios.	Noted. Finding comprehensively revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23946	SPM	9	16	9	16	What do the authors mean with "nature of remaining fossil resources"? Do they want address the already explorated fossil fuel reserves? Something different? Or the potential reserves? Further clarification would be very much appreciated.	Accepted. Term avoided during revisions.
28403	SPM	9	16	9	17	Explain what "baseline scenario" means, at least in the glossary and give a ref. Is this the scenario usually referred to as "BAU scenario"?	Rejected. The term is in the glossary. But we do not refer to glossary entries specifically.
32707	SPM	9	17	9	17	The figure caption should read: “Mean CO2 global emissions …”	Noted. Figure removed.
25234	SPM	9	17	9	17	"inconsistent" - is it inconsistency or are the trajectories different?	Noted. This is what is meant by inconsistent. Revised language of finding
22811	SPM	9	18			550ppm appears here for the first time. How is this motivated?	Rejected. Any of the concentration levels, which are frequently discussed in the scientific literature, will appear for the first time in this SPM at some point.
29036	SPM	9	18	9	18	Line 18 sounds like an endorsement for a 550 stabilisation level, should be re-worded.	Rejected. We do not see in what way this sentence endorses 550 as a stabilization levels. Throughout the SPM other levels are discussed.
22658	SPM	9	19	9	19	Is this 1000 CO2eq or CO2?	Noted. It is CO2eq.
40801	SPM	9	19	9	19	Since "1000 ppm" described here is the value of CO2-equivalent concentrations, it would be recommended to replace "1000 ppm" with "1000 CO2eq ppm".	Noted.
40802	SPM	9	19	9	21	Since it is not clear which part of the Chapter 6.3 is related to the description "The majority of baseline scenarios will exceed atmospheric GHG concentrations of 1000 ppm in 2100", it is recommended to rewrite this part so that the link between this part and the Chapter 6.3 would be apparent.	Accepted. We have revised the finding.
26456	SPM	9	2			The paragraph addresses sustainable development therefore suggest "sustainability" be replaced with "sustainable development".	Accepted. Finding dropped from this section and shifted to SPM.1. New finding consistently refers to "sustainable development".
24059	SPM	9	21			It would be helpful to see the very informative Fig 6.4 in the SPM	Noted. We have added a different baseline figure to the Technical Summary (Figure TS.7).
29648	SPM	9	22	9	32	This section should include discussion of the probability distribution of temperature stabilization levels above 2 degrees C associated with stabilization at 450 ppm CO2eq and 550ppm CO2eq. For example, just how likely are 2.5 degrees C or 3 degrees C for each of these CO2eq levels? In addition, a figure displaying the probability distribution associated with each CO2 stabilization level would provide a richer sense of the risks and uncertainty involved with different CO2 targets. A focus solely on 2 degrees C does not provide this full picture.	Accepted. We have added Table SPM.1, which comprehensively links emission budgets, forcing levels and temperature changes.
25554	SPM	9	22	9	32	Does the insight "studies indicate that the probability of remaining below the 2 degree C target without temporary overshoot is approximately 60% for scenarios aiming at stabilizing atmospheric GHG concentrations around 450 ppm CO2eq in 2100 (…)" come from the WG3? I do not think so. Estimates of probability density functions for climate sensitivities are the matter of WG1. In addition, the estimates are still very uncertain. The probability of "60%" is not a reliable number. Therefore, this part should be deleted.	Rejected. Jointly with WG1 experts the scenario database was run past a simple climate model. Results are summarized in the new Table SPM.1.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25555	SPM	9	22	9	32	The 450 ppm CO2eq "stabilization" will almost correspond to the "equilibrium" temperature of 2 degrees C. However, the equilibrium temperature of 2 degrees C is reached only in very far future, and the temperature rises in 2100 and even in 2200 are lower than 2 degrees C under 450 ppm CO2eq stabilization pathways. In addition, the overshoot scenarios of 450 ppm CO2eq in 2100, which types of scenarios are many in Category 1 of Table 6.1, cannot define "equilibrium" temperature due to the overshoot and declining emissions after 2100, and then the scenarios will not reach the 2 degrees C in 2100 and even in 2300. The IPCC report should clearly describe this fact by using Table 6.1 and by explaining the differences in collected scenarios between AR4 and AR5.	Rejected. Results show transient temperature responses. This is more policy-relevant and reflects the changes undertaken in the scientific community. We added Table SPM.1 which details all the required information to avoid confusion.
30383	SPM	9	22	9	24	It is even more challenging to link GHG pathways to specific changes in regional climates and hence impacts - the uncertainties are extremely large. This should be noted here, with cross-reference to relevant chapters in WG1 and WG2.	Rejected. We do not consider changes in regional climate and should not make such a reference. This is dealt with in depth by the other Working Groups and synthesis report.
30403	SPM	9	22	9	32	Provide an update of AR4 Figure SPM8. Statement is too strong.	Rejected. Such a figure cannot be re-produced as there is no longer a best-estimate of climate sensitivity provided by Working Group I.
31310	SPM	9	22	9	24	We are not convinced that this statement is consistent with 6.3.2. The temperature increase corresponding to the different GHG concentration pathways are given in Table 6.1. Please include this Table 6.1 in the SPM and consider to rephrase the statement in bold, e.g. by replacing it with the key findings of lines 26 to 32.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
29324	SPM	9	22	9	32	The probabilities of stabilizations above 2-C should be included, to be associated with stabilization at 450 ppm and 550ppm. This may benefit from a figure with the probability distribution of each CO2 stabilization level in order to convey the risks and uncertainty involved with different CO2 targets.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. It includes probabilities for staying below 1.5, 2 and 2.5°C and shows the likely temperature range for the different forcing categories.
33545	SPM	9	22	9	32	We think the bolded sentence as it stands frames knowledge on climate change as "we know nothing", and will be used as an argument to postpone all mitigation. We do not think this is the intent of the authors. We propose to delete the bolded sentence and slighly reorganise the remainder of the paragraph, like so: "Studies indicate that the probability of never exceeding a 2°C rise of the annual global average surface temperature is approximately 60% at 450 ppm CO2eq. Remaining within this concentration limit is only possible with steep annual global emission reductions. The probability is between 40 and 50% for 550 ppm scenarios, and substantially lower for scenarios to reach less ambitious objectives. Model result indicate that a delay in emission reductions leads to faster rising temperatures in the coming decades and a higher probability of exceeding 2°C."	Accepted. We have comprehensively revised the finding without loosing the transparency over uncertainties from the carbon cycle.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27040	SPM	9	22	9	32	This section would be improved by including discussion of the probability of temperature stabilization levels above 2 degrees C associated with stabilization at 450 ppm CO2eq and 550ppm CO2eq. What are the odds associated with stabilization at 2.5 degrees C or 3 degrees C for each of these CO2eq levels? In addition, a figure displaying the probability distribution associated with each CO2 stabilization level would provide a richer sense of the risks and uncertainty involved with different CO2 targets. A focus solely on 2C does not provide this full picture.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. It includes probabilities for staying below 1.5, 2 and 2.5°C and shows the likely temperature range for the different forcing categories.
30443	SPM	9	22	9	32	The paragraph refers to "aggressive mitigation", "immediately", and "delay". These definitions are rather vague and it would be great if they could be defined more specifically (e.g. when does a delay in mitigation effort become critical? When delayed by 2, 5, or 15 years?)	Accepted. We tried to further reduce jargon throughout the revisions of this section.
22873	SPM	9	22	9	23	It is important to acknoledge this uncertainty. This para must be kept.	Noted.
21509	SPM	9	22	9	24	This sentence seems too narrow in meaning. If read on its own, it would misinterpret the science. As such, it can only be understood if read with the remaining part of the paragraph. Can this be rewritten into one sentence?	Accepted. We have revised the entire finding.
