



WMO

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



UNEP

**IPCC WGII
Fourth Assessment Report
Climate Change Impacts, Adaptation and Vulnerability**

Government Review of Final Draft

REVIEW COMMENTS

Summary for Policymakers

February 2007



WMO

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



UNEP

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1	0	0	0	0	We would like to thank WG2 for a much improved draft report and are impressed by the level of new work and the quality of many of the graphs. (Govt. of UK)
2	0	0	0	0	We would however like to make a number of suggestions, which we think would make the report much more accessible to a non-technical audience and bring out some of the key conclusions which we find are rather buried in the SPM. In general, the information is presented in a way that is too general and therefore not always meaningful. A sense of timing, and urgency, is lacking throughout the report. Climate change poses NOVEL risks often outside the range of experience, for example melting of Greenland Ice sheet, the melting of permafrost, glacier retreat and increased hurricane intensity and some of the impacts may be irreversible. We feel that this key point is not reflected in the SPM. *Observed changes - The key message - that many impacts related to human activities - is presented with too many caveats and is weak. There seems to be too much emphasis on uncertainty. In order to strengthen this section, it would be helpful to provide some quantified examples. *Regional impacts - this section seems very patchy and lacks consistent approach to scale and timing. *Adaptation - this section is very general and would benefit by the introduction of some concrete examples of adaptation responses, barriers to adaptation and costs. Detailed comments are provided below. (Govt. of UK)
3	0	0	0	0	Throughout the SPM there is a tendency for the authors to emphasise the possible beneficial impacts of climate change to a much greater extent than found in the body of the report. The authors should ensure that not only are the findings that are repeated in the SPM taken from the body of the report, but that the emphasis and context of findings is also mirrored. (Govt. of Australia)
4	0	0	0	0	Throughout the SPM the terms high, middle and low latitudes are used to characterise the locations of certain impacts of climate change. It would be useful for policy readers if the authors could give approximate ranges for the high, middle and low latitudes. (Govt. of Australia)
5	0	0	0	0	There should be a reference in the preface of the WG2 report and the cut-off time applied to publications included in the WG2 AR4 report. (This practice is being followed by WG1). (Govt. of Australia)
6	0	0	0	0	There seems to be little input from Chapter 19 - key vulnerabilities. The issue of "dangerous climate change" is highly policy-relevant and most of the material relating to this is from Chapter 19 of the underlying report and yet is only mentioned once (page 10 line 37).The SPM should make an explicit link between different emission scenarios and various levels of global warming and impacts - all the information is in Tables SPM-1 and SPM-2, It would be helpful if something like Fig 6-1 in the TAR Synthesis Report was reproduced, along with a statement like "Since a warming of 1 C is unlikely to be avoided, due to inertia in the climate system, key vulnerabilities associated with a 1 C warming are likely to be realised. If a warming of 2 C were considered dangerous, then avoiding a 2 C warming by 2100 would require stabilizing CO2 at 450 ppm by 2100, which in turn would require a 40% reduction in global CO2 emissions by 2050 and 70% by 2100. If a warming of 3 C was considered dangerous, then...". This type of information is policy-relevant without being policy-prescriptive. (Govt. of Australia)
7	0	0	0	0	The WG II report contains some very important key findings. In our view the SPM should focus more on the key findings in the report. It should clarify

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					the main impacts and highlight key findings particularly in chapter C. Current knowledge about future impacts. This doesn't have any statements in bold on the pages 6-10 L 22. Could a few be added under "systems and sectors" and under "regions" so to increase the informative value? (Govt. of Norway)
8	0	0	0	0	The text in the SPM seems to be difficult to understand many places and the statements in bold are a couple of times unclear or difficult to understand. This should be improved so the SPM can be more useful for policy makers. (Govt. of Norway)
9	0	0	0	0	The term IPCC SRES should be explained the first time it is used. Through the chapter an effort should be made not to use acronyms not previously explained or to avoid using them whenever possible as the text becomes more unaccessible. (Govt. of Sweden)
10	0	0	0	0	The SPM should also say that the magnitude of the impacts will depend on the magnitude of green house gas emissions during the next hundred years illustrated by the different scenarios. (Govt. of Norway)
11	0	0	0	0	The SPM requires significant work in relation to the material in boxes, in Tables and in diagrams. For example Box SPM-1 is too technical, Figure SPM-1 while probably the best of the figures in the SPM, nonetheless appears confused in relation to the messages it's conveying. More detailed comments on the specific figures etc are provided below. (Govt. of Australia)
12	0	0	0	0	The SPM needs to be checked to ensure that all acronyms are explained at least once somewhere in it. For example, the meaning of the common acronym TAR is assumed without a definition being provided. (Govt. of Australia)
13	0	0	0	0	The revised structure of the SPM is a good balance between general points about impacts of climate change and more specific examples of impacts on regions and sectors. (Govt. of Australia)
14	0	0	0	0	The report should distinguish where climate change is only one contributory factor to an observed or projected event, rather than the sole cause. For example, the sentence on page 3, line 46 currently reads: 'some coastal zones affected by erosion due to sea-level rise' might be better expressed as 'sea-level rise has contributed to erosion in some coastal; zones' (Govt. of Australia)
15	0	0	0	0	Overall we feel that the SPM is easy to read and acceptable. However, the part "Major impacts" has a very smallspace inspite of being of most importance for the policy process. (Govt. of Sweden)
16	0	0	0	0	In terms of general formatting the WG2 authors should follow the structure set in the WG 1 SPM, concerning the use of boxed shaded text for explanatory material at the start of sections. Often this text is purely explanatory and does not contain any new findings, rather it simply summarises the findings of the TAR and sets out the structure of the following headings. This type of text needs to be boxed to more clearly separate it from the more substantive findings in the SPM. (Govt. of Australia)
17	0	0	0	0	In general we find the figures and tables too complicated for a summary aimed at policy makers. We would suggest simplifying these illustrations. Also,

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					illustrations are very useful in conveying messages, and we believe it would strengthen the summary if there were a few additional figures/illustrations. (Govt. of Norway)
18	0	0	0	0	Before listing the selected temperature ranges a sentence should be inserted explaining that these ranges resulted from previous work with emission scenarios (SRES) and global modelling (WG I, 2007) as a service to those readers who are not familiar with that work. (Govt. of Sweden)
19	0	0			The TS contains a very useful subsection on "Advances in knowledge" in TS.6. Unfortunately, this highly policy-relevant information is not provided in the SPM FGD. We suggest to copy the respective text in the TS FGD p. 76, lines 3-28 to Section A of the SPM. (European Commission)
20	0	0			Some more references to the results of the Working Group I, approved during the last session of the IPCC in Paris, should be inserted along the SPM. (Govt. of Spain)
21	0	0			Section C. Virtually all statements about future impacts combine a likelihood estimate (e.g., "very likely") with a confidence estimate (e.g., "medium confidence"). Without further guidance this combination of likelihood and confidence language makes these statements rather inaccessible to the intended audience of the SPM. The widespread combination of likelihood and confidence language raises difficulties for interpreting statements, it is unprecedented in the history of IPCC reports, and it seems to be not in line with the recommendations in the IPCC AR4 Uncertainty Guide. We recommend changing this and using only one type of qualifiers per statement analogous to the TAR WG II SPM, to the AR4 WGI SPM and in accordance with the AR4 Uncertainty Guidelines. For instance, does a future impact assessed as "very likely, medium confidence" warrant more or less attention than if it were assessed as "likely, very high confidence"? As an example, if taken seriously the sentence on p. 10, lines 9-11 assigns "very high confidence" to the statement "There is a 10-34% likelihood that sea-level rise will *not* exacerbate inundation, storm surge, erosion, and other coastal hazards.", which is obviously not correct. The WG II TAR SPM generally use confidence language only whereas the WG II AR4 SPM SOD generally uses likelihood language. The "Guidance Notes for Lead Authors of the IPCC Fourth Assessment Report on Addressing Uncertainties" (July 2005) indicates that confidence language (presented in Table 3 therein) and the likelihood language (presented in Table 4) are to be used alternatively, depending on the degree of quantitative information available (see p. 2, bullet point 8). (European Commission)
22	0	0			Section B. This section does not convey clearly whether a statement confirms, expands, or revises the state of knowledge reported in the TAR. The section should begin with highlighting key advances in observed climate change over the TAR, e.g. as conveyed in the bold statements in Section TS.2 of the TS FGD. These bold statements from Section TS.2 of the TS FGD should be copied to the SPM section B. (European Commission)
23	0	0			Although the present document is a Summary for Policy Makers, still the language and some graphics are not easy to follow, so a further effort to simplify both the language and the graphics would be welcomed. (Govt. of Chile)
24	0	0			"Biodiversity" is an essential topic in nature management and hence important for policy makers. It is therefore, preferential that the effects on biodiversity are more spelled out in the SPM. -At present it is only mentioned once under "Australia", whereas it is frequently referred to in the TS - see specific comments in separate lines. (Govt. of Norway)
25	0				When discussing work since the TAR, e.g. "in the past five years", please use the term "since the Third Assessment" to clearly anchor the assessment in

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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					time. (Govt. of Canada)
26	0				Use of the word D and N is not clear, what is development? N is also used to for the word “natural” page-4. Use of expression very high, high and medium as well as *, **,***, in the text could be avoided, use of words is more useful to policy makers (Govt. of India)
27	0				This report would be more user friendly if the "current knowledge" was dropped from the beginning of each title. The introduction clearly states that this assessment is of current scientific knowledge. (Govt. of Canada)
28	0				There is a notable paucity of Figures in this SPM which also contributes to making the SPM a difficult read. The single Figure that does exist, along with Tables SPM1&2, are so complex as to be very ineffective as communication tools. (Govt. of Canada)
29	0				The WG II contribution to AR4 shows another step to the steady progress observed from the presentation of the IPCC FAR (First Assessment Report). The increasing interest shown by society and the awareness of political levels about the danger resulting from recent extreme events, critically affecting developing countries environmental safety and their economies, as well as creating severe impacts in developed countries ‘ natural and human systems, is slowly bringing politicians and decision makers to give attention to the environment and its components, climate been a vital one. However, there is still need to enhance mitigation, but not only by reducing GHG emissions also by taking action to stop wild deforestation which, in addition to reducing sequestering capacities enhance environment destruction, biological diversity loss, land erosion, floods and drought conditions and the generation of conditions enhancing wildfire frequency. This WG II SPM moves a step further to provide decision levels with a number of conclusions for improving development through combined actions on mitigation, adaptation and better designed development paths aiming at sustainability. There is, however, room for improvement and the following comments from Argentina focus on what could be added, now and in future IPCC ‘s assessments to fulfill the goals of UNFCCC Article 2, in an integrated manner, i.e. adding the IPCC to other international actions such as those deriving from MEA, MDGs, and other international conventions and agreements. (Govt. of Argentina)
30	0				The United States submits its comments on the IPCC Working Group II Summary for Policymakers with the hope that a rigorous review of the current summary will help to ensure the continued credibility of the IPCC scientific process. An accurate and balanced presentation of the assessed state of knowledge – that is, strong statements where the science is unequivocal and the proper qualifications where it is not – is essential to this goal. The remainder of the U.S. Government general and specific comments elaborates on major concerns and recommended solutions. (Govt. of USA)
31	0				The term "Endbox" was not clear - suggest citing page no. as well (Govt. of Germany)
32	0				The Summary for Policymakers is a very clear document that will give a very clear picture of climate change impact to policy authorities authorities of the Environmente sector, the government of the Dominican Republic congratulate to the IPCC Group II for this great job in post of the future generation. Page 3 lines 23 to 26 the language most be revise and line 26 most include the word climate (natural variability of temperatures or natural variability of the climate systems) (Govt. of Dominican Republic)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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33	0				The Summary for Policymakers presents a listing of statements on scientific understanding about current global impacts, future global impacts, sectoral sensitivity and vulnerabilities, and regional impacts. The regional statements are of near equal length. Each statement is weighted with asterixes for likelihood. This style of presentation pretends that the scientific evidence behind the statements for the regions (Africa, Australia, Europe, North America, Latin America, Asia.....) is similar. In fact, the WG II Chapter 3 document: Fresh Water Resources and their Management states that the scientific evidence is heavily tilted towards North America and Western Europe. It would be correct to state this lopsidedness in scientific knowledge at regional level in the Summary for Policymakers. This could be used to make a plea for investing in more research in the weaker regions. (UNESCO)
34	0				The SPM should make more often reference to specific regions when accounting observed and projected changes and impacts of climate change (Govt of Switzerland)
35	0				The SPM should make a more graphical presentation of future impacts using a table that appeared in a previous version of the SPM where regions and sectors were the two entries, and colours (from green to red) would represent the degree of the impacts (Govt of Switzerland)
36	0				The SPM should adopt the same approach as the one adopted by the SPM of WG I when dealing with definition of concepts, likelihood, etc. (Govt of Switzerland)
37	0				The SPM should refer to some specific ecosystems where important human activities take place, such as the alpine ecosystems, not sufficiently covered by the SPM (Govt of Switzerland)
38	0				The SPM refers to current climate-related hazards only from the negative impacts on exposure, vulnerability and adaptive capacity stand-point. This perspective ought to be complemented by a positive stance through explicit reference to the ongoing work to reduce vulnerability to climate-related hazards through disaster risk reduction, resulting in increased adaptive capacity. Indeed future impacts can be reduced through good preparation to manage today's climate-related risks, as evidenced by the signing of the Hyogo Framework of Action 2005-2015: Building Resilience of Nations and Communities to Disasters, which commits governments to integrate climate change adaptation and disaster risk reduction. Additionally, benefits and costs will also depend on how well societies cope with today's extremes. There is also a tendency to equate vulnerability with poverty which, from experience in disaster risk management, is not straightforward. In general when presenting impacts, the summary does not address sufficiently clearly the continuum between present and future climate variability (including extremes) and change (for example, page 6, line 28). Subtle changes in average climatic conditions and climate variability will threaten rural livelihoods and food security. It will also change the baseline environmental conditions under which disasters occur, which affects adaptive capacity. (UNISDR)
39	0				The SPM is much better structured, informative and useful compared to the version in July 2006 (Govt. of Germany)
40	0				The SPM has not included time frames when talking about observed and projected future states. The SPM is a standalone document. Policymakers will not look in the underlying chapters, and time frames are directly relevant to policy decisions. The U.S. Government provides specific suggestions in its detailed comments. (Govt. of USA)
41	0				The SPM does not treat the issue of environmental refugees. However, the issue could be one of the most serious impacts of climate change together with

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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					the impoverishment of nature. The issue of possibility of increased numbers of environmental refugees with all the related implications to societies should be included in the SPM, if the issue is treated in the background reports. (Govt. of Finland)
42	0				The SPM does not give adequate attention to advances in understanding of adaptation that would be useful to decision makers. The first mention of "adaptation and readiness" is on page 9 of the SPM lines 46-47, 4 pages into Section C. (Govt. of Canada)
43	0				The report of group II does not bring back new knowledge of adaptation compared to the TAR. - The report of group II does not reveal measurements of adaptation in particular “ agrometeorologic assistance in the Sahel in Africa ” like strategy of adaptation to the effects of the climatic changes in progress in certain countries like Mali. (Govt. of Mali)
44	0				The report is well written and coherent, and provides adequate references to the relevant chapters of the main report. (Govt. of Pakistan)
45	0				The report is an impressive and very useful compilation of well referenced and relevant information on observed changes in the Earth System likely or certainly relate to climate change. Though, even considering the intrinsic uncertainties related to the processes analyzed, in many cases, also within the executive summaries of each chapter and the Summary for Policy Makers, the strong points are often diluted by the other multifaceted ones. This leaves the impression that observed climate change, or some of more specific changes, are very likely related to human impact, but not certainly related to it. (Govt. of Italy)
46	0				The previous draft of the SPM was much stronger on marine/ocean issues. Revisit the second-order draft and strengthen Sections B and C. The U.S. Government provides specific suggestions in its detailed comments. (Govt. of USA)
47	0				The New Zealand Government would like to thank WG2, the TSU and authors, for the efforts they have made in producing this report, and congratulate them on the production of this Final Draft (Govt. of New Zealand)
48	0				The document itself is very comprehensive and straight to the point, however consideration should be given to having subsections within the SPM numbered accordingly, eg A.1, A.2 etc. Also, a table of contents would be suitable. (Govt. of Trinidad and Tobago)
49	0				The change in structure is very much welcomed. (Govt. of Austria)
50	0				The Basis for Findings/Indications of Gaps in Understanding A strength of the WG II TAR and of many underlying sections of the WG II 4AR volume is the clear association between statements in the report and the basis for the information. The U.S. Government believes the SPM would be much stronger if it placed greater emphasis on identifying the basis for significant statements and including information on significant gaps. Statements that identify the source of information (e.g., “...over thirty long-term studies”) and qualifiers that identify gaps in knowledge (e.g., “There is a notable lack of geographic balance in data and literature on observed changes, with a marked paucity in developing countries”) help the reader to understand the basis for findings and can help to educate policymakers on the science behind the findings. There should be appropriate caveats to acknowledge greater error bounds in relation to finer scales, where appropriate.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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					(Govt. of USA)
51	0				The attempt to produce a short and succinct document using short bullets has resulted in a choppy text that is difficult to read. Readability would be greatly enhanced by the addition of 'chapeaus' at the beginning of each section that could provide context for the major findings that follow, and highlight advances since the TAR. The need for chapeaus is most apparent in Section C, where some introductory text for each of the two sub-sections would significantly improve readability. If possible, a return to a narrative text with slightly relaxed length targets would make for a more useful product. (Govt. of Canada)
52	0				Some of the sentences are very long and may perhaps be broken down to smaller lengths. (Govt. of Pakistan)
53	0				Role of Precipitation and Moisture in Impacts Estimates The Summary for Policymakers and the assessment in general emphasize the impacts of warming. Changes in moisture regimes are considered in terms of major events (e.g., drought, flooding) and to some extent water resources. However, it appears that the assessment does not consider complex changes in moisture over the long term as an aspect of climate change. In the Summary for Policymakers, the emphasis on warming, for example in Table SPM-1, likely oversimplifies the overall impacts of climate change. Uncertainties in the estimates of precipitation can be of greater importance than temperature. Additionally, the methodology for linking climate change to anthropogenic forcing (Box SPM-1) does not consider moisture. If changes in moisture regimes were considered, would the role of anthropogenic forcing be weaker or even stronger? This is sufficiently important to warrant an explanation of the limitations of the findings in the Introduction to the Summary for Policymakers. (Govt. of USA)
54	0				Overall, this document is an updated and timing piece of information and advice, providing a range of data and conclusions very useful to a range of policymakers in such a strategic issue. However, it would be expected that a wider range of recommendations were provided in the document from the extent of data collected and analysed. (Govt. of Chile)
55	0				Likelihood/Confidence Statements The U.S. Government believes that careful application of the guidelines for confidence and likelihood statements is required throughout the SPM to ensure that findings are conveyed to the reader with the appropriate description of certainty. There is a distinction in the guidance between when to use confidence and likelihood levels (i.e., for probabilistic assessment of some well-defined outcome versus expert judgment based on a comprehensive reading of the literature). However, the U.S. Government does not find that these terms have been rigorously applied in the SPM and suggests the following to improve the clarity of the document: 1) Include Box TS-2 (changing the text from "Technical Summary" to "Summary for Policymakers" where appropriate), instead of the existing End Box 2, into the text of the SPM just after the introduction. Box TS-2 contains a better description of the two different ways to describe certainty of knowledge than the current text. 2) Limit the statements throughout the SPM where both descriptions are used in the same sentence. The statement is either capable of being characterized as a probabilistic assessment of a well-defined outcome or it is expert judgment. To overlay one on the other is confusing and not in keeping with the intention of the author guidance for describing uncertainty. The WG II SPM approach to use both likelihood and confidence in the same sentence appears to be inconsistent with the WG I volume, which chooses one or the other, or with the treatment of uncertainties in the WG II Third Assessment Report (TAR). 3) Ensure that confidence or likelihood statements in the SPM accurately reflect those contained in the underlying chapter. Many instances were found

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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					where likelihood/confidence statements were added to statements in the SPM that had not been used in the chapters or the Technical Summary. [Note: The U.S. Government had asked the authors via comments on the second-order draft to include confidence levels with statements in the SPM; however, the intent was that these be created with clear line-of-sight justification in the underlying text.] (Govt. of USA)
56	0				Lack of Context in which Climate Change Occurs In addition, the U.S. Government recommends inclusion of some discussion of the role of socio-economic and other non-climate-change-related factors, as these play important roles in both reducing and increasing vulnerability to climate risks. Climate change, for the most part, exacerbates existing problems rather than creates brand new ones (although location-specific details may vary). Fortunately, the information providing this context exists in the chapters and, in many cases, in the Technical Summary. Policymakers would benefit from being provided estimates of the relative significance of non-climate-change-related factors and climate change with respect to various climate-sensitive problems. (Govt. of USA)
57	0				It would be very useful to have an updated "burning embers" (TAR WGI Figure SPM-2) graphic in this report. This figure was a very useful communications tool and an update (using the AR4 WGI Figure SPM-7) would be an excellent addition to this report. (Govt. of Canada)
58	0				It is our concern that Section B provides too much technical detail about the methods used in order to arrive at conclusions regarding the attribution of observed changes to anthropogenic forcing. This technical information – particularly that provided in Box SPM-1 - will likely be very difficult for readers of the SPM to understand properly. It is our recommendation to provide a little more narrative explanation about the approach used in Chapter 1 of the WGII report (see specific comments below), but to delete Box SPM-1 from the SPM (but leave it in the Technical Summary). (Govt. of Canada)
59	0				It is clear that the SRES were not the only scenarios used in the WG II contribution to the 4AR. Given that there is a methodology chapter in the underlying report, it would be useful for the SPM to indicate what the limits of SRES are in projecting impacts, how these affect the results, and what may lie outside of SRES types of analysis. It is clear that all chapters did not use the SRES to arrive at their respective syntheses. Please add description of scenarios to proper place in the SPM, perhaps in the introduction. (Govt. of USA)
60	0				In the discussion in the SPM there seems little recognition of the importance of the rate of temperature change (and the rate of other changes) in determining impacts. The sensitivity of both natural systems and human socio-economic systems to the rate of change was a characteristic that was given some prominence in the TAR and we believe the topic continues to deserve attention. It might reasonably be introduced in the section dealing with the effects of mitigation in reducing impacts (page 18 lines 16 - 29) (Govt. of New Zealand)
61	0				In the current draft, the use of the 'D' and 'N' throughout section C to signify either developments from TAR findings (D) or presentation of new findings (N) relative to the TAR, needs better explanation. It is not at all clear to readers familiar with the TAR why some findings are given a 'N' designation. See detailed comments below. (Govt. of Canada)
62	0				In SPM, there are 90s, 1990 and 1960-1990 respectively for the baseline of relative temperature time. Please unify the baseline year, and if there is difference in them please give the notes. (Govt. of China)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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63	0				Imbalance of Treatment of Impacts and Adaptation Section C in the SPM corresponds to Sections B and C in the underlying WG II volume. These sections in the report address future impacts and adaptation (emphasis added). However, Section C in the SPM does not fully reflect the assessment of adaptation in these sections. It assumes no increases in adaptive capacity because of climate policy but is silent on what it does assume about natural and human adaptation. This is particularly problematic because the section does not limit its discussion to future impacts: it also makes statements about vulnerability and risk. Without a clear acknowledgment of the role or possible role of adaptation, these impact statements and their associated assumptions about sustainable development (pg. 6, line 20; pg.8, line 28-29), human-induced pressure on coasts (pg. 7, line 13), people at risk from flooding (pg. 7, line 19-22), health (pg. 7, line 44), hunger (pg.8, line 33), over-fishing (pg. 8, line 18), and livelihoods (pg.8, line 7) are unexplained and potentially misleading. The U.S. Government recommends looking to the underlying chapters and the Technical Summary for significant adaptation-related findings to include. These should address demonstrated adaptations, both autonomous and planned, and how they are projected to evolve over time. The U.S. Government believes one should expect in a business-as-usual world that adaptation would occur regardless of climate policy because that's been business-as-usual for millennia, at least for activities such as water management, agriculture, diseases control, and so forth. (Govt. of USA)
64	0				Given that impacts and vulnerabilities are felt at the very local levels as well as adaptation, SPM of working group II can be effective only if one can see reference to one's own micro regional impact analysis. Much of progress in knowledge and presentation has added value over TAR but knowledge gap should have mentioned what regional disaggregation could be achieved at this stage and what remains to be done. Also for not reporting at micro regional level what implication will it have on policy action. Since policy action is not costless knowing this could have been more useful or identification of some no regret options could have given better policy guidelines. Current presentation can at best raise awareness but hard to expect large scale action without further guidelines in SPM. (Govt. of India)
65	0				First at all, congratulations to all the people that directly and indirectly have been participating in this very good and important report. (Govt. of Chile)
66	0				Even the structure of "SPM" is not identical with that of "TS ", TS should be a main source of SPM, but SPM just shown "based on chapters" (page 2 line 10) rather on TS. Some severe conclusions of SPM are subjective and/or deduced without more evidences in TS and Chapters. (Govt. of China)
67	0				Ensure that the WG II SPM is consistent with the final draft of the WG I SPM and underlying chapters. For example, the WG II SPM makes strong statements about extreme events – citing in numerous places that future impacts will include increased frequency and intensity of droughts and floods. Does this agree with the WG I assessment and is it possible to make such strong statements without greater certainty about important underlying processes, such as flux in precipitation? (Govt. of USA)
68	0				Detail and Balance The U.S. Government appreciates the considerable efforts by the authors to address submitted comments on the Expert and Government Review version of the SPM. As a result, several parts of the summary have been refined and improved. However, in general, this version of the SPM is less informative and precise than the previous version. Sections B and C have lost the balance and detail of the second-order draft and don't seem to follow any clearly discernible criteria for deciding which key points from the chapters were included and which were not. The summary would benefit greatly from revision that presented a condensed set of major points, especially in Section C, with the same balance and detail contained in the Technical Summary.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of USA)
69	0				Consistency between IPCC Working Group 4AR Volumes The U.S. Government believes that this version of the SPM includes a few sections that depend heavily upon findings from the WG I and III contributions to the Fourth Assessment Report (4AR) and may therefore be appropriate for possible inclusion in the Synthesis Report, rather than in the WG II SPM, as proposed. The presentation of these synthesis sections in the WG II SPM may only be a partial reflection of the total relevant information in the three underlying reports. The following sections should be amended in the SPM for the reasons noted, and the fuller discussion be considered for inclusion in the Synthesis Report: 1) Section B, page 3, lines 11-38: This section is a new addition to the SPM since the last draft reviewed and seems to extend the conclusions presented in the underlying chapter. As written, with the statement that “the anthropogenic component of warming over the last three decades has had a discernible influence on many physical and biological systems” it is heavily dependent upon WG I findings, which provide an assessment of human and natural drivers of climate change and related attribution. In the detailed comments of the U.S. Government, ways are suggested to revise the section to better reflect Chapter 1 findings; however, the U.S. Government reiterates that, if the authors would like to extend the discussion beyond the heavily caveated discussion in Chapter 1, they raise this topic in the Synthesis Report, thereby assuring the broad input of the range of scientists whose expertise contributes to both the attribution of warming and to observed changes. 2) Table SPM-1: Parts of this table are highly dependent upon WG III findings that have yet to be released. This synthesized finding is therefore more appropriately considered for the Synthesis Report. A portion of this table on projected impacts for varying changes in temperature, analogous to Table SPM-2, could be appropriate for this SPM, although the U.S. Government has many specific suggestions as to how this section of the table could be improved. (Govt. of USA)
70	0				At the end of the chapter one could add section which will present measures for counteract negative effects of climate change, mainly by the utilization of natural mechanisms and processes existing in ecosystems, as well as by managing landscape structure towards increasing their resistance against negative effect of climate changes. Such actions could be undertaken at different level of governmental and local administration. (Govt. of Poland)
71	0				At some places the references in brackets are written before the period mark (e.g. in line 6 on page 15) and at other places these are written after the period mark (e.g. in line 23 on page 15). A uniform approach may be adopted. (Govt. of Pakistan)
72	0				• A balanced geographical representation of experts should have been ensured in the preparation process of all IPCC reports. • An appropriate representation of scientific papers from all countries should be equally evaluated for the relevant volumes and chapters of the Fourth Assessment Report; • Geographically, Turkey is a Eurasian country and is characterized by Mediterranean and continental type of climate. However, it is placed in Asia region in the AR4 WGII Report. (Govt. of Turkey)
73	1	0			Although the title of the document comprises: “impacts, adaptation and vulnerability”, a relatively minor space in the whole document has been devoted to adaptation compared with the 2 other subjects of impacts and vulnerability. (Govt. of Chile)
74	1	1	2	11	The Introduction should be inspired from the one of the SPM of WG I. In particular, it should make reference to the improvements since the TAR and

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					new data, methodologies and modelling (Govt of Switzerland)
75	2	1	2	11	It would be useful in the introduction to set out the key questions that the WG2 report addresses. Page 4 (lines 21-33) in the TS provide a good template. This will allow policy readers to quickly assess the structure and the information contained in the SPM and allow a more nuanced reading of the WG2 findings. (Govt. of Australia)
76	2	1	3	34	Very important scientific facts but does not provide any relevant policy guideline. So if only lines 23-24 in page 2 and 1-12 in page three and from 35 onwards in page 3 are kept no value addition of the report will be lost. Rather in later facts some more can be added which will provide more insights for policy guidance. (Govt. of India)
77	2	1		11	The introduction is not used to greatest effect. It would be more helpful to use this space to explain to policymakers that this is one of three WG contributions to the 4AR and how the volumes relate. Here it would make sense to insert a few key highlights from the approved WG I document to establish context for the presentation of impacts that immediately follows (see WG II TAR SPM as an example). The relevance to policymakers could also be established in the introduction (see WG II SAR SPM) or some unique observation relative to this new report – like the fact that the scientific literature available for this assessment was much larger than in past IPCC assessments, or the fact that many more impacts have now been observed and documented in the literature. The introduction section should also include the definition of “climate change” being used (i.e., moving the end box with definition of climate change to introduction). (Govt. of USA)
78	2	2			On page 17, or in section C, or on page 2, line 2 we would suggest using a contextual figure, such as the graph used in the Millennium Ecosystem Assessment MEA in its report, or if adding a figure is not feasible, in the text to describe and emphasize the fact that climate change is dependent on context. The framework used in MEA takes into account that there are other factors affecting societies and environment - climate change is not the only one and often not even the determining one. For example, land use change is currently affecting natural systems in many places of the world much more strongly than climate change. (Govt. of Finland)
79	2	3	2	11	It would be helpful to clarify in the introduction that these findings draw on climate models that aren't yet sophisticated enough to predict possible catastrophic events. We suggest to add the following sentence at the end of the sentence on line 20: "However, current models do not include the effects of catastrophic events, such as the melting of the Greenland ice sheet or the release of methane from Siberian peat bogs". (Govt. of UK)
80	2	3	2	6	Condense text and make it more in line with opening of WG1 report. Suggest: 'The Working Group 2 contribution to the Fourth Assessment Report describes current scientific understanding of....' (Govt. of Australia)
81	2	6	2	7	The grammar in this sentence needs fixing. ".....impacts of climate change on natural, managed and human systems, THE CAPACITY OF THESE SYSTEMS to adapt, and their vulnerability". (Govt. of Canada)
82	2	6	2	6	"The Assessment" carries a somewhat odd nuance. Employing different terminology is suggested. Previously, alphabet abbreviations were used (i.e.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					FAR, SAR, TAR), so it would seem logical to use AR4 instead of "The Assessment." (Govt. of Japan)
83	2	6	19	52	There seem to be too many generalities and limited quantification of comments in the text. Concern with the tendency to use terms such as "many", "some" among other general quantifying terms which in fact do not give the policy maker a clear assessment. Policy makers rely on numbers (time references included) to guide them in formulating effective climate policies. (Govt. of Japan)
84	2	7	2	7	Should clarify "assessments". Are the writers referring to the assessment of all post scientific assessments or just those of IPCC? "IPCC assessments" is suggested. (Govt. of Japan)
85	2	7	2	7	Footnote 1 should be a short description of confidence and likelihood terms rather than an End box. (consistent with WGI SPM) (Govt. of Canada)
86	2	8			Please explain TAR when the abbreviation is used first time in the text (Govt. of Finland)
87	2	10	2	11	Working Group 1 SPM uses a system of square brackets for uncertainty ranges and curly brackets for cross-links to chapters. It would help the policy-reader in their journey on the sequence of IPCC WG reports for WG2 to follow the same practice. (Govt. of Australia)
88	2	10	2	10	Term 'sources' perhaps should be cast as 'principal sources'. Presumably the cross-links are deliberately selective. (Govt. of Australia)
89	2	13	2	14	Natural and managed systems are referred to in the main heading but not "human" systems, despite Human systems also being referred to in subsequent paragraphs and in the systems taxonomy in lines 6-7. The authors should amend the title to correct this omission. (Govt. of Australia)
90	2	13	2	14	Insert 'human systems' in the heading. In line 6-7, the writers state that "The Assessment is of current scientific understanding of impacts of climate change on natural, managed and human systems..." and yet it is missing from this heading. (Govt. of Japan)
91	2	13	5	11	Does the data support the statements and confidence about the global links between warming, observed changes, and human influence? 28,116 of the total 28,514 observed physical and biological changes in this chapter are in Europe. The data for the rest of the world is very limited. The U.S. Government questions whether the authors can make these broad statements about global influence on physical and biological systems with confidence. Caveat with acknowledgment that "98% of studies are from the European Union" or adjust confidence level. (Govt. of USA)
92	2	13	5	11	Can the authors find a place to discuss whether or to what extent currently observed changes are within the range of natural variability based on historical and paleo data? This is an important piece of information that could provide important context for readers. (Govt. of USA)
93	2	16	2	21	This introductory statement (and indeed the following text of the section) needs to be restructured to more clearly articulate that impacts have now been observed that are due to climate change and that we now have much greater evidence of the scope and magnitude of these impacts. (Govt. of Australia)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
94	2	16	2	21	Revisions to this introductory text are recommended, in order to make it clearer that key messages in Section B can be grouped into two topics: a) observed changes in various systems, and b) conclusions from detection and attribution studies of those changes. The following text is suggested which reorders some of the text in the original paragraph and suggests some new text: The IPCC Third Assessment Report concluded that ‘there is high confidence that recent regional changes in temperature have had discernible impacts on many physical and biological systems’. Since then, the number of studies of observed trends in the physical and biological environment and their relationship to regional climate changes has increased greatly, as has the quality of the data sets. This allows a broader and more confident assessment of both the response of natural and managed systems to changes in regional climate, and of whether the observed responses may be related to anthropogenic climate change." (Note: new phrasing extracted from Ch. 1 Sec 1.1 page 5 line 6 and lines 35-37.) (Govt. of Canada)
95	2	16	2	16	It would probably be more accurate, instead of: "the number of studies on observed trends ...", to say: "the number of studies indicating observed trends..." (Govt. of Mexico)
96	2	16	2	17	At the end of the phrase starting in line 17, add a comma and the following statement “particularly in developed countries” This comment results from the comparison of the region’s information, as observed in figure SPM-1 (Govt. of Argentina)
97	2	16	2	21	As more climatic variables (e.g. precipitation) and their interaction with temperature are responsible for the observed changes in the natural systems please add: "Temperature rise is selected as the major climate variable because it has a strong and widespread documented signal in recent decades, demonstrates an anthropogenic signal, and has an important influence on many physical and biological processes. Effects of changes in other climate variables related to temperature rise, such as sea-level rise and changes in runoff due to earlier snowmelt, are also considered." [chapter 1.1.1, first para] (Govt. of Germany)
98	2	17	2	17	Instead of "as has the quality of the data sets", to say: "as have the quality and reliability of the data sets". It is important to stress the latter. (Govt. of Mexico)
99	2	18	2	18	Please be consistent in the use of "climate changes" and "warming" as appropriate for the drivers of observed changes. While most of the relationships cited relate to temperature, that's not true for all, nor are all fully explained by the temperature change alone. (Govt. of Canada)
100	2	18		18	Change “broader and more confident” to “more robust”. (Govt. of USA)
101	2	19	3	38	It seems peculiar that the lead quote from the TAR (lines 19-20) and first substantive bold heading refer to regional trends. It would make more sense for the authors to begin with global trends then move down to the regional level. Suggest that the first and second bolded sections are transposed. This would also mean that the regional sections are together. In addition this structure more closely replicates the TS. (Govt. of Australia)
102	2	21			add: however global coverage is still poor particular in Africa and South East Asia (Govt. of The Netherlands)
103	2	22	2	22	If a chapeau is to be added to Section B (see General Comment above), which would help explain the approach used in assessing observed impacts, then we would suggest extracting text from the following places: Chapter 1 Section 1.1 page 5 lines 1-11 and lines 16-23, and Section 1.2 page 6 line 51 –