34694	SPM	9	22	9	32	Here the reader would benefit from understanding also the probability of staying below 1.5 degrees, under the described 450 ppm and 550 ppm scenarios, given that a 1.5 degrees maximum warming target is supportec by more than 100 countries in the UNFCCC negotiations.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. It includes probabilities for staying below 1.5, 2 and 2.5°C and shows the likely temperature range for the different forcing categories. Requirements of 1.5°C are briefly summarized in the revised "temperature" finding, but the evidence is extremely thin.
20563	SPM	9	22	9	32	In SPM, the section in lines 22-32 should also be linked to the GHG concentrations of 850 ppm and 1000 ppm in terms of the probability to reach a certain global warming, not only 450 and 550 ppm. 850 and 1000 ppm are mentioned in the section above.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Not everything can be mentioned in the text though due to space constraints.
23947	SPM	9	22	9	32	This paragraph relates to WG I material that has been discussed recently in scientific publication. It might be useful to explain the consequences of assumptions on the climate sensitivity with respect to the probablities of exceeding a given temperature target as well.	Noted. We cannot do so in the limited space of a SPM, but have added a box in the Technical Summary on this matter (TS.8).
25529	SPM	9	22	9	24	It is more informative to report what can be done. Providing a specific value without uncertainty range is anyways in general a sign of poor scientific practice, so it should not be a surprise the reader when uncertainty ranges are provided. Maybe this statement could be reformulated to: "A specific GHG concentration pathway is linked to a range of possible temperature outcomes, because of the uncertainties in the quantification of the relationship between concentration and temperature."	Accepted. Finding comprehensively revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25235	SPM	9	22	9	24	"cannot be directly linked" appear to be too strong conclusion while there are shades of uncertainty. May be the science is not presently at a stage where in strong corelations cannot be established, but then it may be clearly indicated so.	Taken into account. We revised the finding comprehensively.
40803	SPM	9	22	9	23	It is important to maintain the current wordings in order to show the uncertainty of the relation between GHG concentration pathways and specific temperature pathway.	Noted. We revised the finding comprehensively and added a new Table 6.1 to make undertainties more explicit.
28404	SPM	9	22	9	32	The SPM refers to concentrations and scenario categories, and not to global temperature increases, which are discussed at the policy level. While this might be justified from a scientific perspective given the associated uncertainties, information about temperature change is essential for policy makers. Please add information from WGI about the temperature changes related to a given concentration level, including uncertainty ranges. Please use RCPs as labels.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. It includes probabilities for staying below 1.5, 2 and 2.5°C and shows the likely temperature range for the different forcing categories. Requirements of 1.5°C are briefly summarized in the revised "temperature" finding, but the evidence is extremely thin.
23575	SPM	9	25	9	25	This sentence is very relevant for policy making. However, the meaning of this probability should be clearly stated in a foot note such as "This probability is deduced from the spread of the projections of all avilable climate models for the same emissions pathway."	Noted.
40804	SPM	9	26	9	27	This seems to imply that achieving the 2 degree target is almost impossible, but referring to columns for year 2100 in Table 6.1 could be interpreted as indicating such achievement is easy. noting such seeming discrepancy, "Aggressive mitigation" should be elaborated with concrete case studies.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Table was developed in close liaison with IPCC Working Group I.
28406	SPM	9	26	9	32	How do these statements on probability relate to the results of WGI?	We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Table was developed in close liaison with IPCC Working Group I.
30404	SPM	9	27	9	27	Is this a temporary overshoot of a temperature target?	This is correct. The text refers to scenarios that stay below 2°C until 2100.
30405	SPM	9	27	9	28	This seems mixed up with confusion between GHG and temperature stabilisation.	Rejected. This refers to temperature overshoot only.
22813	SPM	9	27		29	Which metric do you use for the percentage numbers? You give 60% for 450ppm (so only one number) but a range 40-50% for 550ppm. What is meant here be the range and why hasn't 450ppm got a range?	Accepted. We revised the finding comprehensively for more clarity.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26719	SPM	9	27			The probabilities connected to 450 ppm resp. 550 ppm CO2eq stabilization for remaining below 2C are higher in this AR5 draft compared what was expressed in AR 4. Needs to be explained (is perhaps explained already in WG1 but needs to adressed also here).	Rejected. AR4 did not provide exceedance probabilities that are in any way comparable to what is reported here. It only provided equilibrium temperature ranges based on best estimate of climate sensitivities for the different forcing categories.
28407	SPM	9	27	9	32	The probability with which a certain scenario category exceeds a specific temperature limit is very important. However, the provided probability (60%) to stay below 2C do not seem to represent the range of scenarios in the Category 1 / 450ppm CO2eq class of scenarios. It should be clarified how exactly that probability (range) is calculated and how it is in line with WG1 findings. The provided range of 40% to 50% for 550ppm scenarios seems to be incorrect. Please double check.	Accepted. We worked hard on the transparency of the revised paragraph and asses a new table SPM.1, which provides all relevant information.
29037	SPM	9	27	9	29	We are surprised that the probability for staying below 2C for 550ppm is so close to that for 450ppm. It does not appear to align with work carried out in the UK's AVOID programme. Can this be checked for different models please.	Accepted. Results presented were work in progress. Finding revised. Added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Table was developed in close liaison with IPCC Working Group I.
30620	SPM	9	28	9	28	Suggest adding the words "and is continued" after the phrase "if aggressive mitigation begins immediately. Beginning the action is not sufficient, clearly to achieve stabilization of atmospheric GHG concentrations.	Noted. Finding comprehensively revised.
25630	SPM	9	28	9	29	This part should be revised to be consistent with the description of section 6.3.2.5. and Table 6.1. In the section, it is described that the probability of category 2 is about 40-50%. And the CO2-eq concentration for category 2 is 485-535 ppm in the Table 6.1. Therefore, the probability for 550 ppm should be less than 40-50%.	Noted. Results presented were work in progress. Finding revised. Added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Table was developed in close liaison with IPCC Working Group I.
23150	SPM	9	29			These probabilities must be derived from GCM. GCM are much too uncertain (as evidenced by the fact that different GCM give different climate sensitivities) for quantitative estimation of these probabilities.. If these probabiliteis are valid, they indicate that the effects of 550 ppm are only slightly greater than those of 450 cm, vitiating any argument for the much more difficult (450 ppm) goal.	Noted. Results presented were work in progress. Finding revised. Added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Table was developed in close liaison with IPCC Working Group I.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28408	SPM	9	29	9	29	Here it states a 40-50% probability for a 550 ppm scenario. In the TS (p.14, line 1) it states the same probability for a 500 ppm scenario. Which figure is correct?	Noted. Results presented were work in progress. Finding revised. Added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Table was developed in close liaison with IPCC Working Group I.
22659	SPM	9	30	9	30	It is not clear what is meant by "international"? Does this actually mean comprehensive? If all nations took action but did not engage in climate specific international actions, this would be more effective than only some nations taking international actions.	Accepted. Language revised.
25530	SPM	9	30	9	32	The use of the qualifier "temporarily" in this sentence is in my opinion not representing the insights of the current literature in this field and is a disservice if one ought to read this SPM from a risk management perspective (as is indicated on page 3 of this SPM). In a recent study (Rogelj et al, 20130, nature) we show that, all other aspects kept constant, a delay in international mitigation efforts always results in higher probabilities of exceeding the 2°C, not just temporarily. In attachment to these comments, a spreadsheet that contains a lookup table of the results published in the paper cited above is provided (file name: "COST RISK CHECK TOOL - Rogelj etal - Nature.xlsx"). These results show that, also in 2100, the probability of exceeding 2°C is higher after a delay, all other assumptions kept the same (which I assume is the scientifically correct way to assess the influence of delay). Reference: Rogelj, J., D. L. McCollum, A. Reisinger, M. Meinshausen & K. Riahi (2013) Probabilistic cost estimates for climate change mitigation. Nature, 493, 79-83, 10.1038/nature11787.	Accepted. Revised finding.