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					page 7 lines 1-14. (Govt. of Canada)
104	2	23	2	24	To use same structure as in TAR, to say that "There is very high confidence that many natural systems ..." (Govt. of Mexico)
105	2	23	2	24	This version in the SPM is much clearer than the corresponding conclusion in the TS (page 7, lines 4-6) suggest you change the TS. (Govt. of Australia)
106	2	23	2	23	Suggest changing 'some oceans' to 'all oceans'; or 'most oceans' if an exception can be found - referencing the reported observed changes in section 1.3 of Chapter 1 and enumerated in table 1.5 on pp 27-28 of the same chapter (Greenpeace)
107	2	23	2	23	Preferable to have a quantification of the term 'many'. How many is many? One would expect that an assessment of scientific research should quantify assessments using number and time reference. (Govt. of Japan)
108	2	23	2	23	Change "some" to "all": Which oceans are not experiencing changes associated with global or regional changes. (Govt. of Germany)
109	2	23	2	24	Because of the headline nature of this sentence we suggest the "very high confidence" statement here should be followed by the superscript reference to Endbox 2 for a definition of the level of confidence, even although that reference has already been given in preceding text. (Govt. of New Zealand)
110	2	23	2	24	"Regional climate changes" is confusing; it is not clear if all regional climates changes are consistent with global warming (Govt of Switzerland)
111	2	23	2	23	"...on all continents and in some oceans" makes the reader wonder about small island states and other islands. Because small islands are covered as a region in the WGII assessment report, one would expect small islands to be commented on here. (Govt. of Japan)
112	2	23	2	24	It is important to make the link that the impacts due to regional climate changes are associated with the global scale climate change depicted in the next key message . WGI has established a link between observed global and regional changes. Suggest: "There is more and stronger evidence that [from previous draft SPM] many natural systems, on all continents and in some oceans, are being affected by the regional impact of global climate changes, particularly temperature increases [very high confidence]." (Govt. of Canada)
113	2	23	3	9	The statement printed in bold ("Many natural systems ... increases") has been labelled with "very high confidence." However, four of the five findings on physical and biological systems that follow have a a label of "high confidence". Only one has the label "very high confidence". Unless other evidence is presented, please rephrase the label of the statement printed in bold to "high confidence". Also cf. ES Chapter 1. (Govt. of The Netherlands)
114	2	23	3	10	The descriptions of changes in this section are only meaningful when associated with some timescale. The section would therefore benefit from an indication of the timescales over which the effects have been identified: Since 1900? Since 1950? Last 3 decades? (Govt. of New Zealand)
115	2	23	3	9	In this section the confidence is very high, so the last sentence "Observed effects of recent ocean acidification on the marine biosphere are as yet

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					undocumented” (P3 L9) ought to be deleted. (Govt. of China)
116	2	23		23	The modifier “some” with “oceans” is unnecessary and confusing. All oceans are being affected by climate change. Clarify whether or not “some” is used because of limited data sets. (Govt. of USA)
117	2	26	1	26	Add reference in this section to direct observed physical effects of CO2 (ocean acidification, araganite saturation ratios) as this new information since the TAR and is covered in the underlying chapters and the question of observed effects on biological systems is left open in oage 3 line 9 (Govt. of Germany)
118	2	26	2	27	Suggest to, intead of "are affecting natural systems, such as:" change to "have effects on natural systems, such as:" What follows is a list of effects, not a list of natural systems. (Govt. of Mexico)
119	2	26	2	26	Suggest adding the following to the heading of this section: "There is abundant and significant evidence that most of the cryospheric components in polar regions and in mountains are undergoing generalized shrinkage in response to warming, and that their effects in the environment and in human activities are already detectable. 1.3.1.2 (Greenpeace)
120	2	26	2	26	Please explain "cryosphere" in brackets. The term might not be known by many policy-makers. (Govt. of Finland)
121	2	26	2	26	It would be helpful to provide examples of the observed changes in the cryosphere and their consequences. Also add the following text (from ch.1.3) after 'with regard to changes in physical systems': There is abundant evidence that the vast majority of the cryosphere is shrinking in response to warming and there is high confidence that ... (Govt. of UK)
122	2	26	2	32	It is confusing to have this section describe changes in natural systems RESULTING from cryospheric changes. Why not just describe the cryospheric changes (i.e. a change in a physical system)? While understanding the desire not to duplicate WGI coverage of changes in physical aspects of the climate system, these are also IMPACTS of climate change, and some mention would benefit readers of WGII report. Suggest adding text similar to that in the previous draft SPM that briefly summarize observed changes in cryosphere (prev. draft SPM-3 lines 40-42). The inclusion of 'changes in Arctic flora and fauna' seems out of place as it would seem to fit more appropriately below, in the section on changes in biological systems.) (Govt. of Canada)
123	2	26	2	26	Is it necessary to write in bold "physical systems" ? (Govt of Switzerland)
124	2	26	2	26	Does "cryosphere" really refers to all regions of the globe, or are there regional differences ? (Govt of Switzerland)
125	2	26	2	26	Could shorten opening phrase to : 'For physical systems' (Govt. of Australia)
126	2	26	2	26	Add a footnote explaining the term cryosphere. Suggested text: The term “cryosphere” describes the portions of the Earth’s surface where water is in a solid form and includes mountain glaciers and ice caps, floating ice shelves and continental ice sheets, seasonal snow cover on land, frozen ground, sea

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					ice and lake and river ice. (Govt. of UK)
127	2	26	3	52	Clarify in the presented examples the influence of climate parameters other than temperature on the observed changes. (Govt. of Germany)
128	2	26		26	The U.S. Government previously asked that the authors define cryosphere for the lay audience. The word appears neither in Webster's on-line dictionary nor in <dictionary.com>. It is certainly not in common usage amongst policymakers. Use the definition provided in the WG II TAR glossary, as follows: "The component of the climate system consisting of all snow, ice, and permafrost on and beneath the surface of the earth and ocean." (Govt. of USA)
129	2	27	2	27	Is there sufficient evidence to say 'natural and managed systems'? (Govt. of Australia)
130	2	27	2	27	Delete ", such as" replace with "Examples of these changes include:" to improve the flow of the sentence. (Govt. of Australia)
131	2	28	2	28	Add a bullet point on glacial mass loss as this is a dominant global phenomenon in all glaciated regions and is linked to the subsequent bullets (Govt. of Germany)
132	2	28		28	Delete "with increased risk of outburst floods". This is not an observed impact; it is a statement of potential vulnerability. (Govt. of USA)
133	2	29	2	29	We think this statement is relevant not only for mountain regions and permafrost regions, but also lower areas e.g. in Northern Europe where increased precipitation as rain and less snow increase the risk for land slide. Hence the sentence should be adjusted to cover also lower areas and the term "land slide" inserted of " in mountain regions". (Govt. of Norway)
134	2	29	2	29	Unclear as to how 'other' should be interpreted. Other as opposed to what? (Mountains in what areas? Other permafrost regions, means exactly what?) (Govt. of Japan)
135	2	29	2	29	The key point of this dot point is concerns increasing ground instability, which is caused by permafrost melt. The authors need to redraft this sentence to more adequately explain this causal connection. (Govt. of Australia)
136	2	31	2	32	Would comments focusing on changes in flora, fauna and predators not be more appropriate classified under the 'biological systems' section? (Govt. of Japan)
137	2	31	2	32	This topic is not relative to physical systems, but to biological systems. It would be more consistent to cut these two lines and paste them after line 42, in the biological systems part. (Govt. of France)
138	2	31	2	31	There is no reference to the consequences of the shrinkage of Greenland Ice Sheet, it would be very helpful to add a bullet point on the impact of the warming on GIS ecosystems, if any. (Govt. of UK)
139	2	31	2	32	The sentence actually deals with changes in Arctic biological systems, whereas the subheading above refers to "physical systems". Please either change subheading to "bio-physical systems or move bullet further down under the correct heading.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Denmark)
140	2	31	2	32	The phrase "predators high in the food chain" may be replaced by "predators at higher trophic levels in food chain" or some other appropriate phrase. (Govt. of Pakistan)
141	2	31	2	32	Should be moved to Line #43 of the same page, or P.2 Ln. 8, as this is more on biological not physical (Govt. of Thailand)
142	2	31	2	32	Put the sentence (in line 31,32)after line 42, since the phenomenon belongs to biological systems. (Govt. of China)
143	2	31	2	32	It is unclear why this final dot point is regarded as a change to a physical system and not a biological system change. Suggest moving this point to the dot points on biological systems. (Govt. of Australia)
144	2	31	2	31	It is difficult for a lay person to understand what the consequences of changes in Arctic and Antarctic flora and fauna are. It would be helpful to provide some examples and clarify what sea ice biomes and predators are. (Govt. of UK)
145	2	31	2	32	As flora and fauna belong to biological systems please move down the bullet to line 43. (Govt. of Germany)
SPM-146	2	31			We would prefer that the phrase "sea-ice biomes" is substituted by a more commonly known expression. (Govt. of Norway)
147	2	31		32	Are Arctic and Antarctic flora and fauna physical systems? Should this statement be moved to the paragraph addressing biological systems? (Govt. of USA)
148	2	33	2	33	In general the key findings related to the polar areas highlighted in the Executive Summary of Chapter 15 is brought forward into the SPM in a reasonable manner. However, the finding that the changing cryosphere and hydrology will cause global climatic feedbacks is not highlighted in the SPM. We find the matter of feedback mechanisms associated with climate changes in the polar system to be an important issue that should be highlighted also in the SPM. This issue could likely be taken onboard under heading B on Current knowledge about observed impacts in natural and managed systems after bullet point in line 31-32. Text could read as follows: "The changes in the polar cryosphere and hydrology will also cause climatic feedback, <i>for example changes in albedo due to decreased snow cover and increased emissions of methane due to thawing of permafrost</i> , inducing further changes to the global climate." (Govt. of Norway)
149	2	34	2	37	Similarly, lines 34-37 reference changes in hydrological systems, but do not actually mention observed changes in precipitation events, droughts, floods and extreme events . It is recommended that such observations be added here (using agreed WGI results). (Govt. of Canada)
150	2	34	2	34	Instead of " affected, for example:" change to "affected, having for example". In consequence, eliminate "are" in line 36. (Govt. of Mexico)
151	2	34	2	34	Does "hydrological systems" really refers to all regions of the globe, or are there regional differences ? (Govt of Switzerland)
152	2	34	2	34	Delete 'also'

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Australia)
153	2	34		34	To make this sentence more conform with the other paragraphs, we propose that "hydrological systems" is written in bold. (Govt. of Norway)
154	2	35	2	35	Reductions in dry season flow have been observed in a number of regions and are highly relevant (Govt. of Germany)
155	2	35	2	35	For balance, it should be made clear that this phenomenon also entails reduction, in some cases dramatic, of summer-time flows, which is key for agriculture. See 1.3.2.1 "The early spring shift in runoff leads to a shift in peak river runoff away from summer and autumn, which are normally the seasons with highest water demand, resulting in consequences for water availability". Suggest adding to this to the text here. (Greenpeace)
156	2	35	2	35	Enhanced run-off could give associations as improved run-off. We suggest to replace "enhance" with "increased" (Govt. of Norway)
157	2	35		35	Change "... snow fed rivers" to "... snow fed rivers in the last [insert appropriate number] years." Policymakers will likely not dig into the detailed chapters for the temporal context, so providing it here is useful and can be done efficiently without distracting from the main message. (Govt. of USA)
158	2	36	2	36	The meaning of "thermal structure" might be unclear to many, not at least decision makers and should be replaced with a more understandable expression (Govt. of Norway)
159	2	36		36	Change "... in many regions are warming" to "in many regions have been warming since [insert appropriate date]". (Govt. of USA)
160	2	38	2	38	The following example of hydrological system being affected could be added: "in regions with small precipitation located in temperate climatic zone, decreasing amount of water retained in the soil during winter is expected because of higher evapotranspiration and changing the type of precipitation from snow to rain." (Govt. of Poland)
161	2	38	2	38	ocean impacts, including acidification, should be included here, as per section 1.3 and table 1.5 on pp 27-28 of Chapter 1 (Greenpeace)
SPM-162	2	38	2	38	Add bullet points on effects of sea-level rise and on changes in the ocean eg acidification. These were mentioned on the SOD SPM and need to put back here. (Govt. of Germany)
163	2	39	2	39	This heading does not accurately reflect the underlying material. Suggest "There is more evidence, from a wider range of species and communities in terrestrial ecosystems than reported in the TAR, that recent warming is already strongly affecting natural biological systems. There is substantial new evidence relating changes in marine and freshwater systems to warming." From the Technical Summary page 10, 28-31 (Greenpeace)
164	2	39	2	40	Replace the vague text "that observed changes in some terrestrial species are linked to higher temperatures" by "that recent warming is already strongly affecting many plant and animal species", based on TS FGD p. 10, lines 28-44. (European Commission)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
165	2	39	2	39	Does "biological systems" really refers to all regions of the globe, or are there regional differences ? (Govt of Switzerland)
166	2	39	2	40	This is not direct enough see text in TS "that recent warming is already strongly affecting many plant and animal species", TS -10, lines 28-44. Suggest to include the following statement from TS: "The evidence suggests that both terrestrial and marine biological systems are now being strongly influenced by observed recent warming. (Very high confidence)" (TS-10, 31-33) (Govt. of Germany)
167	2	39		42	Since the statements in this paragraph have the highest confidence, it might be worth considering moving this paragraph forward. (Govt. of Norway)
168	2	40	2	40	Species level effects: "In tropical montane cloud forests, extinctions of amphibian species has been attributed to recent climate change" Chapter 4 (Govt. of Germany)
169	2	40	2	40	Replace "are linked to" with the TS finding of "are being strongly influenced by" (see TS page 10, line 32), as this is the more positive and certain finding provided in the body of the report. Also it would be clearer to say "observed high temperatures", which is similar to the TS construction. (Govt. of Australia)
170	2	40		40	Change "...linked to higher temperatures" to "...linked to higher temperatures of the last [insert appropriate number] years". (Govt. of USA)
171	2	41	2	41	Suggest a bullet here on impacts of coral reefs, as per section 1.3.4.1 which talks of both observed impacts due to warmer temperatures and the anticipated effects of increased acidification on the oceans. This should especially reference the 'cross chapter case study' on coral reefs. (Greenpeace)
SPM-172	2	41	2	41	Add coral reef bleaching. This was in SOD SPM and in the chapters (Govt. of Germany)
173	2	42	2	42	Quantifying the amount is suggested. As written, the readers are lead to assume that there will be a poleward and upward shift in all ranges in plant and animal species. (Govt. of Japan)
174	2	42	2	42	Insert "altitudinal" after upward to make the finding more precise. (Govt. of Australia)
175	2	42	2	42	"plant and animal species" should be changed to "flora and fauna species" so as to maintain consistency throughout the text. (Govt. of Japan)
176	2	42		42	Insert "(in elevation)" after the word "upward" for clarification. (Govt. of USA)
177	2	43			Miss timing caused by different responses of species whithin on food chain (leaves, caterpillars, migratory birds) (Govt. of The Netherlands)
178	2	44	2	46	This sentence seems to break the format of the section and repeat some of the findings contained in the first dot point on biological systems (e.g. "earlier timing of spring events, such as leaf unfolding" and "earlier greening of vegetation"). Suggest that this sentence is combined with the first dot point. In addition the finding concerning increased primary production seems to be drawn from a study conducted in North America. If the finding is to remain, it should be made clear that any increase in primary production due to longer seasons and increased CO2 concentrations will be highly dependent on

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					location and other factors such as water availability. (Govt. of Australia)
179	2	45	2	45	Simplify the language of the footonote 4: the NDVI measures the amount of green vegetation in an area based on satellite images. (Govt. of UK)
180	2	45	2	45	Please clarify whether this greening is global or regional, and if so specify the regions. (Govt. of UK)
181	2	45		46	Do the chapters cited provide evidence that increased primary productivity is linked to increasing atmospheric CO2? (Govt. of USA)
182	2	46	2	46	The authors should avoid referencing only Executive Summaries. The findings of the each of the chapter ES should be drawn from supporting information in the chapter. (Govt. of Australia)
183	3	1	3	3	The FS FGD p. 10, lines 30-33 state that "There is substantial new evidence relating changes in marine and freshwater systems to warming. The evidence suggests that both terrestrial and marine biological systems are now being strongly influenced by observed recent warming (very high confidence)". Hence, the term "high confidence" in line 1 should be changed to "very high confidence". (European Commission)
184	3	1	3	1	Should be "very high confidence" as this seems to better reflect the underlying assessment (Govt. of Germany)
185	3	1	3	52	It would make it more informative if a few more examples could be incorporated. For example, in the following case include in brackets where the erosion is taking place: - some coastal zones (where?) affected by erosion due to sea-level rise [1.3]; (Govt. of Canada)
186	3	1		9	The previous draft of the SPM was much stronger on marine/ocean issues. Please revisit that draft and strengthen Section B. The reference to bleaching of coral reefs is still appropriate to include in the introductory section. (Govt. of USA)
187	3	1		1	Delete the word "extensive". In Figure SPM-1, the number of changes observed in marine and freshwater biological systems is miniscule compared with terrestrial changes. (Govt. of USA)
188	3	2	3	3	Instead of witing "changes in ...", qualify "ice cover", etc.: "reduced ice cover", etc. (Govt of Switzerland)
189	3	4	3	4	The meanings of the phrase "shifts in ranges" are not clear. This weakness may be removed. (Govt. of Pakistan)
190	3	4		5	The poleward shift in ranges of algal, plankton, and fish abundance is only mentioned in the underlying text as being observed in the Northern Hemisphere. Changes in abundance have been observed in the Southern Hemisphere, but not the poleward shift. (1:25,26). Change the statement to: "changes in algal, plankton, and fish abundance in high latitude oceans, including a poleward shift in ranges in the Northern Hemisphere." (Govt. of USA)
191	3	7	3	7	The meanings of the phrase "range changes" are not clear. This weakness may be removed.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Pakistan)
192	3	7	3	7	Same remark as 11: qualify "range changes in rivers" (Govt of Switzerland)
193	3	7	3	7	"changes in rivers" does not give the policymaker reader much to go on. It is rather general and the reader wonder if this text infers that all rivers all over the globe will change? This also leads to the question of how will they change? Qualification of this statement is required. (Govt. of Japan)
194	3	8			possible reduced up welling of deep waters would be very policy relevant (impacts on ocean productivity) (Govt. of The Netherlands)
195	3	9	3	9	What does this mean: There have been effects observed but they have not been fully reviewed in the literature, or no effects have yet been observed. Clarify. (Govt. of Germany)
196	3	9	3	9	We question whether this statement should be so unbalanced? Although observed effects are not yet sufficiently documented, it seems to us reasonable to raise awareness of the issue of potential impacts of acidification a bit more. We note i.a. that Chapter 15 states (with high confidence) that "Acidification of polar waters is predicted to have adverse effects on calcified organisms and consequential effects on species that rely upon them." We therefore suggest that the texts changed to: "Ocean acidification due to increasing atmospheric levels of CO ₂ is occurring. Present knowledge of consequences is limited, although there are concerns about impacts for calcifying organisms (eg. corals, lobsters, crabs and oysters). Serious effects on other marine living resources cannot be ruled out." (Govt. of Norway)
197	3	9	3	9	This sentence would be better if split into two to make two points: 1) that ocean pH has decreased, and 2) that there is yet no documentation of effects. Suggested phrasing is: "Evidence collected and modelled to date indicates an increase in ocean acidity as a result of increased absorption of atmospheric CO ₂ . However, the effects of ocean acidification on the marine biosphere are as yet undocumented". (Govt. of Canada)
198	3	9	3	9	This sentence runs the risk of misleading readers. It requires repetitive reading to understand that the writers are not writing that observed ocean acidification has yet to be documented but that the impacts (effects) of observed acidification on marine biosphere systems have yet to be documented. This sentence also does not adequately summarize text from the Technical Summary and Chapter 4 of the underlying report. We suggest that this sentence be deleted and be replaced by the text in TS page 30, line 26-29 which is a more adequate summary of the underlying report text in Chapter 4, 4.4.9 page 39, line 27-37. Unclear where in the underlying report B4.5 refers to. (Govt. of Japan)
199	3	9	3	9	The authors should restructure this point to note that while the Working Group 1 report has found that global surface ocean pH has decreased by 0.1 units since pre-industrial times, (and this is expected to drop further) the range of impacts of this change in pH remains uncertain, due to the lack of assessed scientific research. In addition the significance of 'recent' is unclear - delete? (Govt. of Australia)
200	3	9	3	9	Same remark as 11: qualify "ocean acidification" (Govt of Switzerland)
201	3	9	3	9	It is quite disappointing that the SPM does not describe in more details the effects of acidification. We suggest to add the following sentence: However,

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					concerns about the impacts of climate change in coral reefs also centre on the effects of the recent trends in increasing acidity (ch. 1.3.4) (Govt. of UK)
202	3	9	3	9	"undocumented" is a very strong word. If there is some documentation but it is not still enough to assess the effects of climate change in the marine biosphere, it should say instead of "undocumented" "under study" (Chapter 1, page 33, line 4 and 5; Chapter 1, page 80, lines 19 and 20; Chapter 1, pg 96, lines 14 and 15) (Govt. of Spain)
203	3	9		9	The statement on ocean acidification is weak. The U.S. Government comments on the second-order draft were to clarify the ocean acidification issue not to weaken or remove it. It is incorrect to say that the effects of ocean acidification are undocumented. Change "as yet undocumented" to "an emerging issue". (Govt. of USA)
204	3	9			remove or rephrase sentence, many issues are undocumented (Govt. of The Netherlands)
205	3	10	3	10	There is no commentary on the bleaching of coral reefs which are a significantly impacted marine system, this needs to be addressed in this section. (Govt. of Australia)
206	3	11	3	12	To use same structure as in TAR, to say that "There is high confidence that at the global scale ..." (Govt. of Mexico)
207	3	11	3	11	The expression "anthropogenic component of warming" is ambiguous (is it possible to discriminate between the influence of human and natural warming?) (Govt of Switzerland)
208	3	11	3	18	Same remark as 14 (Govt of Switzerland)
209	3	11	3	38	Please add text from the TS (page 7 lines 8-13) to better introduce the section and clarify why the term "warming" is used: e.g. The Fourth Assessment analysed studies showing changes in physical and biological systems in relation to climate drivers and has found stronger quantitative evidence of a relationship to anthropogenically induced changes. The major focus on is on global and regional surface temperature increases. (Govt. of Canada)
210	3	11	3	38	It would be helpful to clarify why the anthropogenic component of warming is evident over the last 30 years only. This does not seem to be consistent with the WG1 SPM, which concluded that the increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. Is this due to the fact that studies available only focus on the last three decades? If so, please clarify. (Govt. of UK)
211	3	11	3	12	Change the word "componet" to "contribution" and the word "influence" to "impacts". (Govt. of Norway)
212	3	11	3	12	Change "At the global scale the anthropogenic component of warming over the last three decades has had a discernible influence on many physical and biological systems [high confidence]." To "Global warming over the last three decades has had a discernible influence on many physical and biological systems [high confidence]."

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of The Netherlands)
213	3	11	3	12	Can the term "anthropogenic component of warming" be just simply "anthropogenic warming" or at least "anthropogenic contribution of warming" (Govt. of Thailand)
214	3	11	3	11	Add continental at the beginning of the sentence so as to read: 'At the global and continental scale the anthropogenic component ... (Govt. of UK)
215	3	11	39		Given the remarks in the last two para's and the supporting text in Chapter 1 reconsider the [high confidence] (Govt. of The Netherlands)
216	3	11		12	This key, bold-faced statement must correspond to the discussion in Chapter 1 and with findings in the WG I SPM. The confidence level at the end of the sentence on line 12 has been intentionally deleted in the U.S. Government's proposed revised text. (Govt. of USA)
217	3	11		38	The phrase "At the global scale" that begins this sentence is not supported by the findings of WG I or in the underlying chapter of the WG II volume. Chapter 1, Section 1.4.2.1, states that "It is likely that there has been a substantial anthropogenic contribution to surface temperature increases averaged over each continent except Antarctica since the middle of the 20th century (WG I Chapter 9, section 9.4.2). Statistically significant regional warming trends over the last 50 and 30 years are found in many regions of the globe (WG I Figure 3.9)." Another contradiction to the phrase "At the global scale" is found on page 53 of the underlying chapter (WG II Chapter 1): "Although the detailed results of these studies are different, because they used different species and different methods, they all conclude that a significant impact of warming is already discernible in animal and plant populations at regional and continental scales in the Northern Hemisphere." The data are sparse in the tropics and elsewhere. Similarly, findings of WG I indicate the difficulty of attributing observed temperature changes at smaller scales. The U.S. Government suggests the authors adhere strictly to the attribution allowed by WG I findings and by the underlying chapter, and to modify their attribution to those instances where anthropogenic influences can be scientifically supported to have impacts on physical and biological systems. The U.S. Government suggests the following substitute text for lines 11-39: "Modeling and statistical analyses indicate that observed changes in numerous physical and biological systems over the last three decades are consistent with findings that significant anthropogenic warming averaged over each continent except Antarctica is likely. It is likely that there has been a substantial anthropogenic contribution to surface temperature increases averaged over each continent except Antarctica since the middle of the 20th century (WG I Chapter 9, Section 9.4.2). Statistically significant regional warming trends over the last 50 and 30 years are found in many regions of the globe (WG I Figure 3.9). [1.4] Attributing temperature changes on smaller than continental scales and over time scales of less than 20 years is difficult due to low signal-to-noise ratios at those scales. Attribution of the observed warming to anthropogenic forcing is easier at larger scales because averaging over larger regions reduces the natural variability more, making it easier to distinguish among changes expected from different external forcings, or between external forcing and climate variability. [1.4] Available evidence is not sufficient to conclusively link observed physical and biological responses to anthropogenic warming across the Earth's surface or in specific locales. Thus far, analyses of observed changes have considered a limited number of systems and locations, primarily in the Northern Hemisphere. The effects of natural climate variability and other non-climate drivers such as land-use change complicate our ability to attribute observed changes to anthropogenic warming. Nevertheless, the consistency in several studies between observed and modeled changes as well as spatial agreement between significant regional warming and consistent impacts across large regions indicate that observed responses of many physical and biological systems are correlated with warming over the last three decades that contains an anthropogenic component. [1.4] • Several studies link responses in selected physical and biological systems to the anthropogenic component of warming by comparing observed trends

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(such as changes in phenology or migration of species poleward or to higher elevations) with modeled trends in which the natural and anthropogenic forcings are explicitly separated. Strongest agreement occurs with modeled temperatures driven by both natural and anthropogenic forcings. [1.4] • Observed changes in many physical and biological systems in some regions are consistent with a warming world. The majority of changes summarized by large data sets (e.g., more than 85% of the data sets whose locations are displayed in Figure SPM-1) have been in the direction expected in response to warming. [1.4] • Spatial agreement between regions of significant regional warming and the locations of significant observed changes in many systems is unlikely to be due solely to natural variability of temperatures or natural variability of the systems. [1.4]” (Govt. of USA)
218	3	14	3	38	This section presents a number of different ideas and is confusing to the reader. First, Line 14-16 is written in the affirmative, using words like "are linked", "three sets of evidence", "support this conclusion". As we read further, the paragraph from line 28 causes a pause as the reader is informed that "limitations and barriers remain in the evidence..." and that there are other factors that "complicate the issue." This is then followed by "nevertheless..."The way these 3 paragraphs have been written may cause more confusion and perhaps even unnecessary debate among policymakers. (Govt. of Japan)
219	3	14	3	26	The text might be shortened by removing the three numbered "evidence" and aggregate them in a single phrase. It seems that number two in the list is not an evidence of discerned human induced warming but only warming. (Govt. of Finland)
220	3	14	3	14	It is unclear what "the effects described above" refer to. The authors should amend this sentence to make its meaning more clear. (Govt. of Australia)
221	3	14	3	14	In reference to "...effects described above...", the meaning of "above" is unclear. How much of the above text is included in "above"? Clarifying this to avoid confusion among readers is suggested. (Govt. of Japan)
222	3	14	3	26	Elevate content of footnote 5 into the main body of the text. It is necessary to justify the inclusion of the second and third sets of evidence - that on their own do not directly relate to attribution. (Govt. of Canada)
223	3	15	3	15	Footnote 5: use the exact wording as in SPM WG I (Govt of Switzerland)
224	3	17	3	27	Thought needs to be given to significantly restructuring these three dot points to make them more meaningful to policy readers. While the points currently contain important information about how scientists have linked observed warming with anthropogenic influences, the key message that observed changes are "very unlikely" to be due solely to natural variability needs to be made much more prominent. The discussion of joint attribution provided in Chapter 1 (page 7) is clear and concise and could also be included in this section. (Govt. of Australia)
225	3	17	3	19	In the existing form the sentence is too complex and its meaning is not very clear. The following replacement text is suggested “ <i>Several studies that have compared observed and modelled trends using explicitly separated natural and anthropogenic forcing, have established the linked responses of physical and biological systems to anthropogenic forcing</i> ” (Govt. of India)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
226	3	17		27	The underlying text that presents these studies linking system responses to anthropogenic warming (Chapter 1, section 1.4.2.2) does not state that “anthropogenic forcing is explicitly separated”. It does state that these studies indicate changes in physical and biological systems that “cannot be explained by natural variability”. To the extent possible, precise language from the chapter should be used in the SPM. (Govt. of USA)
227	3	17		26	Move the first set of evidence to the last position as this is the weakest. Consider dropping it. It just shows that the models used are indeed sensitive to temperature. And as temperatures have gone up and the observed effect is modeled with confidence it shows that the models do a good job. Separating the two components does not add to this conclusion. (Govt. of The Netherlands)
228	3	17			Ad the word modelling, there have been several modelling studies (Govt. of The Netherlands)
229	3	18	3	18	Suggest rephrasing sentence to read "comparing observed trends IN THESE SYSTEMS with modelled trends" ... (Govt. of Canada)
230	3	20	3	20	Suggest to chage "consistent with a warming world" to "consistent with the Earth's warming" (Govt. of Mexico)
231	3	20	3	22	Indicate in text that 85% refers to the proportion of the observations but due to the uneven distribution of observations, this may not reflect the proportion of the globe that is experiencing changes/impacts consistent with warming. (Govt. of Canada)
232	3	20		21	It should be noted here that 97% of the 29,000 data sets cited in this sentence are from Europe (see legend for Figure 1.8 in Chapter 1). There is void in data sets in the tropics and Antarctica, which is another reason the bold-faced statement on line 11 cannot begin with the phrase “At the global scale”. (Govt. of USA)
233	3	21	3	21	The term ">85%" should be changed to ">90%" to be consistent with the cell "GOL" in Figure SPM-1. (European Commission)
234	3	21	3	21	It should be considered specifying both the exact percentage and the number of datasets (instead of using >). The current text opens for uncertainty. (Govt. of Norway)
235	3	21		21	On considering the % of significant changes consistent with warming in figure SPM-1, one might conclude that the referred percentage (>85%) might be even higher. (Govt. of Norway)
236	3	21			In Figure SPM-1 the box GLO (for global changes) indicates 95% of significant changes for physical systems and 90% of significant changes for biological systems. That means it could be stated on page e, line 21: "The majority (>90% of the > 29,000 datasets....". If that is true please change the figure. (Govt. of Germany)
237	3	22		22	Insert “observed” before “changes in these systems”. (Govt. of USA)
238	3	23	3	26	This paragraph seems to be difficult to understand. Could it be rephrased to enhance understanding? (Govt. of Norway)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
239	3	23	3	26	The whole sentence is not clear, especially for a policy maker" (Govt. of Mexico)
240	3	23		26	If a statement like this is included in the final draft, the U.S. Government suggests substituting “some regions of the globe” for the phrase “across the globe”, to correspond with statements in underlying text in Chapter 1 (1.4.2.1). (Govt. of USA)
241	3	26	3	26	Line of evidence #3 appears to also need a reference to Figure SPM-1. (Govt. of Canada)
242	3	28	3	33	This sentence seems to pose too much emphasis on uncertainty and weakens the whole report. We suggest that this sentence is moved after the paragraph currently on lines 35 to 38. We also suggest rewording this sentence: limitations still remains in the evidence of the casual linkage of observed impacts and anthropogenic warming, mainly due to the limited geographical distribution of the study available. (Govt. of UK)
243	3	28	3	28	The word 'barriers' should be replaced by the word 'gaps'. (Govt. of Canada)
244	3	28	3	29	The phrase "full causal linkage" is particularly confusing for policy readers. Suggest rephrasing this sentence, as follows "Uncertainties remain in completely attributing the causes of observed system responses to anthropogenic warming" (Govt. of Australia)
245	3	28	3	33	The issue raised in this paragraph is a very important note and merits further emphasis, by e.g. extracting the essence into the introduction of the SPM (A. <i>Introduction</i> or initially in B. <i>Current knowledge about observed impacts in natural and managed systems</i>). (Govt. of Norway)
246	3	28	3	29	The first sentence of the paragraph should be more simple, something like "The are still limitations and barriers that would prohibit a full causal linkage between observed system responses to anthropogenic warming." (Govt. of Thailand)
247	3	28	3	28	Suggest to change "...remain in the evidence chain that would permit full causal..." to "...remain in the evidence that would prove full causal..." (Govt. of Mexico)
248	3	28	3	38	Suggest that these two paragraphs are switched. This would make more sense as the key message that there is high confidence that the anthropogenic component of warming over the last three decades has had a discernible influence on many physical and biological systems, would be the primary focus of the paragraphs with the caveats on current understanding following. (Govt. of Australia)
249	3	28	3	38	Line 11,12 of page 3 states: "...the anthropogenic component of warming has had a discernible influence on ...systems [high confidence]". Per definition "high confidence" means about an 8 out of 10 chance. In other words: it is implicit that "a full causal linkage of observed system responses to anthropogenic warming" cannot be stated. Therefore we regard the lines 28 to 38 as to be redundant. Please drop lines 28 to 38 completely. (Govt. of Germany)
250	3	28	3	33	Besides these 3 points mentioned in the text, there is still limitation in methodology and models in box SPM-1 such as uncertainty in downscaling the climate model-simulated change to grid box; lack of estimates of natural internal variability in physical and biological systems and insufficient information from the process models that would link forcing to response in an end-to-end manner and lack of time-series of sufficient length to determine