19744	SPM	9	30	9	32	This phrase is inconsistant with the phrase in page 9 line 22-24 of SPM. Correct expression may be "The delay in international mitigation efforts leads to a considerably higher rate of GHG accumulation and as a result, may leads to higher rate of tempareture increase..."	Rejected. It is not necessary in our view to re-state this.
20082	SPM	9	31	9	32	It would be interesting to recall the potential range of global temperature increase in baseline and worst case scenarios by 2100, to highlight the potential risks associated : here the text only mentions the 2°C targets.	Accepted.
20865	SPM	9	33	9	37	AR5 should deal with each scenarios impartially, and shouldn't focus on limited scenarios(1.5 and 2 degrees targets).	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30406	SPM	9	33	9	37	The report is focused on 1.5. and 2C scenarios. It might be best to say this at the outset. may be useful to point to where the information is which shows a link between stabilisation levels and these temperatures are shown.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
30621	SPM	9	33	9	37	Suggest this paragraph could be deleted as it does not present a key finding and is not really accurate. The SPM does not really mention global temperature targets. Rather, reference is made to various atmospheric GHG concentration targets. Alternatively, the paragraph could be moved up to introduce the discussion of long term mitigation scenarios, and expanded to explain why the mitigation scenarios assessed by WGIII are categorized according to atmospheric GHG stabilization level rather than temperature targets.	Accepted.Finding removed.
25593	SPM	9	33	9	37	It seems strange as there is no clear relationship between temperature and concentration (See Chapter 6). Elimination of this para all is the best way or at least highlight point should be expanded to "This is no indication of the adequacy of these target." to avoid misunderstanding of readers.	Rejected. This finding does not talk about the relationship between concentrations and temperature.
33546	SPM	9	33	9	37	We do not think the fact that the SPM puts emphasis on any particular topic should not be a statement. We therefore suggest to rephrase this paragraph as follows: "Whether scenarios that are consistent with limiting climate change to 1½ and 2°C are adequate to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner, is not yet clear. Such scenarios have extensively been discussed during international climate change negotiations. This topic will be addressed in the Synthesis Report, where the combination of information from all three Working Groups is expected to create a better insight on this issue."	Accepted. Finding removed.
33547	SPM	9	33	9	37	Source and confidence statements are lacking.	Rejected. This is a "statement of fact" which does not require an uncertainty qualifier.
26160	SPM	9	33			Please add 'with temporary overshoot' after senarios here as it can clarify the sentence.	Rejected. A 1.5 or 2 degree scenario with temperature overshoot is no longer a 2 degree scenario. We define scenarios in terms of staying below certain temperature changes.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24464	SPM	9	33	9	37	It's wrong that SPM puts emphasis on scenarios of 1.5 and 2 degree targets, because SPM must cover full range of scenarios in table 6, chapter 6 page 19.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
24151	SPM	9	33	9	37	I do not understand why 1.5 and 2.0 degree scenarios are only emphasized. I recognize that the IPCC report should give several possible scenarios based on scientific considerations and then some of scenarios should politically focused in the other relevant document.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
21397	SPM	9	33	9	37	SPM puts too much emphasis on scenerios of 1.5 and 2 degree target. SPM shall also discuss other scenerios.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25631	SPM	9	33	9	34	This part should be deleted completely and SPM should explain unlimited evaluation results because it is prejudicial and misleading to put an emphasis on limited scenarios from 1.5℃ to 2℃. IPCC should be policy-neutral and should have responsibility to indicate unlimited evaluation results, as described in Table 6.1. The 1.5 ℃ target is not realistic and even 2℃ target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). If this part could not be deleted, the part of "This is no indication of the adequacy of these targets" must be bold style as well as this part. <Reference> [1] Höhne, N., C. Taylor, et al (2011). National GHG emissions reduction pledges and 2℃: comparison of studies. Climate Policy, 1-22, DOI:10.1080/14693062.2011.637818. Available at: http://www.tandfonline.com/doi/full/10.1080/14693062.2011.637818 [2] Rogelj, J., W. Hare, C. Chen & M. Meinshausen (2011). Discrepancies in historical emissions point to a wider 2020 gap between 2℃ benchmarks and aggregated national mitigation pledges. Environmental Research Letters 6, 9, DOI:10.1088/1748-9326/6/2/024002.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
22874	SPM	9	33	9	37	IT IS INAPPROPRIATE to narrow the range to 1.5 to 2 degree C. This gives bias to the policy makers regarding their choice. Pathways with much higher tempereature must be surveyed with the same emphasis. SPM must cover full range of scenarios as displayed in Chapter 6, table6.1 on page 19.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
21510	SPM	9	33	9	37	Which scenarios are in line with a 1.5 degree or 2 degree scenario? Compared to which time period? It needs to be much clearer how one can compare scenarios/results across the different SPMs of the three WGs to be able to compared the SPMs and feed this into the Synthesis Report. At present, this is fully inadequate across the three SPMs!	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
22812	SPM	9	33		37	I would change the order of this paragraph with the one before (p. 9, line 22-32) because here you introduce the 2deg target, where you already refer to in the previous paragraph	Accepted. We have worked hard to achieve greater cross-Working Group consistency.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24382	SPM	9	33	9	33	It's good that you say that 1.5C and 2C targets may not be adequate, but there is abundant scientific evidence that these targets are definitely not adequate in the long term. I suggest instead that you cite these as maximum increases or short-term limits.	Noted. We have removed this finding as such.
22452	SPM	9	33	9	37	Add sentence stating that climate policy objectives can only be evaluated by exploring the practical consequences of their means (including all the ethically relevant aspects), so there is an ends-means interdependency. This is what WG III AR5 SOD chapter 3 states on page 8, lines 19-35 ! Could be cited/quoted here.	Noted.
30502	SPM	9	33	9	37	The SPM should not focus on only scenarios in the neighbourhood of the 1.5 and 2 degree targets. Although it states "This is no indication of the adequacy of these targets", it might lead to a misunderstanding that IPCC recommends these targets. Other scenarios with different long-term goals should be also presented here.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
30513	SPM	9	33	9	37	SPM discusses both 450 and 550 ppm. "Puts an emphasis on 1.5 and 2 deg targets" seems not to fit for the discussion and can be misleading.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25531	SPM	9	33	9	37	This section must be a either a mistake or a test to see if reviewers were well-awake reading the SPM. The first statement is not consistent with the rest of the SPM. In my reading of the text of the entire SPM, the SPM currently does not mention the 1.5°C target at all, and only provides information about less-than-likely-chance options for limiting warming below 2°C. I suggest removing this text in order to avoid putting at peril scientific credibility, or, even better, rephrase the text to read as follows: "This SPM largely fails to address issues related to the 1.5 and a stringent (>66% chance) 2°C target, because the intercomparison studies underlying this assessment did not consider such low temperature targets. The current absence of information on the implications of such stringent targets is no indication of the attainability or adequacy of these targets. " Then the paragraph could continue with the current text starting with "Scientific information...". Papers that look at 1.5°C are available in the literature, for example: (1) Ranger, N., L. Gohar, J. Lowe, S. Raper, A. Bowen & R. Ward (2012) Is it possible to limit global warming to no more than 1.5°C? Climatic Change, 111, 973-981, 10.1007/s10584-012-0414-8. (2) Rogelj, J., D. L. McCollum, B. C. O'Neill & K. Riahi (2012) 2020 emissions levels required to limit warming to below 2°C. Nature Clim. Change, advance online publication, 10.1038/nclimate1758. (3) Rogelj, J., D. L. McCollum, A. Reisinger, M. Meinshausen & K. Riahi (2013) Probabilistic cost estimates for climate change mitigation. Nature, 493, 79-83, 10.1038/nature11787.	Accepted. We have added a summary of the evidence relevant for 1.5 degree target.