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					if the changes are outside normal ranges of variability as well. So add "limitation in methodology and models" as fourth point. (Govt. of China)
251	3	28		29	Please consider rewriting the sentence as: Limitations and barriers remain in the causal analysis of the observed system responses... (Govt. of Finland)
252	3	29	3	29	Suggest to add "for several reasons" at the end of first sentence. (Govt. of Mexico)
253	3	29	3	29	"Few analyses" is not helpful. Suggest rephrasing as "available analyses" - to link with the 3 evidence sets in the paragraph above. (Govt. of Australia)
254	3	30	3	31	Please elaborate why temperature variability is larger at the regional scale than at global scale (it should be vice versa?) (Govt. of Thailand)
255	3	30			few analysis' as this concerns observed impacts please specify with numbers (Govt. of The Netherlands)
256	3	31	3	32	Rephrase the last sentence of the paragraph: ' Furthermore, factors such as land-use change, pollution and invasive species may mask the element of regional change caused by anthropogenic warming. (Govt. of UK)
257	3	31	3	32	Changes the words "complicate the issue" to "may increase the effects of climate change and these effects may be interlinked as a result of multiple stresses." (Govt. of Norway)
258	3	32	3	32	The expression "complicate the issue" should be replaced by an expression stating the difficulty to separate the influence of the various factors (Govt of Switzerland)
259	3	34	3	34	Here the following information should be introduced: "the land use changes lead to changes of energy balance structure of climatic system which in turn must change the water balance structure of earth. Thus, there is a question which impact on climate changes is stronger: land use changes or emission of greenhouse gases?" (Govt. of Poland)
260	3	35	3	39	Invert the order of this paragraph and the previous paragraph currently on lines 28 to 33. (Govt. of UK)
261	3	35	3	38	In this paragraph it should say that (as it was concluded and aproved in the SPM WG I) there is a global warming due to anthropogenic causes (insert here the reference to the page of the SPM WGI) and this global warming over the last three decades has had a discernible influence on many physical and biological systems. (Govt. of Spain)
262	3	35	3	38	Delete this section as it simply repeats what is in lines 11-26 on same page (Govt. of Canada)
263	3	35			'several studies as this concerns observed impacts please specify with numbers (Govt. of The Netherlands)
264	3	37	3	37	Same remark as 14

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt of Switzerland)
265	3	37	3	37	Comment: term "anthropogenic component"; this term should be briefly explained here or in glossary (Govt. of Finland)
266	3	40	3	40	write "Regional effects of climate change" instead of "Effects of regional temperature increases", since the sea-level rise as discussed in line 46 is not an effect of regional temperature increase. Line 44 to 45 should be adjusted as well. (Govt. of Germany)
267	3	40	3	42	To use same structure as in TAR, to say that "There is medium confidence that effects of regional..." (Govt. of Mexico)
268	3	40	3	52	There should also be evidence on impacts of increases in heavy precipitation and drought (compare SPM IPCC WG1 table SPM-1), certainly at medium confidence and without attribution. This is a very large (partly not specifically climate-related) body of literature, but it should at least be acknowledged. (Govt. of The Netherlands)
269	3	40	3	42	The header refers to natural systems whereas the previous header refers to biological systems (which includes agriculture, a human system). The definitions of the various systems are not provided and can be confusing. (Govt. of The Netherlands)
270	3	40	3	42	The confidence level should be changed from "medium confidence" to "very high confidence" to adequately reflect the information in the main text. For instance, the TS FGD (p. 27, lines 10-11) states: "Climate change currently contributes to the global burden of disease and premature deaths (very high confidence)." . Chapter 1 FGD states "All the reported studies concern Europe, where recent warming has clearly advanced a significant part of the agricultural calendar." (p. 40, lines 45-46) and "In temperate regions, there are clear signals of ... that are in agreement with regional warming." (p. 45, lines 1-4). Table 1.10, Box 1.2 and p. 52, lines 37-49 provides additional clear evidence from many different world regions that does not justify the use of "medium likelihood". (European Commission)
271	3	40	3	42	Suggest rewording, "Effects of regional temperature increases on some managed and human systems are now well established, although these are..." With reference to the climate change imprint on the European Summer heatwave of 2003, and the 'cross chapter case study' on that event. (Greenpeace)
272	3	40	3	42	Although the confidence level assigned to this umbrella paragraph might even suggest lack of information, it is evident that, in respect of managed and human systems, adaptation is in developing regions falls below expectations. Therefore, for the sake of reliable information for decision making, mentioning lack of adaptation practices is opportune to convey the urgency to develop some efforts in this direction. Though the increasing adverse effects of weather and climate events so requires, decision making should become also aware of the value of adaptation to ripe the potential benefits of climate change. (Govt. of Argentina)
273	3	40	3	42	A previous draft made reference to increasing losses from weather related disasters and its causes. Why was it omitted? This statement should be taken on board again because a) the TAR WG2 SPM referred to this increase in losses (Section 3.7 on page 13), and b) the underlying chapters in AR4 provide evidence of the role of exposure as well as increases in the severity of extreme events (see Section 1.3.8.4, Figure SM1.1, and Section 7.5, Table 7.4). It is important to report recent advances in this respect since the TAR, with respect to recent discussions on the costs of climate change e.g. in connection to the Stern Review, and ample evidence that is available in the underlying chapters in this assessment.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of The Netherlands)
274	3	40		52	This section could convey useful information but is unclear as written. The U.S. Government finds the language in the Chapter 1 Executive Summary to be clearer: "Although responses to recent climate change in human systems are difficult to identify due to multiple non-climate driving forces and the presence of adaptation, effects have been detected in a few agricultural systems. Changes in several aspects of the human health system have been related to recent warming. Adaptation to recent warming is beginning to be systematically documented." [1.3] [medium confidence] If used, clarify to what medium confidence applies. The U.S. Government notes that this statement in the Executive Summary does not refer specifically to regional temperature. Regional temperature is only referenced for physical and biological systems. This leads reviewers to question why the shift in the SPM language. (Govt. of USA)
275	3	41	3	41	Add after "emerging" words like " ,with high or very high confidence in a few cases," as otherwise the overall confidence statement for this paragraph appears to be inconsistent with the underlying material eg health impacts, some agricultural changes etc mentioned in the subsequent bullet points. (Govt. of Germany)
276	3	41	3	41	.. to discern than those on natural systems .. (Govt. of Austria)
277	3	44	3	52	The descriptions of changes in this section are only meaningful when associated with some timescale. The section would therefore benefit from an indication of the timescales over which the effects have been identified: Since 1900? Since 1950? Last 3 decades? (Govt. of New Zealand)
278	3	44	3	45	Suggest this sentence is strengthened to be more consistent with chapter 1, suggest the following wording: "Managed and human systems where the effects of regional increases in temperature have been detected, include the following:" (Govt. of Australia)
279	3	44	3	44	Better be "... where there are evidences of effects" (Govt. of Thailand)
280	3	46	3	46	The authors need to explain the inclusion of this dot point. It seems that coastal zones are affected by sea level rise, (i.e. a regional impact caused by a global phenomena). The heading is to do with "regional increase in temperature", not global ones. Note the TS (page 10 lines 22-26) puts the emphasis on natural coastal erosion. (Govt. of Australia)
281	3	46	3	46	Revise sentence to recognize that other factors also effect erosion : "many coastal areas affected by erosion due to sea-level rise and other factors [1.3];" (Govt. of Canada)
282	3	46	3	46	Is coastal erosion an impact on natural system rather than human/managed system? (Govt. of Thailand)
283	3	46	3	46	Is "coastal zone" as such a natural system or a managed system? Erosion due to sea-level rise certainly affects the coastal zone, which again can have further effects on community infrastructure and settlements (i.e.. managed and human systems). Possibly this distinction could be made clearer? E.g.. "Effects on community infrastructure and settlements due to erosion of coastal zones caused by se-level rise. (Govt. of Norway)
284	3	46	3	48	In regard to: "...such as early spring planting" it is unclear as to whether this pertains to both agriculture and forestry management. Clarification is suggested.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Japan)
285	3	46	3	46	After words "sea-level rise" the phrase "and reduction or removing plant cover" can be added. (Govt. of Poland)
286	3	46	3	46	"Some coastal regions..." is rather general. Quantification or a regional reference is suggested. (Govt. of Japan)
287	3	46	52		as an assessment of already existing impacts on managed and human systems the list of items looks rather incomplete (compare to SOD July 2006, p. 5, lines 44-48, for example) (Govt. of Germany)
288	3	46		46	This statement is too general, and also appears to be incomplete. It does not help policymakers understand those observed impacts of climate change as they relate to sea-level rise and coastal erosion. It would be more helpful to provide greater specificity regarding those locations within the coastal zone that have been "affected by erosion due to sea-level rise" (Govt. of USA)
289	3	47	3	48	Suggest to re-write bullet as follows "agricultural and forestry management lands at northern higher latitudes, where there have been effects such as earlier spring planting" (Govt. of Mexico)
290	3	47	3	47	Further qualification of "northern higher latitudes" is suggested. (Govt. of Japan)
291	3	47	3	49	Agricultural effects - what about increased pests and impacts on plant health, earlier planting is a relatively minor effect in these instances (Govt. of UK)
292	3	49	3	49	Suggest to change " some aspects of human health, such as..." to "human health, where there have been effects such as ..." (Govt. of Mexico)
293	3	49	3	49	It should be better to delete the sentence of "some aspects of human health, such as heat-related mortality in Europe and Asia", because there are no direct evidences to support it, even few studies to prove it in TS (page 11, line 24). (Govt. of China)
294	3	49	3	52	"...infectious disease vectors in some areas" is rather vague. What are where does "some areas" refer to? The first bullet specifies Europe and Asia and the second bullet specifies northern mid-latitudes. (Govt. of Japan)
295	3	49		50	Since this sentence (probably) refers to both heat- and cold-related mortality, we propose that "heat-related" is substituted by "temperature-related". (Govt. of Norway)
296	3	50	3	50	Should be "pollen induced allergy in northern mid-latitudes." (Govt. of Thailand)
297	3	50	3	50	"in northern mid-latitudes " in SPM is different with "in northern mid and high latitudes" in TS page 11,line 28, please describe them clearly. (Govt. of China)
298	3	51	3	51	What exactly "aspects of indigenous livelihoods" are is unclear. This term is insufficient and does not represent the impact on indigenous livelihoods in the way of effects on traditional lifestyle (i.e. hunting practices, food availability, housing, etc.) and more importantly, how these impacts are linked to

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					climate changes. Further explanation is necessary. (Govt. of Japan)
299	3	51	3	52	we suggest to replace "shorter vehicle travel seasons" with "shorter seasons for transportation on snow and ice" (Govt. of Norway)
300	3	51	3	52	The wording "aspects of indigenous livelihoods" is excessively vague and provides no indication of the negative impacts experienced by indigenous communities still dependent to a large extent on subsistence harvesting. Suggested the following wording: "Negative impacts on Arctic indigenous livelihoods due to changes in ice conditions and in the migration patterns, health, and ranges of animals and plants." (Govt. of Canada)
301	3	51	3	52	"...shorter vehicle travel seasons" is defined as what kind of vehicle travel and in what seasons? Vehicle is usually a term used to refer to land transportation. In the Arctic, when there is ice, people travel in Bombardiers and snowmobiles, when it melts they use boats, 3-wheel motorbikes and trucks for surface transportation. It would be better to specify the type of travel season rather than vehicle travel in this comment. (Govt. of Japan)
302	3	52	4	1	Footnote 5. Should commence with "Most of the warming over the past 50 years..." (Govt. of Australia)
303	4	0			In Box SPM-1 there should be some differentiation between the lines depicting weaker and stronger agreement of the model results with the observed effects in the natural systems. For this the first may be given in dots and the later may be given in dashes. (Govt. of Pakistan)
304	4	0			As mentioned in our general comment, Delete Box SPM-1 from the SPM as it is too detailed and technical for the SPM. The purpose of the SPM is to convey key messages, not methodologies, as is done in this Box. Given the very limited space in the SPM, using up one whole page to describe the methods used to arrive at findings that are presented in the text, does not seem the best use of space. We have suggested some additional explanatory text (a few lines) that could be brought into this section B of the SPM that would replace much of the info in this Box. (Govt. of Canada)
305	4	1	4	50	Box SPM-1: alternatively, if the authors wish to keep the box the diagram needs to be clarified as follows: The two boxes currently on the left may should read 'Temperature changes [or Temperature variations] in climate models...' and the bottom one read 'The extent of temperature changes from models..' This better emphasises the impact of anthropogenic warming in that it results in prolonged exposure to warmer temperatures, which maybe outside those experienced due natural variability (ie the difference between N and A is 'duration and magnitude' of change). (Govt. of Australia)
306	4	3	4	50	Box SPM-1: We request the deletion of Box SPM-1. Although the diagram, "Linking the causes of climate change to observed effects in natural systems" and text "Using Spatial Pattern Analysis", is informative, considering the space limits of the WGII SPM, it is questionable whether or not this box presents critical information. The text for "Using Climate Models" is a repeat of WGI work and does not need to be repeated on the second page of WGII text. (Govt. of Japan)
307	4	3	4	50	Box SPM-1: One of the roles of WGII is to present findings on observed impacts, especially those based on long-term studies and specifically, the timing of seasonal events are best represented by long-term studies for clear understanding of the changes. Based upon long-term research by the Japanese Meteorological Agency, we refer the following for inclusion in the SPM: Mapping of the observed changes in flowering dates for the Japanese cherry