25038	SPM	9	33	9	33	Replace "puts an emphasis on" by "allots ample space for".	Noted. Finding removed.
38936	SPM	9	33	9	37	There should be a footnote or clarification here that states that the original 2C "threshold" was discussed in WG2 of AR3... and that it was against a 1990 baseline - NOT a pre-industrial baseline. While numerous political decisions since then have stated 2C above preindustrial levels, the science behind that (i.e., IPCC) states that it is against a 1990 baseline. It makes a difference since the world has warmed by ~0.6-0.8C from pre-industrial to 1990.	Rejected. This is not how 2°C is commonly defined in the peer-reviewed literature. Finding removed.
32449	SPM	9	33	9	37	It is inappropriate to emphasize on the limited scenario(1.5 and 2 degree targets) in the SPM thus should be mentioned without limitation.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40805	SPM	9	33	9	37	Focusing the goal temperature range to 1.5 and 2 degree C is inappropriate. This can give bias to the policy makers regarding their choice, and appears to be policy prospective. The other scenarios shown in Table 6.1 should be also treated equally in this paragraph.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
19747	SPM	9	33	9	37	Keep the pharase"This is no indication of the adequacy of this target", since IPCC should net be and can not be recommender of any "target".	Accepted. We avoid referring to goals and targets in the revised version.
24411	SPM	9	33	9	34	I don' think SPM should " put(s) an emphasis on scenarios in the neighborhood of the 1.5 and 2 degree targets". Yes, these targets "are heavily discussed in international climate change negotiations. The role of the IPCC is to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. If there is some physical possibilities of exceeding 2 degree (and the possibility seems quite high), SPM should not downplay the risk of it. Scientific discussion should not be dragged into the political situation.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
29038	SPM	9	33	9	37	This is a useful reminder. A similar comment perhaps could be made about the CO2 stabilisation levels.	Noted.
20797	SPM	9	33	9	33	REVISE. Various scenarios should be listed up in this paragraph. It is inappropriate to narrow the range to 1.5 to 2 centigrade in this SPM. This gives bias to policymakers. Chapter 6 has variety of temperature scenarios. Without bias, SPM should cover these scenarios as the summary chapter. The summary chapter should not be one-sided.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
25116	SPM	9	33	9	34	IPCC report should be policy relevant. In this context, it is reasonable to focus on scenarios in the neighborhood of the 1.5 or 2 degree target as those are most widely discussed in the international negotiations. On the other hand, negotiators may change their thoughts in view of the new scientific findings, technology development, new economic situations etc. To prepare for any those change, it is also policy relevant to focus on other scenarios that may lead to higher concentrations, especially most scenarios are based on the perfect world with lots of unrealistic assumptions (ref. p. 13 lines 9-20). Another point I would like to stress is the Chairman's Vision Paper by Dr. Pachauri prepared for IPCC Synthesis Report Scoping Meeting held in Liege, Bergium in August 25-27, 2010. In this paper, the chairman cited UNGA (United Nations General Assembly) resolution No. 43, that states "(UNGA) endorses the action of WMO and UNEP in jointly establishing IPCC to provide internationally coordinated scientific assessments of the magnitude, timing and potential environmental and socio-economic impact of climate change and realistic response strategies". Then he added his interpretation of the resolution as "The important part of this resulution is a very clear inclusion of the term "reasonable response strategies" --- ". From this point, focusing on other scenarios that may lead to higher concentrations should be considered policy relevant.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.
25236	SPM	9	34	9	35	The meaning of adequacy of these targets is not clear	Noted. Finding removed.
25039	SPM	9	34	9	37	This caveat to the line 33 is very important and should be kept. Especially, the sentence from line 34 to 35 "This is no indication of the adequacy of these targets." should be block-lettered.	Rejected. We do not block-letter in the IPCC. Finding removed.
25115	SPM	9	34	9	35	Show the sentence “This is no indication of the adequacy of these targets” in bold letter, as this is really an important message.	Rejected. This is not in line with the format of IPCC SPMs.
26457	SPM	9	35	9	35	'"Adequacy" in terms of what?	Noted. Finding removed.
30378	SPM	9	38	9	41	This statement should be more explicit about the consequences of the rapid changes in energy systems and the use of the global land surface - the latter should include cross-references to WG2 Chapter 4 (Terrestrial and Inland Water Systems) as policymakers need to be aware of the consequences of widespread land use for ecosystems and biodiversity.	Rejected. This is done in the later section on AFOLU.
30407	SPM	9	38	9	39	Use of global land surface for what? Is this land use?	Noted. Finding revised.
30622	SPM	9	38	9	47	Where is stabilizing atmospheric GHG concentrations at 450 ppm stated as an internationally accepted long term ambition? What consensus is there for such a goal? If this language is to be retained, then an explanation is required. Also, given that the paragraph on lines 22-32 on the same page refer to global temperature targets, then a link between these two paragraphs (and the two different targets) is required.	Rejected. The text does not claim that this is an internationally accepted long-term abition. We have already motivated in the previous two findings why emphasis is given to such ambitious forcing levels in 2100.
33548	SPM	9	38	9	47	We think it would be helpful to express the knowledge in this paragraph in a graph.	Noted. We revised all figures of this Section.
34695	SPM	9	38	9	47	The ranges are very large (15 - 50 % by 2030 and 40 % to almost 80 % in 2050), and merit an explanation on what are the key differences between the extremes. Maybe a table, where the most ambitious and the least ambitious pathway would be compared, in terms of 1) cumulative emissions by 2050 and their (different) implications for ocean acidification, risks of exceeding certain critical thresholds etc 2) the extent of reliance on technologies that are still in testing phase and the viability and sustainability of which is yet to be proved 3) the extent of reliance biomass 4) differencies in adaptation needs 5) risks of technology lock-in 6) short term vs. long term costs 7) achievements of co-benefits or unintended consequences from mitigation policies etc. It should be made very clear that even though both extremes would reach the same stabilisation levels in the end, by 2100, it doesn't mean that they would come with similar impacts and risks for the environment and communities.	Noted. Finding comprehensively revised. It does no longer give those emission reduction ranges.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24383	SPM	9	38	9	38	Similar to my previous statement, I don't agree that you should talk any longer about stabilizing at 450 ppm. We cannot stabilize at this value. At most, it should be considered a maximum value soon after which atmospheric levels need to drop. See Foster and Rohling, PNAS, January 22, 2013, where they conclude that stabilizing at even today's value of 395 ppm will ultimately result in a longterm sea level rise of 9 m. Scientific targets should not be set based on what is considered possible in today's political climate.	Rejected. This is not a general scientific consensus. The synthesis report will bring together evidence from the different WGs and is the right place to focus on such issues. In any case, there are hardly any more amitious scenarios available (<430ppm). We note this exlicitly in the revised version of the draft.
25237	SPM	9	38	9	47	This paragraph requires clarity. "at odds" its not clear what is at odds?	Accepted. Language revised.
38937	SPM	9	38	9	41	Please reword so that the "transitions" are more clearly defined based on the first sentence.	Noted. We have revised the entire statement comprehensively.
40806	SPM	9	38	9	39	“A rapid change to energy systems and to the use of the global land surface” is too vague as a expression placed at the head of the paragraph, and should be more concretely written.	Noted. We have revised the entire statement comprehensively.
28412	SPM	9	38	9	38	Another example of the undue focus on concentration stabilization goals and hence a disconnect to the temperature target discussion in the policy arena: The literature has produced quite a number of classifications of scenarios in regard to temperature goals. thus, either a temperature-related classification is used or the RCP related classification in order to maximize cross-working group consistency.	We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Table was developed in close liaison with IPCC Working Group I.
28411	SPM	9	38	9	39	Are changes in energy systems and LULUCF the only changes needed? How about other sectors and behaviora change?	Noted. We believe that through a broad interpretation this can be seen as encompassing all emission sources.
28410	SPM	9	38	9	41	(SPM) sectors "industry" and "transport" are missing in this statement	Noted. We believe that through a broad interpretation this can be seen as encompassing all emission sources.
28413	SPM	9	38	9	47	For policymakers it is of importance to know also the emission reduction goals compared to the emission level of 1990 as the reporting. Also providing the necessary reductions compared to 1990 would increase comparability with prior assessments.	Noted. Finding revised comprehensively.
29039	SPM	9	38	9	47	Specifying emissions reductions in terms of absolute levels of permitted emissions rather than in terms of percentage reduction on 2010 levels would make this section more accessible to policy makers.	Noted. Finding revised comprehensively.
25238	SPM	9	39	9	39	The phrase 'to the use of the global land surface' is not clear in the paragraph. Nothing has been stated in the paragraph from line 38 to 47 on page 9 about it.	Accepted. Tried to clarify language in revisions.
28414	SPM	9	39	9	39	The term "rapid" does not convey the profound transformation required in the energy sector. Therefore, keep "dramatic change to energy systems" as in the Executive Summary of Chapter 6.	Taken into account in revisions. We believe that both expressions are not precise and have tried to avoid such expressions during our revisions.
30401	SPM	9	4	9	12	Text can be replaced by a simple statement on relevant ethical points and included in box with SD issues	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30616	SPM	9	4	9	12	This paragraph does not present a substantive finding. It is not clear what the reader is to make of these series of questions. Suggest revising to focus on where understanding has advanced, and consider moving this paragraph to section 5.1 Human decision-making.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
32584	SPM	9	4	9	12	I hope the generations of ethical efforts reviewed in Chapters 3 and 4 provide something better than a list of questions?	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
33541	SPM	9	4	9	12	This may be perceived as very policy prescriptive. We suggest to replace it by the following: “<bold>Complex problems such as climate change may be dealt with through application of the precautionary principle in combination with participatory policy formulation.</bold> The climate is a common good which has a delayed response to greenhouse gas emissions, independent of the location of these emissions. Local climate change mitigation therefore benefits the entire world and has its greatest impact over generations. Decisions regarding climate change mitigation thus entail valuation of interests over time and space. Information on cost and benefits however, is imperfect and strongly biased towards the present, formal economy, well-organized groups, and aspects that can be expressed in monetary terms. Policy science describes such characteristics as an unorganized complex problem. Application of the precautionary principle and participatory policy formulation are specifically suited to this type of problem. To limit climate change to 2°C at most compared to the preindustrial period, all large countries, sectors and gases need to contribute substantially to emission reduction. In the absence of mutual trust that others will contribute a fair share, this further complicates policy decisions, and may tilt the balance from mitigation towards adaptation.”	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
22810	SPM	9	4		12	This whole paragraph on ethics (which was advertised in the beginning of the SPM) only contains questions but no answers so it is not very useful. In the end two views are contrasted (on decisions and on outcomes) but it is not clear if there in contrast to some other philosophy or whether these two viewpoints are the only ones. I recommend to include the paragraph that appears in the TS (TS, p. 12, Box TS.3, line 40-46) into the SPM: "Nearly all theories of value imply that those who are better off might be reasonably assigned lower weight on their monetary values when determining social value. Much practical cost-benefit adds up monetary values without any weighting factor. This is to assume implicitly that the distributional weight is the same for each person. This approach could leads to serious error in cost-benefit analysis concerned with climate change mitigation, which often needs to take into account the extremes of wealth between rich and poor countries, as well as within countries (high confidence)."	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
32091	SPM	9	4		12	Ethics is a philosophical discipline and there is no such thing as an unified theory of ethics, therefore the report has to handel this term in a much preciser way.	Taken into account.
25232	SPM	9	4	9	12	All policy choices will involve ethical considerations, why state 'climate policy choices involve ethical consideration'? This para seems subjective or personalized interpretation	Rejected. The report focuses on climate policy. It does not say that other policy choices do not involve ethical considerations.
25233	SPM	9	4	9	12	This entire paragraph is written in a language that provides more questions than answers. AR5 is expected to provide answers to these questions based on literature, not simply pose these again. Suggested re-writing of this entire section appropriately.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26110	SPM	9	4	9	12	This paragraph is not very informative as it seems to contain only questions. One would expect there to be information on what the research says about this issue, not just questions.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
28389	SPM	9	4	9	10	Suggestion to modify text (see our comment on ch 3): "Climate policy choices involve many ethical considerations. What duties and responsibilities do present generations have towards future generations, in view of the fact that present emissions affect environmental conditions in the future, and consequently the quality of life of future generations? How should the responsibility to reduce emissions be allocated among nations and individuals within societies, so that fair outcomes are achieved – who should act, who should bear the costs and who should benefit from the necessary transformation, new technology development and innovation. IS THE SUGGESTED SOLUTION SUCH THAT ALL STATES INCLUDING THE MOST VULNERABLE COUNTRIES AND COMMUNITIES COULD AGREE TO IT? DOES THE OUTCOME SET THE RIGHT INCENTIVES TO REDUCE RISKS VIA MITIGATION AND ADAPTATION? Do those who may suffer disproportionally from the consequences of climate change have a claim to compensation? While there are many ways to weigh these ethical choices, the literature points to two important perspectives—the process through which decisions are made and the outcomes of such processes—and many different methods for assessment. "	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
28387	SPM	9	4	9	12	Paragraph about ethical questions does not fit completely into the context of preceding and following topics.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
28388	SPM	9	4	9	12	Please indicate what consequences result from these ethical questions.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
28390	SPM	9	4	9	12	This is the only paragraph on Chapter 3 within the whole SPM. Hence, there is an underrepresentation of its results in the SPM. Furthermore, this one paragraph is not very helpful for policy makers because it gives very little indication on what to conclude from this. The most part of the paragraph lines one question after another. In order to make this more useful, it is suggested to begin the paragraph with a bit of information/explanation, i.e. integrate two additional paragraphs out of the Executive Summary of Ch. 3 (i.e. p. 5, line 21-27: "One of the ethical questions raised by climate change that is widely recognized and much debated is the question of 'burden-sharing' or 'effort-sharing': how action to mitigate climate change and its burden might reasonably be divided among countries and generations? Another is the question of how much total mitigation to undertake. To answer this question, we must evaluate the effects climate change may have on people and on societies, to judge how bad they might be. These effects will undoubtedly influence the decisions made by individuals, the public, private organizations, governments, and the international community.") prior to the row of questions raised. The questions are useful to give an overview over what needs to be considered, but anwsers should be provided as well.	Accepted. While it is actually not true that this is the only paragraph, we have added additional results from chapter 3 to SPM.1. The finding itself was removed from SPM.3. New finding on the role of ethical question in climate change policies are added to section SPM.1.
28386	SPM	9	4	9	5	The question, what duties and responsibilities do present generations have towards future generations is simply rhetoric and superfluous	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29034	SPM	9	4	9	12	This paragraph also does not belong here - it also does not seems to conclude any research. If any of this paragraph is retained, the last sentence seems helpful.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
31311	SPM	9	40	9	41	Very important finding. Please consider to supplement this with an illustration of the stablilsation scenarioes together with the past trends in GHG emissions to illustrate this finding.	Accepted. We have added a new Figure SPM.7 showing this.