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					tree and the irohakaede (Japanese maple) recorded by the Japan Meteorological Agency (http://okdk.kishou.go.jp/news/PhenologicalEventsJapan.pdf). (Govt. of Japan)
308	4	3	4	50	Box SPM 1 seems unnecessarily complex for a summary for policy makers; it is also difficult to read. This box is appropriately included in the TS with additional figures, however, its utility in the SPM is limited as detailed discussion of causal connections and spatial pattern analysis unnecessarily confuses the main storyline of the SPM that the impacts of climate change are much more clear in the AR4 than in the TAR. Suggest deletion of box and replacing this discussion with a simple statement to the effect that "In climate models the causal connection between observed effects in natural systems and combined natural and anthropogenic forcing is stronger than either natural or anthropogenic forcings on their own." (Govt. of Australia)
309	4	4	4	30	The sentence "Thus, observed changes in physical and biological systems" just shows that the models do a reasonable good job. Of course these systems respond to natural and anthropogenic climate forcing these systems (and the models are build accordingly) respond to changes in climatic conditions. (Govt. of The Netherlands)
310	4	4		48	The framework presented in Box SPM-1 is a new addition to this summary and does not reflect the discussion in the underlying chapter. The U.S. Government finds it to be a very technical construct that neither seems appropriate for the SPM nor adds significantly to the readers understanding of the issue beyond the related description on page 3, lines 11-38. The U.S. Government also notes that this framework is contained in the Technical Summary for those more inclined to such technical constructs. Therefore, the U.S. Government suggests deleting Box SPM-1 and using the space to provide a more full and balanced description of WG II findings. The detailed U.S. Government comments on the box are provided only to facilitate discussion should the box be retained; however, the U.S. Government's strong preference is to delete the box in this SPM. (Govt. of USA)
311	4	4			Box SPM-1: Please add to the caption: "Temperature is selected as the major climate variable acknowledging that other climate parameters have influenced the observed effects as well."Reason: Otherwise, readers could be given the wrong impression that only temperature is responsible for the observed effects in natural systems. (Govt. of Germany)
312	4	6		20	We find this figure of limited value. However, if one chooses to use it, we think that a reorganisation/simplification with all boxes regarding temperatures rearranged in one single row might make the figure less confusing. We also question the box "Temperatures from climate models with anthropogenic (A) forcing" - is it really relevant to use a model with only anthropogenic forcing? (Govt. of Norway)
313	4	9	4	9	"Temperatures from climate models with natural (N) forcing only" (Govt of Switzerland)
314	4	14	4	14	Same remark as 19: "...anthropogenic (A) forcing only" (Govt of Switzerland)
315	4	23	4	27	Short information whether the impact of positive feedback between temperature increase and increase of water vapour content in the atmosphere on greenhouse effect was taken into consideration in anthropogenic forcing factors should be added. (Govt. of Poland)
316	4	26	4	26	should be(greenhouse gases and anthropogenic aerosols, A).

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Thailand)
317	4	26		30	This text in Box SPM-1 falls short of explaining the point that anthropogenic forcing appears to be a stronger driver of observed changes in natural systems, compared to changes in natural forcings alone, and as such does not agree well with the corresponding figure, or to the summary statement (page 3, lines 11-12) that anthropogenic warming is have a discernible influence on natural systems. (Govt. of USA)
318	4	30		30	Delete the phrase “thus linking causes of climate change to observed effects.” (Govt. of USA)
319	4	35		35	The word “causal” should be deleted here because the spatial pattern analysis is about correlation, not causality. Suggest re-writing sentence to read: “The spatial analysis of the correlation between temperature changes and changes in natural systems follows these stages:” (Govt. of USA)
320	4	36	4	37	Please state the time period over which the warming of individual cells has been identified. (From Figure SPM-1 it appears to be 1970 - 2004, but this should be clarified so the period of warming can be related to the period over which changes in the natural systems (following sentence) have been identified. (Govt. of New Zealand)
321	4	36	4	36	Are temperature changes here refer to changes in annual mean temperature? (Govt. of Thailand)
322	4	36		37	Suggest inserting “observed” before “significant warming”, and insert “over the last three decades” at the end of this sentence. (Govt. of USA)
323	4	38	4	39	Please state the time period over which the observed changes in the natural systems have been identified in individual cells. Is it the same period as for the temperature analysis (preceding lines, 36-37). (Govt. of New Zealand)
324	4	39		39	Suggest inserting “(defined as greater than 0.2°C over 1970 to 2004)” after “warming” because in this case warming means something very specific. (Govt. of USA)
325	4	42	4	44	Why not use the terminology defined in Endbox 2 to describe confidence? (Govt. of Thailand)
326	4	42		44	This sentence is somewhat diffuse. What does significant at more than the 1% level mean (is it virtually certain, as defined in end box 2)? Does "location of the observed changes" actually mean "the observed local changes"? (Govt. of Norway)
327	4	42		48	These two paragraphs seem to counter the argument made on page 3, lines 28-32. Can the authors reconcile? Statements in the box should reflect the limitations to attribution evident in the underlying chapter and in the description on the previous page. (Govt. of USA)
328	4	42		43	SPM-1: Please explain the significance of "the 1% level" (Govt. of Finland)
329	4	47	4	48	The Box presents a well founded explanation for attributing anthropogenic causes to the observed changes in many natural systems. Therefore, it should be convenient to remark this conclusion by means of a clearer reference to climate change.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Consequently the closing sentence in Box SPM-1, should read as follows: "this shows a discernible human influence in climate change impacts on many natural systems" (Govt. of Argentina)
330	4	48	4	48	Box SPM-1: please replace "natural systems" by "physical and biological systems". (Govt. of The Netherlands)
331	4	49	3	50	These impacts also apply to animal health, which is of key importance for subsistence farmers, as well as threats to industrial agriculture (cf bluetongue outbreaks in Netherlands last year). Although research may be limited in these areas, it would be helpful to cite it. (Govt. of UK)
332	5	0	5	11	Figure SPM-1 For areas that lack studies, such as most of Asia and Africa, is it because of lack of capacity or interested to collect data, or because there was not observable trend? (Govt. of Thailand)
333	5	0			Figure: Please, change colours. The colours assigned for the Observations and for the Temperature change are very similar and it is very difficult to see the differences in the figure. (Govt. of Spain)
334	5	0			FIGURE SPM-1: This sole figure in the SPM is rather hard to understand. It does convey a lot of very useful information but it takes some time for the reader to extract the key messages from this Figure. We suggest the following changes to improve readability of this key Figure: 1) Delete the box explaining the different size dots for Europe. Instead, include in the Figure caption lines 30-31 from page 58 of the Technical Summary (which reads "dots represent about 75 studies which have >29,000 data series, of which about 27,800 are from European phonological studies."). 2) Provide some text that essentially walks the reader through the graphic so they know where to look first, 3) The gradations for the change in temperature between 1970 and 2004 are inconsistent. This requires explanation. Alternatively, qualitative descriptors of temp change could be used (i.e. warming/significant warming or temp decrease/increase) 4) provide an improved map which shows the polar regions better - it is unclear in the present map whether observations in the Canadian high arctic are marine or terrestrial, 5) choose colours for the dots that differ significantly from the colours used to depict areas where observed temperature has decreased, 6) consider deleting the small 4-celled boxes showing significant changes for Terrestrial, Marine and Global and just still to the regional boxes (or vice-versa). This would allow you, perhaps, to move the explanatory box to the same space as the smaller boxes so they more clearly belonged together. (Govt. of Canada)
335	5	0			Figure SPM-1. The figure caption indicates that locations of observed changes in physical and biological systems are shown on the map. This (along with information provided in line 21, pg 3 of SPM (and Ch 1, 57-58) would indicate that all observed changes, regardless of direction have been shown. While the tables provided indicate the proportion of observations that are consistent with warming, this provides no information on where they are consistent with warming as they are summarized for rather large regions. Although for most regions there is a rather large proportion of observations consistent with warming, the location of observations within that region that are not consistent with warming is also important. The figure does not show the spatial variation in the agreement between observed changes in systems and temperature. (Govt. of Canada)
336	5	0			Figure SPM-1 contains too much information which makes it difficult to digest. Please see if this information may be presented in two separate Figures. (Govt. of Pakistan)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
337	5	0			Fig. SPM-1. Is there a specified area for which the number of observations has been recorded on the map? For example, is it for each grid cell on the temperature map? It is difficult to know how to interpret several overlapping small dots outside of Europe vs. larger dots inside Europe. The close proximity of some observations is important if they are treated as separate observations - are several observations/time series (related to same phenomenon) essentially in the same location etc. (Govt. of Canada)
338	5	1	5	11	Taking into account the observed changes in biological systems in Central America (golden frog extinction) and the endangered situation of Monarch butterflies in Mexico, it is suggested to place LA instead on SAM at the foot of the figure and in the explanatory text. This change will bring the official designation of one of the IPCC Regions. Although a reflection on the outstanding differences in the number of cases observed, between developed and developing regions corresponds to Section E, this gap in information should be reported for decision making 's actions. (Govt. of Argentina)
339	5	1	5	11	It is clear from the map that observed changes are concentrated in some regions more than others. Is this because there are no relevant researches in other areas, or there are in fact no significant observed changes in the left-out areas? (Govt. of Thailand)
340	5	1	5	11	Figure SPM 1 is very useful and succinctly captures a vast amount of information. Suggest that the scale for European studies is improved as it is currently very unclear in the figure. In addition more explanation of exactly what has been counted for the TER, MFW and GLO boxes is needed. The 4 cubed boxes showing the 'significant observed changes and % of significant changes consistent with global warming are, however, a little misleading. The studies referred to do not necessarily cover all significant observed changes in physical and biological systems and, given the subject of the report, are possibly biased towards observed changes which are likely to have a climate change component. The second last sentence could be changed to "Boxes are for (i) continental regions.....Global(GLO) changes in physical and biological systems based on the studies available." (Govt. of Australia)
341	5	1		11	The number of biological systems data sets in Europe is 28,118, approximately 97% of the global biological data sets considered in this figure. Because of this large percentage, the terrestrial and global trends on “% of significant changes consistent w/ warming” essentially only reflect the trends in Europe. What are the global trends outside Europe? (Govt. of USA)
342	5	1		11	In Figure 1, although most of the observations presented in this Figure for the Latin America region correspond to observations collected in Chilean territory, this is not indicated. It is proposed to include a note in the body of the text, possibly Section E, stating this. (Govt. of Chile)
343	5	1		11	Figure SPM1. It is not evident how this figure (showing temperature changes) concurs with Figure 3.9 of Chapter 3 of the WGI report. In the latter, for almost the same period (1979-2005) in the west coast of South America a decrease of temperature is showed, whereas positive anomalies (temperature increase) are presented in Figure SPM1. It is likely that in this period there is a strong impact of the PDO which needs to be taken into account in the analysis. (Govt. of Chile)
344	5	2		11	The top of this figure requires a title. Suggest: “Temperature changes since 1970 and observed changes in physical and biological systems” (Govt. of USA)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
345	5	2		11	According to Figure SPM-1, there are some observations in physical and biological systems in areas where there are no data to support a temperature trend. If these observations show changes that one would expect with warming, are these observations included in the percentage estimates shown as ‘% of significant changes consistent w/ warming’? (Govt. of USA)
346	5	5			Figure SPM-1: As not only temperature is responsible for the observed effects in natural systems please insert after "2004": "Temperature rise is selected as the major climate variable because it has a strong and widespread documented signal in recent decades, demonstrates an anthropogenic signal, and has an important influence on many physical and biological processes. Effects of changes in other climate variables related to temperature rise, such as sea-level rise and changes in runoff due to earlier snowmelt, are also considered." [chapter 1.1.1, first para] (Govt. of Germany)
347	5	6	5	6	It is should be considered to specify the exact number of datasets (instead of using >). The current text opens for uncertainty. In addition, clarify the difference between datasets and number of observed changes. (Govt. of Norway)
348	5	6		6	Insert “(of which ~27,800 are from European phenological studies of flora and fauna)” after “>29,000 data series”. (Govt. of USA)
349	5	7	5	7	Trend' in what - temperature; physical/biological systems...? (Govt. of Australia)
350	5	8	5	8	The authors should confirm whether New Zealand is also included in the abbreviation AUS. (Govt. of Australia)
351	5	51	3	52	It is not clear what these impacts are and what a shorter vehicle travel seasons actually means for the people living in the Arctic. Please clarify. (Govt. of UK)
352	5	51	4	52	It would be helpful to also mention human impacts of drought in particular, and broader water management issues (flooding) - For example, 'more frequent and intense extreme weather events in some regions and persistent low rainfall in other regions have caused damages to socio-economic systems' (ch.1.3). (Govt. of UK)
353	5		5		Figure SPM-1: To maintain consistency with the underlying chapters of regions, suggest that the observations for small islands be included in this figure. (Govt. of Japan)
354	5				We think that the matrixes under the map might be more readable if they are substituted by, for example, bar graphs and the regions are written in full-text. (Govt. of Norway)
355	5				Figure SPM-1: We would suggest to move the explanatory table of the fourfold table closer to the tables. The last three aggregate tables (terrestrial and water ecosystems, global) are somewhat doubtful, as practically all the observations (99%) are from Europe. It would be good to emphasize the fact that majority of both the physical and biological observations are from the Northern hemisphere. (Govt. of Finland)
356	6	0	5		In Figure SPM1, the Southern hemisphere is strakingly blank. Please clarify whether this is due to the lack of actual observed changes or the lack of observational data.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of UK)
357	6	0	5		Figure SPM1 would benefit by being presented in landscape rather than portrait. (Govt. of UK)
358	6	0			For the whole section C, it would be useful to add information with regards to the timescale when the projected effects are likely to occur, or at least to indicate which are the ones forecasted to occur earlier. (Govt. of Chile)
359	6	1	6	1	Request insertion of "vulnerability" into heading for section C. Should read "Current knowledge about vulnerability and future impacts". In the introduction, the writers state that one of the aims of this report is to assess vulnerabilities. It seems odd that this has been omitted from the heading. (Govt. of Japan)
360	6	1	6	1	(A conceptual comment from the future studies point of view:) Should the title of the section C be "Current inference of future impacts" rather than "knowledge about"? After all, it is questionable whether we can talk about knowledge of the future. (Govt. of Finland)
361	6	1	10	20	Section C. The text on sectoral and regional impacts does not contain a single summary statement (in bold face). First, a statement should be added at the beginning of Section C emphasizing that many different types of systems (TS FGD p. 67 lines 3-4 mentions "social, economic, biological, and geophysical systems") in all world regions will be impacted by anthropogenic climate change. Second, a summary statement in bold face should be added for each sector/system (possibly using one of the bold statements in Section TS 4.1 of the TS FGD) and for each region (possibly from Section TS.4.2). (European Commission)
362	6	1	15	42	This entire section could be much more useful to policymakers if the information was organized in terms of estimated near-term (i.e., 2030 or 2050) and long-term (2100) impacts—the goal being to better delineate impacts into those that are less sensitive to future emission scenarios and those that are more sensitive to future emissions, so as to better inform adaptation and mitigation decisionmaking. (Govt. of USA)
363	6	1	15	41	The U.S. Government finds this version of the future impacts and adaptation section of the SPM to be less informative and precise than the previous version. It has lost the balance between impacts and adaptation – now it is only focused on impacts – and lost the detail of the second-order draft. Is there a reason why the boxes from the previous version were omitted? Their inclusion provided much more detail from each of the chapters than the current version, which only provides three to five points for each sector/region. A problem with the current list of future impacts is that it doesn't seem to follow any clearly discernible criteria for deciding which key points from the chapters were included and which were not. The summary would benefit greatly from revision that presented a condensed set of major points with the balance and detail contained in the Technical Summary. Rather than specifying which points from the underlying chapters to be included, the U.S. Government asks that the authors choose some appropriate criteria, such as statements with the greatest confidence, major findings in the Executive Summary, findings with strong scientific basis, etc., and decide the statements to include accordingly. The U.S. Government looks forward to the re-write and welcomes identification of the criteria. The major glaring omission in this version is the exclusion of statements that account for or include adaptation. Section C in the SPM corresponds to Sections B and C in the underlying Working Group II report. These sections in the report address future impacts and adaptation (emphasis added). However, Section C in the SPM does not fully reflect the assessment of adaptation in these sections. It assumes no increases in adaptive capacity because of climate policy but is silent on what it does assume about natural and human adaptation. This is particularly problematic because the section does not limit its discussion to future impacts: it also makes statements about vulnerability and risk. Without a clear acknowledgment of the role or possible role of

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					adaptation, these impact statements and their associated assumptions about sustainable development (pg. 6, line 20; pg.8, line 28-29), human-induced pressure on coasts (pg. 7, line 13), people at risk from flooding (pg. 7, line 19-22), health (pg. 7, line 44), hunger (pg.8, line 33), over-fishing (pg. 8, line 18), and livelihoods (pg.8, line 7) are unexplained and potentially misleading. The U.S. Government recommends looking to the underlying chapters and the Technical Summary for significant adaptation-related findings to include. These should address demonstrated adaptations, both autonomous and planned, and how they are projected to evolve over time. The U.S. Government believes one should expect in a business-as-usual world that adaptation would occur regardless of climate policy because that has been business-as-usual for millennia, at least for activities such as water management, agriculture, diseases control, and so forth. In addition, the U.S. Government recommends inclusion of some discussion of the role of socio-economic and other non-climate factors, as these play important roles in both reducing and increasing vulnerability to climate risks. Climate change, for the most part, exacerbates existing problems rather than creates brand new ones (although location specific details may vary). Fortunately, the information providing this context exists in the chapters and, in many cases, in the Technical Summary. (Govt. of USA)
364	6	1	15	42	The failure and/or inability of current impacts assessments to adequately estimate future adaptation and increases in adaptive capacity is critical and relevant to everything in this section, including estimates of likelihood and/or confidence levels. However, many policymakers will not necessarily appreciate the importance of these limitations. Accordingly, the U.S. Government thinks they are owed a more transparent explanation of their consequences with respect to impact estimates in the introduction to this section and in the footnotes for the tables. (Govt. of USA)
365	6	1	15	42	The basis for statements of likelihood (scenarios/models/methodological studies/expert judgment of authors involved) needs to be made very clear in this section, both so that policymakers can understand their basis and to ensure that the document stands up to scrutiny by the expert community over time. Are these statements on the basis of models? If so, what provides the basis for medium/high confidence? Agreement between models? What is the basis for statements of likelihood? Models? Statistical studies? Expert judgment? The basis for such statements has generally been made clear in WG I; it is important that this document do so as well. Second, the inclusion of both likelihood and confidence language in many statements in this section is confusing and not in keeping with a careful application of the guidelines for confidence and likelihood statements as required throughout the assessment. The U.S. Government believes adherence to the guidance is important to ensure that findings are conveyed to the reader with the appropriate description of certainty. The U.S. Government strongly urges the authors to use only the appropriate form of uncertainty language, as reflected in the underlying text, and not to combine them (i.e., in ways that say that something is likely with high confidence.). In addition, the U.S. Government believes confidence statements should be articulated as part of a sentence (either with "There is medium confidence that..." or in bracketed statement at the end of the sentence) as opposed to asterisks. (Govt. of USA)
366 A	6	1	15	41	Section C. statements about future impacts in Section C combine a likelihood estimate (e.g., "very likely") with a confidence estimate (e.g., "medium confidence"). This combination of likelihood and confidence language makes these statements very inaccessible to the reader and is not explained. Can they really be combined in this way? Is it consistent with the "Guidance Notes for Lead Authors of the IPCC Fourth Assessment Report on Addressing Uncertainties" (July 2005) which seems to imply that confidence and likelihood statements are to be used alternatively, depending on the degree of quantitative information available. We suggest only using one category, either likelihood statements (where possible) or confidence level statements. (Govt. of Germany)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
366 B	6	1	15	41	Comment on Section C: Throughout the SPM, in particular this section, temperature changes should be expressed relative to pre-industrial levels, as was done in the SOD. The reason is that this very policy-relevant as for example the EU has set itself an objective of avoiding warming beyond 2 degrees above pre-industrial levels. Other thresholds are also often stated with regard to pre-industrial levels. In terms of defining what level of climate change is dangerous, the reference to the pre-industrial levels is more relevant than the more arbitrary one of 1990. (Govt. of Germany)
367	6	1	15	41	General comment The freshwater issue should be omnipresent in WG 2 'SPM. As reported by the World Bank: “If the wars of the 20th century were fought over oil, the wars of this century will be fought over water” The analysis of the eight sectoral issues, on which the current knowledge about future impacts is reported, show the freshwater issue being mentioned under: Water, in page 6 and lines 12 to 23, Food, in page 7, lines 7 and 8 Health, in page 7, lines 46 and 47 The analysis further noted that not all the sectoral issues are referred with the name assigned to each corresponding chapter. This could be explained by the fact that the SPM does not include any reference to freshwater resources management, therefore it was opportune to head the conclusions under “Water” only. Furthermore, the reading of the chapters, i.e.: Chapter 3. Freshwater Resources and their Management Chapter 4. Ecosystems and their goods and services Chapter 5. Food, Fiber and Forest Chapter 8. Human Health, and 6 and 7, which are mentioned in Section C with their complete designation, shows that their complete texts include more information on the freshwater problematic. Also the Regional Chapters deal with this issue which has already appears as key issue in many countries. The Government of Argentina understands the efforts made to succinctly report the key issues in each sector; however the freshwater issue should be not restricted to the topics encompassed between lines 12 and 23, in page 6. Chapter 3, Freshwater Resources and their Management, includes various issues of great interest to decision makers which, at least, have them have the same importance than the three conclusions shown under this Section. Some of them, having great socio-economic importance could have been crossed-cut with other relevant chapters, like it is the case of the insidious underground water contamination with elements like Arsenic and Fluoride, which also falls under Chapter 8 Human Health. More than 200 million people are seriously affected; however, the assistance recently provided from bilateral projects, has led to drilling millions of wells in areas where the Arsenic pollution cancel out the efforts made. Therefore, decision making must be informed, so to obviate the repetition of the same mistake. Other questions, like the importance of informing decision making on other key issues, like the availability and problems regarding the replenishing underground freshwater sources under climate change, are missing. This, together with the increasing adversities deriving from extreme precipitation events, might also be included in the conclusion under Chapter 7 and crossed-cut with Chapter 3.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Moreover, although Chapter 20 may refer the concept of water governance as a tool for sustainable development, the wider problem of water management under climate change falls completely under Chapter 3. In consequence, it pertains to Section C, under Water (which should read Freshwater Resources and their Management) to inform water managers and planners about the implications of climate change on the water resources management. Additional comments would be made when commenting on Chapter 3. A fourth bullet, under this sub-section should cover this important matter. (Govt. of Argentina)
368	6	1			The assumption for Section C that climate change is not mitigated, and that adaptive capacity has not been enhanced by climate policy is very vague in so far as the temperature increase according to Working Group 1 SPM might be anything between 1 and more than 6 degrees centigrade. It is obvious that there will be a significant difference in impacts depending on the actual emission path way and the true climate sensitivity. The assumption made is therefore in practice meaningless and should be deleted. For future impacts that have not been linked to global temperature increase relative to 1990 additional information on the upper limit of temperature increase coherent with the statement should be provided. (Govt. of Austria)
369	6	1			In section C there needs to be a clearer sense of the relative impact of climate change growing over time. At the moment the only time expression is in the first sentence of the section ('over this century'). If individual judgements are read in isolation it gives the misleading impression that impacts are more immediate. (Govt. of Australia)
370	6	1			In section C the order of the individual findings in section C should be rearranged within each subheading according to the confidence with which the judgement is held, with those with the highest confidence being listed first. (For example the section on Food currently lists three judgements with 'medium confidence' before a 'high confidence' judgement. This should be reversed.) (Govt. of Australia)
371	6	1			All statements about future impacts combine a likelihood estimate (e.g., "very likely") with a confidence estimate (e.g., "medium confidence"). This combination of likelihood and confidence language makes these statements very inaccessible. The SPM does not provide any guidance how the two types of qualifiers might be combined. We ask for abandoning this practice and use only one type of qualifiers. (Govt. of The Netherlands)
372	6	3	4	50	Box SPM-1 is confusing, what is the observed temperatures box together with the N+A forcing? (Govt. of UK)
373	6	3	6	4	What years include "over this century"? Qualification is suggested to avoid diverse interpretations. A specific timeframe reference would be helpful to the policymaker reader. (Govt. of Japan)
374	6	3	6	5	What about Key Vulnerabilities? This is nowhere mentioned and effects need to be mentioned in relation to the "relevance" issue. (Govt. of Germany)
375	6	3	6	4	The clause "sector and region over this century" needs clarification (i.e. are the expected impacts to occur by 2100, or before? And if they are before, do dates need to be provided for those impacts?) (Govt. of Australia)
376	6	3	6	3	Suggest to change "...impact in each system and sector and region..." to "...impact by system and sector, and by region..."

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Mexico)
377	6	3	6	3	SPM should focus on what has been new since TAR. (noticed here as N). What is the implication of the letter D (development)? If it implies improved knowledge compared to TAR, the improvement should be explained. (Govt. of Sweden)
378	6	3	6	8	It would be useful to include an explanation of why impacts are generally more difficult to predict than physical climate changes - e.g. reliance on regional projections, complex interactions between multiple factors like pests, extremes, human effects (Govt. of UK)
379	6	3	6	6	Insert footnotes 7 and 8 in the main text. These are very important remarks that needs to be highlighted more to the reader. (Govt. of Sweden)
380	6	3		8	Amend this introduction to provide context for the findings, including a fuller description of adaptation, and a clarification of what is meant by "climate policy." (Govt. of USA)
381	6	4	6	5	Whereas it probably is so, that the summarised projected impacts are made under the assumption of "that adaptive capacity (resp. adaptation) has not been enhanced by climate policy", it is less evident that the assumption of "non-mitigated climate change" applies regardless of whether the climate scenarios underlying the impact results are based on SRES or not. In a number of cases, it appears that projected impacts are terms for some amount of climate change (e.g. "global average temperature exceeds 1,5-2,5oC" on lines 34-35) that might come to happen both in mitigated and non-mitigated cases, depending on the development of the socio-economic drivers (that under the different SRES lead to different emissions pathways) and the actual amount of mitigation. A suggested formulation would be: "It assumes that adaptive capacity (resp. adaptation) has not been enhanced by climate policy. The severity, timing and extent of the impacts refer to specific measures/amounts of climate change. Mitigation would always reduce the latter compared to non-mitigated conditions for similar socio-economic development. Some of the considered climate change drivers and subsequently impacts might come to pass under some cases of mitigated climate change. On the other hand, some of the considered climate change drivers and subsequently impacts might not occur under the less emission-intensive non-mitigated socio-economic and climate futures (e.g. SRES B1)". (Govt. of Sweden)
382	6	4	6	4	The words, "It asuumes that climate...." are not clear. What is it that makes the assumption? If it is the summary then it should be written "The summary assumes that climate...". (Govt of Malawi)
383	6	4	6	5	The second sentence is awkward and unclear. It would be improved by using the language from caption of Table SPM-1, specifically: "Most impacts have been estimated from modeling analyses based on scenarios of altered climate that assume unmitigated climate change and adaptation not enhanced by climate policy." (Govt. of Canada)
384	6	4	6	4	The authors should provide in a footnote the factors that were considered in determining "relevance for people and the environment". (Govt. of Australia)
385	6	4	6	5	Delete the sentence of "It assumes that climate change is not mitigated, and that adaptive capacity has not been enhanced by climate policy." because different climate scenarios have included mitigation, and adaptation, so their impacts should involve different mitigation and enhanced adaptation. (Govt. of China)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
386	6	4	6	4	“...judged in terms of relevance for people and the environment...” leaves the reader wondering what the basis of judging was? How was relevance to people and/the environment determined? This should be edited. Additionally, the term ‘humans’ and/or ‘human societies’ should be employed instead of ‘people’. (Govt. of Japan)
387	6	4		4	Suggest deleting “judged in terms of relevance for people and the environment”. This is an assessment of knowledge about future impacts. What does the ‘judgment’ refer to? Does this refer to how the authors came to likelihood/confidence levels? (Govt. of USA)
388	6	5	6	6	The second order draft included only temperature changes relative to the pre-industrial level. In an attempt to be more consistent with WG 1 SPM this draft also includes temperature changes relative to 1990. This is in principle fine. However, some additional text (citing SPM WG1) is suggested to be included in order to inform the reader that most of the observed increase on globally averaged temperatures since the mid-20th century (0,6 degrees centigrade) are caused by anthropogenic GHG increase. It is also suggested that the text informs the reader that in order to describe the anthropogenic impact on climate change careful consideration should be given to the appropriate baseline and that a running 30-years average (that is used in climatology) would mask the full anthropogenic impact. (Govt. of Austria)
389	6	5	6	5	Suggest to eliminate "by climate policy" at the end of the sentence. (Govt. of Mexico)
390	6	5	6	5	It would seem that there would be multiple benefits and drivers to increase adaptive capacity in addition to climate. Suggest either deleting “climate” or delete “by climate policy”. Furthermore, it should be made clear whether the adaptive capacity assumed is the current adaptive capacity, or those of some (what?) reference scenario. (IPIECA)
391	6	5	6	6	It is not clear if this refers to the actual temperature of the year 1990, or to some mean around 1990. Lately, the Group I has referred to the average 1980-1999. Please be perfectly clear. See also comment on Note 8 on the same page. (Govt. of France)
392	6	5	6	5	In many of the agricultural and coastal studies adaptation measures are attempted to be included. The part of the sentence that read "and that adaptive capacity has not been enhanced by climate policy" is therefore potentially misleading. What is really meant here? A number of crop yield studies included adaptation options? Were these omitted from the analysis? A separate clearer sentence is needed on the role of adaptation in the studies reviewed and reported is needed here whether or not they are to do with climate policy (what is that anyway?) If the point is literally about "adaptive capacity" then it should be deleted as this covered in Section D. (Govt. of Germany)
393	6	5	6	5	"Adaptive capacity" should be explained or reference to definition in Endbox 1 should be given. (Govt. of Norway)
394	6	5		6	“All global temperature changes are expressed for the year 2100(?) relative to 1990, unless otherwise stated.” Authors should clarify if all temperatures are year 2100 projections. (Govt. of USA)
395	6	6	6	7	The word 'changes' appearing after "sea-level" may be deleted. It looks superfluous.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Pakistan)
396	6	6	6	6	Are the temperature changes really relative to 1990, or are they relative to an average over a period (10 years? 30?) centred on 1990? Please specify. (Govt. of New Zealand)
397	6	6	6	6	"Relative to 1990", usually it should be 1990s as baseline? check again. (Govt. of China)
398	6	8	6	8	Add short sentence pointing to direct CO2 effects on natural systems. The preceding sentences are hard to modify to get this issue mentioned at the beginning of this section, which is important. (Govt. of Germany)
399	6	10	6	10	There is a need for chapeaus for each of the two subsections of Section C. Suggest adding one short paragraph to state research advances and most importantly to indicate whether conclusions here are consistent or inconsistent with those in TAR. Should also add a sentence indicating that some areas are already experiencing changes. (Govt. of Canada)
400	6	10	7	55	Section C. Systems and sectors. Comment: Whereas there are references to global average temperatures in the "Ecosystems" and "Food" sections there is no references to temperature in "Water", "Coastal systems and low-lying areas", "Industry, settlement and society" and "Health". Although the Table SPM-1 contains some information to this global average temperatures it could be useful to give at least one example of global average temperature interval in each systems and sectors in pages 6 and 7. (Govt. of Spain)
401	6	10	7	55	Section C. Systems and sectors. Comment: Due to this section is related to systems and sectors it could be necessary to remove any reference to specific continents: Asia could be found in page 6, line 15 and in page 7, line 22 and there is no other reference to other high vulnerable continents as Africa and South America. (Govt. of Spain)
402	6	10	10	20	There is scope for policymakers to be confused in this section over the use of the calibrated 'confidence' scale (Table 3 in the Guidance note for authors of the IPCC ... on addressing uncertainties) and the calibrated 'likelihood' scale (Table 4 in the same document), to refer to the same statement. An example is page 7 lines 4-5, where it is stated that global agricultural production ... is 'very likely' to decrease [i.e. it has been assessed that there is a >90% probability of this event, a decrease, occurring] , but the confidence level assigned to the statement would mean the statement has only a 50% chance of being correct. If we have only 50% confidence in an assessment of 'very likely' being correct, is it an appropriate assessment? Other places within this section where there may be problems are page 6 lines 34-35, 38-40, and 44-45; page 7 at line 40, lines 44-49, lines 51-52, and lines 54-55; page 8 lines 6-8, 11, 15-16, 23-24, 26-26, 29-30, 37-38, 40-42, and 48-51; page 9 lines 3-5, 22-24, 27-28, 35-36, and 45-47; page 10 lines 1-2. We suggest that EITHER the 'likelihood' scale OR the 'confidence' scale be used for statements but not both for the same statement, to limit the possibility of confusion. (Govt. of New Zealand)
403	6	10	10	20	Many of the statements in this section are unacceptably qualitative. We will give some specific examples below but are concerned that to make it clear what is new since the TAR, and to identify what is really relevant, the text needs to be more quantitative throughout this section. (Govt. of New Zealand)
404	6	10	10	39	Although we would prefer to have the Boxes covering the main expected impacts for Sectors (p. 12-13) and Regions (p.14-15) from the Second Order Draft re-inserted for the same sections in the current SPM (p.6-7 and p.8-9) (Box TS-5 and Box TS-6 (p. TS29-32 and p.TS50-54 are also good examples