30623	SPM	9	40			"decidedly at odds" is vague. Suggest increasing precision.	Accepted. Language revised.
24385	SPM	9	40	9	40	The statement about being at odds with longterm trends is overly pessimistic, in my opinion. We are now at about 300,000 MW of worldwide wind power. PV modules have dropped to well under a dollar a watt. Renewable technologies are experiencing exponential growth. I believe it is more reasonable to expect that mounting damages from climate change will impact policies around the world. Clear links between climate change and extreme weather events, based on probability analysis, are now appearing with some regularity in respected, peer-reviewed scientific journals.	Rejected. Given the growth projection for population and world economy and the required energy requirements (also in the development of less developed world regions), scenarios highlight the need for a fundamental shift away from BAU. Note that emissions between 2000 and 2010 have grown faster than in previous 3 decades. Links between Working Groups 2 and 3 are integrated in the synthesis report.
26111	SPM	9	40	9	40	The term "long-term trends" would imply future development. However, the sentence seems to refer to past development -> please rephrase the sentence.	Accepted. Finding comprehensively revised.
24060	SPM	9	41			Please insert from Chapter 6 p.13, line 41 "Although most baseline scenarios project a deceleration in emissions growth, especially compared to the rapid rate observed in the past decade, none is consistent in the long-run with the pathways in the two most stringent RCP scenarios (2.6 and 4.5), with the majority falling between the 6.0 and 8.5 pathways" - this is worth to appear in SPM	Rejected. This finding is not focussed on baselines.
31312	SPM	9	42	9	47	This sentence is important, but would read better if it could be split up, by introducing a full stop after "… almost 80% in 2050". Then continue with "This requres anywhere from a moderate increase to roughly a tripling of low-carbon energy above 2010 levels, substituting high carbon energy ....."	Noted. Finding comprehensively revised.
30444	SPM	9	42	9	47	This is a key finding and would be very useful to highlight in a specific table	Noted. We have decided to present emission pathways in a different way in the revised version.
25632	SPM	9	42	9	45	This part should be revised to be consistent with the description of Table 6.1 and Table 6.2. Since the CO2-eq concentration for category 1 is 425-485 ppm in the Table 6.1, 450 ppm scenario can be considered in category 1. And the emission reduction of category 1 is from -28% to +35% in 2030 and -77% to -37% in 2050, compared to 2005. Considering the total emissions in 2010 is higher than in 2005 from Figure SPM.1. The figures in this part is not consistent with the description of Table 6.1 and Table 6.2.	Noted. We have comprehensively revised the finding.
21511	SPM	9	42	9	45	The range of reductions given for 2030 to be in line with 450 ppmv CO2-eq. is large, too large to be informative for policy makers. One would probably want to know if lower reductions in 2030 probably mean higher reductions in 2050? Can this be clarified? Is it possible to give some indication of a median or average reduction across models similar to the type of information given in figure 3.1 of the UNEP Emissions Gap Report 2012.	Accepted. We have added a figure (SPM.8) and text outlining this relationship between short-term and long-term emission reductions.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40807	SPM	9	42	9	47	The sceneries treated here is limited within 450 and 550 ppm scenario, and it appears to be policy prospective because of the ignorance of other scenarios. Therefore, it would be better to treat here also for 650ppm scenarios.	Rejected. While we have generalised the finding during revision, it is important to highlight the large interest that has been given to more ambitious scenarios. It is also important for the IPCC to reflect well the underlying scientific discussions.
28416	SPM	9	42	9	47	How does this relate to Figure SPM.8? Yellow points (no negative, full)?	There is no direct relation to that figure. Figure removed.
19745	SPM	9	42	9	47	Some specific assumptions for the "idealised scenario"should be specicically stated here, since those asumptions such as perfect information, zero barrier in technology deffusion etc. are not easy to be met in real world.	Rejected. This cannot be done at the level of the SPM. But we have added a series of boxes in the Technical Summary to provide good transparency on model assumptions.
22375	SPM	9	43	9	47	The statement: "a reduction in global emissions below 2010 levels of 15% to over 50% in 2030 and 40% to almost 80% in 2050 [High Confidence]" is not supported anywhere in the rest of the SPM or even in Chapter 6. There is no reference indicated for this statement. There is also no basis indicated anywhere in the text of the SPM or Chapter 6 regarding the "High Confidence" rating.	Noted. Finding comprehensively revised.
31273	SPM	9	44	9	45	The ranges for emissions reduction in 2030 and 2050 are very wide, which make them difficult to communicate on. Would it be possible to complement these ranges with some mean values ? Using a 1990 baseline would also facilitate a good understanding of the deepness of emissions reductions needed, as 1990 is commonly used in climate change negotiations.	Noted. We have opted to discuss long-term emission reductions subject to short term mitigation activities in the new draft.
30408	SPM	9	44	9	44	use normal units of time for trends e.g. years or decades	Rejected. Providing emission reductions relative to a specified year is common scientific practice.
30409	SPM	9	44	9	48	Put information into a table and show the differences for various regions and between developed and developing countries. This is key information.	Rejected. We have opted to discuss long-term emission reductions subject to short term mitigation activities in the new draft. We provde a Figure on this (new SPM.8).
26720	SPM	9	44	9	47	The ranges given are very wide and gives to little advice to the policy makers. At least the ranges needs to be explained a bit more. For instance : is it possible to be on the high side both in 2030 and in 2050? (is an emission reduction pathway meeting 15% reduction in 2030 and 40% reduction in 2050 compared to 2010 in line with 450 ppm? and what is in that case needed in 2050 to 2100 in terms of negative emissions?) The message on the reduction pathways is also a bit different to what has been translated into policy messages after AR4. That needs to be explained.	Noted. We have opted to discuss long-term emission reductions subject to short term mitigation activities in the new draft. We provde a Figure on this (new SPM.8). The new presentation also highlights the developments in the literature since AR4.
25532	SPM	9	44			Please define whether it is CO2 or total GHG emissions that are referred to here (or whether these ranges apply to both of these emission definitions).	Rejectd. It is clearly specified that we are talking about GHG emissions as the unit is CO2eq rather than CO2. We have nevertheless tried to be more specific as we revised the text.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38938	SPM	9	44	9	45	Language is convoluted, and would benefit from reorganization to clarify reductions and timeframes. Perhaps: reduction in current (2010) global emissions of 15-50% in 2030, and 40-80% in 2050	Accepted. We have opted to discuss long-term emission reductions subject to short term mitigation activities in the new draft. We provde a Figure on this (new SPM.8).
28417	SPM	9	44	9	45	Also providing the necessary reductions compared to 1990 would increase comparability with prior assessments. For policymakers it is of importance to know also the emission reduction goals compared to the emission level of 1990 as the reporting	Rejected. We have opted to discuss long-term emission reductions subject to short term mitigation activities in the new draft. We provde a Figure on this (new SPM.8).
30624	SPM	9	46	9	46	The expression "low-carbon energy" is vague and could be included in the glossary. Depending on the definition low-carbon energy could include only renewables, or could include also natural gas, nuclear, coal with CCS, etc.	Noted.
29040	SPM	9	47	9	47	would be good to have similar figures for 550ppm perhaps?	Accepted. We have opted to discuss long-term emission reductions subject to short term mitigation activities in the new draft. We provde a Figure on this (new SPM.8). The new presentation covers a broader range of scenarios (430-530ppm).
25003	SPM	9	7	9		Suggest insert words: "What responsibilities do present generations have for the survival of other species as well as the ecosystem services that biodiversity provides to human society?"	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
24410	SPM	9	8	9	12	I agree that "Climate policy choices involve many ethical considerations. The latter half of this paragraph, however, seems irrelevant discussion, or beyond ethical considerations. Who should act and who should bear the costs? Do those who may suffer disproportionally from the consequences of climate change have a claim to compensation? These questions should be addressed not only from the ethical point of view, but also from a physical, economical, and political standpoint. So I would suggest remove the latter half of the paragraph.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
28415	SPM	9	42	9	47	"In an idealized scenario context of immediate and economically-efficient action, meeting a goal of 450ppm CO2eq by 2100 would call for a reduction in global emissions below 2010 levels of 15% to over 50% in 2030 and 40% to almost 80% in 2050" up to here the sentence is clear. But what do you mean with the next part " and anywhere from a moderate increase to roughly a 45 tripling of low-carbon energy above 2010 levels in 2030 and from a tripling to a seven-fold increase by 2050"?	Accepted. The tripling to quadrupling provides actually very important information. However, it needs more explanation to be clear. We have included an own findung on the upscaling of low and zero carbon technologies into the new draft.
28405	SPM	9	22	9	32	This para should be placed second at the beginning of section (p. 8, line 8).	Noted. We have revised the entire section as well as this finding, which features now as the second paragraph.
28409	SPM	9	35	9	37	This para should be placed at beginning of chapter (p. 8, line 8) as it lays out the emphasis made.	Noted. Finding removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
28269	SPM	9	21	9	21	Chlorofluorocarbons don't contain hydrogen. Please remove.	We do not see a link between chlorufluorocarbons, hydrogen and this finding.
24231	SPM	9	13	9	14	Very important! As my comments No. 3 and 5, I also think this should be mentioned in advance in the text. I would suggest re ordering the findings at least in the SPM. More emphasis should be given to the "negative" findings in order to cause real awareness.	Noted. We have moved the baseline finding to the end of section SPM.2. It is important for the IPCC not to be negative, but balanced. This is what the author team comtinued to worked hard on throughout the revisions.
23107	SPM	9	15	9	15	Replace "ameliorated" by "mitigated"	Noted. Finding comprehensively revised.
23108	SPM	9	16	9	16	Add after "in technology": "unless breakthroughs in low carbon technologies are made"	Noted. Finding comprehensively revised.
24232	SPM	9	18	9	19	This statement should be contextualized in terms of the 450 ppm target. It is quite strange that being the 450 ppm target the priority, suddenly the 550 ppm figure seems to take more importance.	Rejected. It is a stronger statement to highlight that less ambitious concentration cannot be met. However, we revised the entire finding and no longer have a reference to either 450 or 550.
35200	SPM	9	26	9	29	The discussion on the probability of achieving 2 degree target in ES does not conform to Table 6.1, in which the indicative 2100 temperature increase above pre-industrial under Cat 1 scenario (450ppm) is 1.3-1.7 degree and the mean temperature increase under Cat 2 scenario (550ppm) is around 2 degree. Further elaboration on the reason for inconsistency and corresponding modification is required.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. Table was developed in close liaison with IPCC Working Group I.
41038	SPM	9	26	9	32	Probability to maintain global temperature to be below 2C. These probabilities need to supported and verified with numbers that cover all GHG gases, with individual gas specific contribution to the reduction of CO2.	Noted. We have added a new Table SPM.1 Q888
32257	SPM	9	33	9	37	It is very important to clearly state that the IPCC is not in a position to support or deny any particular level of target. The reason why SPM put emphasis on scenarios in the eighbourhood of the 1.5 and 2 degree target should be clearly stated.	Taken into account. We, of course, acknowledge the importance of analysing scenarios across different forcing levels and provide evidence accordingly. However, there is a particular demand from the policy level, which has also led to a focus in the scientific literature on more ambitious mitigation targets. We have removed this finding added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
41037	SPM	9	4	9	12	Policy choices that involve ethical considerations. The ethical choices should be governed and addressed by the principles of the Convention, equity and CBDR.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
24230	SPM	9	4	9	12	This paragraph should be completly changed. I find very unadequate to raise questions in a text that is supposed to summarized findings. As policy maker, I want to read this text in order to find answers not in order to know further questions. Very bad writting strategy for such an important report.	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
35201	SPM	9	42	9	45	This conclusion is referenced from the ES of Chapter 6, which discusses about future mitigation pathways. The conclusion that “meeting a goal of 450ppm CO2eq by 2100 would call for a reduction in global emissions below 2010 levels of 15% to over 50% in 2030 and 40% to almost 80% in 2050” never appears in the content of Chapter 6, thus lacks supportive texts. Furthermore, it contradicts with data presented in Table 6.2. It is suggested to provide clarification regarding the conclusion.	Noted. We have comprehensively revised the finding.
41039	SPM	9	43	9	47	Emission percentage below 2010 that is needed to maintain concentration at 450ppm. Again this needs to make a differentiation by the source of GHG gas, given their significantly varied GPW.	Rejected. The ranges in estimate reflect also variation in emission mitigation by gases across scenarios.
24233	SPM	9	43	9	43	"Idealized" should be changed to "optimal" as it can have missleading implications i.e. as it is ideal, we can't do it.	Rejected. Strictly speaking any results from an integrated model is optimal subject to the constraints considered (also less idealized scenarios like with delays in mitigation or limited availability of technologies).
32256	SPM	9	13	9	21	The fact that it is very difficult to generate scenarios without overshooting for 450ppm means that "stablization scenarios" are likely impssible for the target. Once we allow overshooting, the timing of the peak and the goal year need to be reconsidered as CDR measures assumed in the scenario will decrease the level of GHG concentration to lead the temperature decrease. This has a very significant impoication to the negotiation and need to be clearly stated.	Rejected. This finding is about baseline scenarios and not mitigation (climate policy) scenarios. The issue of overshoot is dealt with in a later finding.
30169	SPM	9				In the bottom left tile for OECD 90 there is a slight dip in ~2007 - 2008. It bears mentioning that this is related to the stock market crash (e.g. global financial crises). It appears the dip registers all all of the other locations as well and is visible in the World tile on the right of the figure. It is interesting to note that the top left tile for Asia does not register any dowarn trend in C02 during the same time. I mention this because it is mentioned in the section 1.2.1.2 The World Macoreconomic Situtation but does not higlight the short term reduction in emissions.	Noted. We provide a new figure in the revised version focussing on the global picture. We also updated the data in the revisions.
32362	SPM	9	11	9	12	This sentence appears very vague and unspecific, please provide more substance to it, e.g., by expanding on what is referred to as "frequently used assessment methods"	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
30171	SPM	9	12	9	15	The statement argues for incremental change in the short term instead of radical (e.g. "stringent climate policy") to suit a state of nature that would require rapid decarbonization. If we reached a state of nature that requires rapid decarbonization, will rapid decabonization be a realitic goal. It may be much more out of reach once the feedbacks take effect Methmann, C., & Rothe, D. (2012). Politics for the day after tomorrow: The logic of apocalypse in global climate politics. Security Dialogue, 43(4), 323-344.	Noted, but it is unclear to the author, which paragraph the reviewer is referring to. The link between line/page numbers and the comment are not clear.

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32363	SPM	9	13	9	32	These two paragraphs on projected CO2 levels over time and projected temperatures need to be closely coordinated with the relevenant sections in the WGI AR5 report (Chapters 6 and 12). For example, it is not at all clear if and how uncertainties in the physical climate system and carbon cycle have been considered to determine the years or exceedence of certainl levels of CO2equivalents. Or what was the physical science basis for the probabilities given to meat a certain temperature target. It's also absolultely crucial that those results are not based on the most comprehensive climate models but are the result of some sort of simple climate models tuned match the more comprehenisve models. Adding the most important caveats when presenting these numbers and referring to the WGI report is absolutely necessery. In addition, any numbers given should be consistent across the WGs to avoid confusion and different interpretations of what should be identical.	Accepted. There has been close cooperation with Working Group 1 authors in the revision process. All temperature estimates are now fully consistent. Caveats are made transparent in the footnote of a new table SPM1 we added.
20014	SPM	9	14			Check if "high confidence" is correct, as it is "medium confidence" in the ES of chapter 6 (p.5 line 29) .	Accepted. Writing processes run in parallel and it is sometimes difficult to synchronise the revisions fully. We have established consistency in confidence statements.
26278	SPM	9	15	9	16	The sentence states: "This emissions growth will not be meaningful ameliorated by improvements in technology or the nature of remaining fossil fuel resources." Maybe is better to say: "This emissions growth will not be controlled by (…)" or "This emissions growth will not be reduced by (...)". The verb "ameliorate" can induce a misleading lecture as if we wanted to increase emissions.	Noted. Finding comprehensively revised.
29744	SPM	9	15	9	16	This is a strong and controversial statement. Better replace it with: "Improvements in technologies or the quantity and types of remaining fossil resources, in the absence of more effective policies, will not be able to lead to declines in global GHG emissions."	Noted. Finding comprehensively revised.
32364	SPM	9	16	9	19	It is not clear where the 550 ppm number is rooted. For example, WGI AR5 does not specifically highlight 550 ppm as a critical threshold of atmospheric CO2 concentrations. It might be useful to coordinate further with WGI (Ch12, section 12.5) in order to provide a consistent picture on critical concentrations/climate targets across WGs.	Noted.
20015	SPM	9	19			Change the expression "majority", as baseline scenarios exceeding 1000 ppm (6.8W/m2) in 2100 do not seem majority on the Figure 6.4 of chapter 6 (p.16).	Rejected. The median is well above 1000 ppm.
20016	SPM	9	28			Change the expression "aggressive mitigation" with e.g. "economically efficient mitigation", as "aggressive" is too vague.	Noted. Finding comprehensively revised.
20017	SPM	9	29			Make the description consistent with Chapter 6, as "40% to 50%" is for "category 2" in Chapter 6 (p.25 line45-47) instead of for "550ppm scenarios" and "550ppm scenarios" should be included in "Category 3" (Table 6.1) instead of "category 2".	Accepted. We refer to concentration ranges in the revised text.
32365	SPM	9	33	9	33	We appreciate the coverage of climate targets as this is an extremely policy relevant discussion. From a scientific point of view, we are however wondering about the appropriatness of such a rather unique focus on two specific targets only, which are based on arbitrary political choices . It seems to us that it would be very useful to put those few targets into a broader context by providing information about a wide range of possible climate futures. This same issue also holds for the focus on CO2equivalent levels 450 and 550 ppm as well. It seems hard to defend the focus on these few targets from a scientific point of view and thus we suggest to expand the discussion to provide a wider context for your choice of targets.	Accepted. We have added a new Table SPM.1 which links emission budgets, radiative forcing and temperature changes across forcing categories. It includes probabilities for staying below 1.5, 2 and 2.5°C and shows the likely temperature range for the different forcing categories. We have a broader references to atmospheric concentration levels in the revised version of the section.

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32705	SPM	9	34	35		The sentence “This is no indication of the adequacy of these targets” should be deleted: the following sentence indicates how these targets will be scientifically dealt with by the whole AR5.	Noted. Finding removed.
32704	SPM	9	4	12		The format of the paragraph (many questions without answer) should be reconsidered in view to provide answers	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
32706	SPM	9	40	9	40	“… long-term trends … ” may be deleted in this context, since these trends will depend on mitigation pathways to be chosen and can still be determined to be in line with the referred “transitions” to reach the 450 ppm.	Noted. Finding comprehensively revised.
20018	SPM	9	42		45	Make the numbers consistent with Chapter 6, as the numbers are not consistent with Table 6.2 (p.21).	Noted. We have comprehensively revised the finding.
26401	SPM	9	14	9	15	Economic growth, that does not apply sustainability development principles, will continue to drive emissions growth at a global level.	Noted.
40991	SPM	9	15	9	17	Baseline emissions trajectory from fossil and industrial sources It appears that GHG concentrations trends only relate fossil and industrial gases. Other emission sources such as methane emission from livestock, AFOLU shall be considered.	Accepted. Language revised so that it more generally refers to any climate-potent gas.
25005	SPM	9	15	9	16	The sentence "this emissions growth will not be meaningfully ameliorated by improvements in technology …" requires explanation. It seems to be inconsistent with SPM4.2 (page 17, line 7-8) that "studies have consistently found that the global technical potential for RE is substantially higher than global demand."	Noted. Finding comprehensively revised.
40992	SPM	9	22	9	32	It appears that based on Chapter 6 assessments there is large uncertainties in the relationship between concentration and temperature. A strong and clear message shall be stated in SPM	Noted. The relationship between concentration and temperature with associated uncertainties is discussed in WG1 in depth. Here we present results consistent with WG1, which does not require repeating material. We have added Table SPM.1 which concisely provides information on ranges in emission budgets, forcing levels and temperature changes.
40993	SPM	9	33	9	37	This section appears as standalone statement, may be deleted to move in the introduction of SPM.	Accepted. Finding removed.
40990	SPM	9	4	9	12	SPM shall only include solutions not questions in regard to climate policy choices	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
20750	SPM	9	4	9	12	I recommend to rephrase this paragraph avoiding questions to gain more strenght	Noted. Finding removed. New finding on the role of ethical question in climate change policies are added to section SPM.1.
26400	SPM	9	4	9	12	Global institutions have a fiduciary duty to mitigate climate change as a prudent "going concern" policy since prudent institutions realize that the low-risk pathway is to mitigate climate change while the high-risk pathway is to not mitigate climate change. Choosing the high-risk pathway to not mitigate climate change puts institutions' stakeholder and shareholder value at much greater risk than choosing the low-risk pathway to mitigate climate change.	Noted.
40994	SPM	9	42	9	47	Mitigation option only refers to energy sectors, missing methane emissions from livestock, AFOLU	Rejected. The finding refers generally to all greenhouse gases.

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23770	SPM	all				no feedback mechanisms are mentioned (ie thawing permafrost) - and yet, this is clarly the one process that undermines the entire proposition behind AR5	Taken into account - evidence on feedback mechanisms is mainly assessed in WGI and WGII reports.
32850	SPM	all				Transparency would increase if it was indicated which results are based on scenario-analysis and which not or if both came to the same conclusion.	Accepted - language clarified.
26099	SPM	General				What is the policy regarding grey literature? Is it ensured that agreed practices on the use of grey literature are followed?	Noted - yes, the IPCC's comprehensive policy for the treatment of grey litterature is fully ensured.
26102	SPM	General				Most of the time series displayed end to year 2009 or 2010. This is understandable as statistics are often lacking behind. However, we encourage the authors to update the figures to always include the latest available year.	Noted - common datasets (EDGAR/IEA)for all Kyoto gases end in 2010. We have added information on developments in fossil-fuel related CO2 emissions up to 2012 in SPM.2.
26119	SPM	General				"Developed countries" is not the same as Annex-B and "Developing countries" is not the same as non-Annex-B. This can arguably be observed in any recent GDP/capita comparisons and the topic is highly political under the UNFCCC. Where "Annex-B countries" is used as a reference to developed countries, this should be highlighted as a separate interpretation only e.g. developed countries (here/in Figure X: Annex-B). See e.g. page 4, but same applies throughout the Document.	Accepted - text revised. No discussion of Annex B anymore.
26125	SPM	General				The different forms of international cooperation should be discussed more thoroughly. There are forms of cooperation which are not mentioned at all, such as WTO negotiations and the possible impact of liberalisation of trade in environmental goods and services.	Accepted - text added in new section SPM.4.
26127	SPM	General				There should be more references to the Chapters where the discussed issue has been dealt with.	Accepted - added many additional references.
26128	SPM	General				In many parts of the SPM, developed countries are dealt with as if they were a uniform group. This is misleading and should be corrected.	Noted.