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					of this style of presentation), we realize this is probably difficult at this point. Thus, we request that more comments with specific quantification be included in this section of the SPM. With quantitative data being the most effective vehicle for the transmission of this message, as it stands, the comments are overwhelmingly qualitative and lack the clarity required by policymakers to make confident decisions. Therefore further quantification is required. (Govt. of Japan)
405	6	10	10	20	A number of statements in this section are given a calibrated confidence rating of 'medium confidence'. In general, statements with 'medium confidence' (50% probability of statement being correct, thus 50% of it being wrong) do not appear to us to be particularly useful. If a confidence scale is to be used, we would prefer to have the statements re-phrased into a form which can be assigned a higher confidence. (Govt. of New Zealand)
406	6	10	10	20	We are concerned that this section appears to focus on the negatives (i.e. on the most vulnerable sectors and regions). It is our view that the assessment would be much stronger if it assessed both the negatives and positives, and only then, if appropriate, concluded that the negatives outweigh the positives. There is otherwise a danger those opposed to the IPCC process will show one could fill this section with an equal amount of positives as there currently are negatives, and use this to claim that the IPCC is not balanced and has a systematic negative bias. (Govt. of New Zealand)
407	6	12	6	23	The subsection on water fails to convey two important aspects of projected impacts. The following text should be added: (a) "The impact of climate change on water resources and freshwater ecosystems is negative in all IPCC regions." This statement is taken almost verbatim from TS FGD p. 19, lines 26-27. It should be added at the beginning of the subsection (possibly in bold face). (b) "Climate change will exacerbate many forms of water pollution, with impacts on ecosystems, human health, and water system variability and operating costs (high confidence)." This statement is taken almost verbatim from TS FGD p. 18, lines 48-50. (European Commission)
408	6	12	6	23	It should be made clear here that what the literature shows is .2 - 3.2 billion people additionally with increased water stress by 2050, and up to 3.4 billions additionally at risk by 2080, as referenced in Table 20.6. The current text does not reflect the magnitude of the situation. In addition, treating flood risk separately would make sense, as they are quite distinct (albeit related) phenomena. (Greenpeace)
409	6	12		23	This section seems to focus on freshwater and water resources but also refers to the hydrologic cycle in general. Without a sense of context – for example drought will be more extensive than areas of higher precipitation – addressing contrasting effects (e.g., drought and extreme precipitation events) in the same sentence will confuse policymakers. In addition, this section needs significant strengthening since hydrological cycle impacts are described but with only limited statements on potential social and environmental impacts. This section should be rewritten for clarity. (Govt. of USA)
410	6	12		23	The U.S. Government has comments on the specific findings included in this section, but reserves these pending the suggestion that the authors reconsider the current findings and choose findings from the underlying chapter or Technical Summary that provide major findings on future impacts AND adaptation, basis for statements, and singular assessment of uncertainty. (Govt. of USA)
411	6	13	6	13	We suggest to take in the sentences from the TS p.19, l 17-19 and l 24-25: "The impacts of climate change on freshwater systems and their management are mainly due to the observed and projected increases in temperature, evaporation and sea level, as well as precipitation variability (very high confidence)" and "The negative impacts of climate change on freshwater systems outweigh its benefits (high confidence)" eventually in bold.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Norway)
412	6	14	2	23	A rise in water temperature creates an increased demand for oxygen (DBO5), so climate change will directly affect superficial water quality. Furthermore, less precipitation will likely involve less runoff and, in consequence, greater concentration of pollutants in rivers and lakes.(TS, page 18, lines 48 to 50) (Govt. of Spain)
413	6	14	6	16	This does not convey the larger message which is that the impact of climate change on water resources affecting the largest numbers of people are overwhelmingly negative (see eg TS-19). Suggest "Runoff and water availability impacts are expected to be negative in most regions with some exception." and then continue with the original sentence more or less. (Govt. of Germany)
414	6	14	6	16	Suggest that this dot point is split in two to distinguish between areas where there will be increased water availability and areas where it will be reduced. Suggest finishing the first dot point after "SE Asia", with a new dot point to read "Due to projected increase in temperature, evaporation and precipitation variability water availability will decrease over much of the mid-latitudes and dry tropics, which are presently water-stressed areas, (the Mediterranean Basin, Western USA, Southern Africa, Northeastern Brazil and Southern and Eastern Australia" (this is derived from the TS). The authors also need to check the reference for "Eastern Australia" figure TS-5 seems to suggest it should be "Southern Australia". (Govt. of Australia)
415	6	14	6	14	For accuracy insert "areas in the" between "some" and "wet tropics". (Govt. of Australia)
416	6	14	6	16	Figure 3.4 of the main text could be inserted here. (Govt. of Thailand)
417	6	14	6	15	"...some wet tropics, including populous areas in E and SE Asia". Clarification of this text is required. It should read, "...some wet tropics, such as populous areas in E and SE Asia". (Govt. of Japan)
418	6	14	10	20	This text contains a series of 44 statements in which dual measures of expert judgment are applied. Each statement contains a measure of likelihood and a measure of confidence. In most cases the two measures are inconsistent, which will only confuse policymakers. For example:, Pg. 6, lines 14-16 reads: Runoff and water availability are very likely to increase at higher latitudes an in some wet tropics, including populous areas in E and SE Asia and decrease over much of the mid-latitudes and dry topics, which are presently water-stressed areas. (High confidence) Very likely indicates that in the expert judgment of the authors, the statement has >90% probability of being true. High confidence indicates that in the expert judgment of the authors the statement has about 8 out of 10 chances of being correct. Even worse, Pg. 8, lines 23-24 reads: Glacier melt in the Himalayas is virtually certain to increase recent flooding, rock avalanches for destabilized slopes and disruption of water resources. (High confidence)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Virtually certain indicates that in the expert judgment of the authors, the statement has >99% probability of being true. High confidence indicates that in the expert judgment of the authors the statement has about 8 out of 10 chances of being correct. Which of these two very different assessments should the policymaker use in evaluating this risk? One of the measures should be deleted from each statement. (IPIECA)
419	6	14			Is this limited to "tropics", or does it regard the whole inter-tropical area? Please be more precise if this is the case. (Govt. of France)
420	6	15	6	15	This part of the sentence is misleading (could be read by some to imply that all of East Asia is likely to experience increased water availability, which is incorrect) and needs more specific regional references. Suggest rewording to "including populous areas in TROPICAL E and SE Asia, and decrease over much of the mid-latitudes and dry tropics, which are presently water-stressed areas (eg (e.g. Mediterranean basin, Western USA, Southern Africa, Northeastern Brazil, southern and eastern Australia). (Govt. of Germany)
421	6	15	6	15	Suggest to change "E and SE" to "East and Southeast" (Govt. of Mexico)
422	6	15	6	15	should be be "including some populous areas in E Asia", as it most certainly does not include east-central China, for instance. (Greenpeace)
423	6	16	6	16	We propose to add the word "already" so the sentence will be "which are presently already water-stressed areas" (Govt. of Norway)
424	6	16	6	16	It is unclear what is meant by "resilience...many...exceeded". Suggest a quantitative measure of consequences, or that clearer terms be used. (IPIECA)
425	6	16	6	16	It is unclear if the last phrase "which are presently water-stressed areas" applies only to "dry tropics" (which would be obvious) or to "much of the mid-latitudes". Suggest deleting or making clear. (IPIECA)
426	6	16	6	16	Comment applies here, and throughout section C. The use of the *,**,*** to denote confidence levels is NOT reader friendly. Better to write out the words. (Govt. of Canada)
427	6	16	6	16	Add reference to effects of climate change on water pollution and one could take the sentence from TS-18 lines 48-50 "Higher water temperatures, increased precipitation intensity and longer periods of low flows are likely to exacerbate many forms of water pollution, with impacts on ecosystems, human health, and water system reliability and operating costs (high confidence)." (Govt. of Germany)
428	6	16			We suggest that definitions of confidence would be at the beginning of the SPM. It would also be easier for the reader if the asterisks were not used in the text as there is a possibility for confusion. Currently confidence is defined in three places (on page 6 and on table SPM-1, page 12, and Endbox 2., page 20) and likelihood on page 20.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Finland)
429	6	16			footnote 9: The conventions introduced for section C are welcome. (Govt. of Austria)
430	6	18	6	20	We propose to separate in two sentences the two types of extreme events mentioned in this paragraph (drought and extreme precipitation), as far as their impacts and effects are radically different and, in general, they will affect also different regions (Govt. of Spain)
431	6	18	6	19	This sentence describes two very different risks. It should therefore be split into two sentences, one on drought and the other on flood risk. (European Commission)
432	6	18	6	18	The WG1 SPM says extreme precipitation events are 'very likely' to become more frequent, this text says 'likely'. Please make the text consistent. Are extreme precipitation events going to increase in all areas and if so, can that be made more explicit - and if not, can the language be more specific about location? (Govt. of New Zealand)
433	6	18	6	20	Suggest to expand into two bullets on drought and floods as they are both major issues and deserve more space in the SPM (Govt. of Germany)
434	6	18	6	18	Replace "which are likely" by "which are also likely". (Govt of Malawi)
435	6	18	6	20	Need more explanation about why and how a finding is given the designation of D or N. For example, many of the NEW findings do not strike the reader who is familiar with the TAR as being new. This finding, about changes in extreme precipitation is one such example. What part of this finding is actually new? Same comment applies throughout section C. Some explanation for the D or N designation could go into the proposed Chapeau for the section. (Govt. of Canada)
436	6	18	6	20	It should be underlined that the extension of drought areas (a spatial extension) is due to the increase of frequency and length of drought spells (time extension), thus I would reformulate the sentence as follows: "Drought-affected areas will likely increase, drought spells in those areas are likely to increase in frequency and length; extreme precipitation events, which are likely to increase in frequency and intensity, will augment flood risk. Increase of frequency and severity of floods and droughts will have implications on sustainable development." (Govt. of Italy)
437	6	18	6	18	Are drought-affected areas everywhere going to increase and if not, can the language be more specific about location? Note WG1 SPM says 'likely' precipitation decrease in most sub-tropical land areas. (Govt. of New Zealand)
438	6	19	6	20	This sentence mentions "implications on sustainable development" without clarifying whether they would be negative or positive. Chapter 3 FGD clearly states that "Even with optimal water management, it is very likely that negative impacts on sustainable development cannot be avoided. Figure 3.8 shows some key cases around the world, where freshwater-related climate change impacts are threat to the sustainable development of the affected regions." (p. 41, lines 11-14). Hence, the last sentence should be changed to "Increases in the frequency and severity of floods and droughts will have negative impacts on sustainable development, even with optimal water management (very high confidence)." (European Commission)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
439	6	19	6	19	Replace "Increase of frequency" by "Increase in frequency". (Govt of Malawi)
440	6	19	6	19	Please replace "risk" by "probability". (Govt. of The Netherlands)
441	6	20	6	20	Should specify which indicators of Sustainable development. (Govt. of India)
442	6	20	6	20	should be: "...will have negative implications for sustainable development." (Greenpeace)
443	6	20	6	20	Are the "implications for sustainable development" positive or negative? The literature and this assessment indicates that the effects are negative hence would add "highly adverse" before " implications". (Govt. of Germany)
444	6	20	6	20	after "will have impacts on sustainable development": add "as well as lives and livelihoods, particularly of the most vulnerable people" ("sustainable development" suggests that the impacts are primarily a long-term problem, while there are also immediate consequences for those affected; this is well-documented). (Govt. of The Netherlands)
445	6	20			With regards to the sentence relating vulnerability of systems and sectors, with sustainable development, it is fair to state that there are implications on a series of systems and sectors, not only droughts as currently appears in the document. Thus, it is proposed to include in the heading of the whole Section C a more general comment with regards to this issue of vulnerability and sustainable development. (Govt. of Chile)
446	6	20			Regarding to the same issue of sustainable development, an important issue worth to include in a sentence or paragraph, would be one relating the effect of climate change and the availability of resources that are needed by several sectors. In the case of the use of resources (water is a good example, considering its increasing scarcity) that are needed by different sectors (social, economic) for their own development, heavy competition is likely to occur. (Govt. of Chile)
447	6	20			Please consider adding achieving to: ...will have implications on achieving sustainable development (Govt. of Finland)
SPM-448	6	22	6	23	We think that a geographical reference to (some of) these regions might be relevant here. (Govt. of Norway)
449	6	22	6	23	This sentence is unclear and confusing. It tries to pull together a discussion that is relatively complex in the main chapter where this issue is considered. Rewording should be considered. (Govt. of Norway)
450	6	22	6	22	"highly likely" needs to be replaced by "virtually certain" if one is talking of the global and continental scales outside of the Antarctic continent. (Govt. of Germany)
451	6	23	6	23	The comment 'where more than one sixth of the world population currently live' is sweeping and a formula not used in similar points elsewhere. It could be deleted.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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					(Govt. of Australia)
452	6	23	6	23	Should mention where 1/6th of the population live. (Govt. of India)
453	6	23	6	23	Could it be possible to be more specific and mention regions? (Govt of Switzerland)
454	6	23			Include: .. This will provoke impacts in water supply and agriculture. (Govt. of Bolivia)
455	6	25	6	40	Section on Ecosystems could consider including a bullet about most vulnerable systems, as was done under the section on Industry, Settlement and Society. (Govt. of Canada)
456	6	25		40	The U.S. Government has comments on the specific findings included in this section, but reserves these pending the suggestion that the authors reconsider the current findings and choose findings from the underlying chapter or Technical Summary that provide major findings on future impacts AND adaptation, basis for statements, and singular assessment of uncertainty. (Govt. of USA)
457	6	26	6	26	Please insert: The importance of forest ecosystems remains a key issue due to their dual role both as an adaptation and as a mitigation measure. (Govt. of Denmark)
458	6	27	6	28	This sentence could be reworked to read, "The impact of climate change, including indirect drivers such as wildfires and insects, is likely to exceed the resilience (i.e. their ability to adapt naturally) of some ecosystems this century". The use of the words 'many ecosystems' in the current draft could be easily misread as 'most' (Govt. of Australia)
459	6	27	6	27	The phrase "the resilience of many ecosystems" needs explaining. An alternate option would be to rephrase sentence without using the word "resilience" in which case, the sentence could read: "During this century it is extremely likely (virtually certain?) that ecosystems will be affected by an unprecedented combination of climate change, associated disturbances (e.g., wildfire, insects), and other global change drivers" (Govt. of Canada)
460	6	27	6	29	Suggest adding the following to this heading: "Projected future climate change and other human-induced pressures are virtually certain to be unprecedented compared with the past several hundred millennia" 4.1.2 (Greenpeace)
461	6	27	6	27	Replacing "resilience" with "ability to adapt" or "vigour" could make the sentence easier to understand (Govt. of Norway)
462	6	27	6	28	It is not clear from this sentence, it reads as though global change will increase the resilience. The sentence could be modified (Govt. of India)
463	6	27	6	27	Add before "this", "within a few decades and latest within" as this better characterises the range of risks and their onset times. (Govt. of Germany)
464	6	27	6	29	"Biodiversity" should be included. Suggest adding at end of sentence (line 28):" , leading to irreversible effects such as biodiversity loss through extinction.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Norway)
465	6	27		28	The "other global change drivers" might be specified (is it population and economic development?) (Govt. of Norway)
466	6	28	6	28	The phrase "and other global change drivers" is so broad as to be virtually meaningless. Suggest that, at the least, examples of other global change drivers are provided. (Govt. of Australia)
467	6	28	6	28	Provide a list of global change drivers: ... such as ... (Govt of Switzerland)
468	6	28	6	28	Please replace "drivers" by "pressures". (Govt. of The Netherlands)
469	6	28	6	28	Mention the drivers. (Govt. of India)
470	6	28	6	28	Associated' is vague, suggest rephrasing to 'consequential climate linked disturbances'. This also needs to encompass the idea of 'intensification' - see TS page 30, line 22. (Govt. of Australia)
471	6	28	6	28	Add after "climate change," , " increased CO2," to include the direct CO2 effects which are substantial (Govt. of Germany)
472	6	28	6	28	"...and other global change drivers". Qualification of this statement is requested. It is unclear as is. (Govt. of Japan)
473	6	31	6	32	The wording from Chapter 4 (page, line 20-21) of the underlying report: "The terrestrial biosphere is likely to become a net source of carbon throughout the course of this century" is much clearer than the wording used here. The phrase '..especially from previously under-estimated C stock' is confusing because it is not clear whether the size of some key carbon stocks has been under-estimated or whether the potential loss-rate has been under-estimated. The underlying text talks about losses occurring earlier than previously considered. (Govt. of Australia)
474	6	31	6	32	Is this because of the net loss or organic-C stock in the ecosystem? If so say so. (Govt. of Thailand)
475	6	31	6	32	If this is referring to methane in permafrost as per 4.4.6 (page 29) then it should say so. Otherwise, the only thing I find in section 4.2 is the reference to the C emissions due to the European summer heat wave. Unless this is explained, it is merely mysterious and open to interpretation. (Greenpeace)
476	6	31	6	32	after terrestrial ecosystems I would add " , on a global average," thus explaining that not all ecosystems will become a net source of carbon (Govt. of Italy)
477	6	31			We would like to have this point on the inconsistency of forest estimates considered and commented in the report: The FAO collects forest data on a global basis (FAO 2005). The global stock of forest vegetation carbon in these data is estimated at 283 Gigatonnes (Gt=Pg). Chapter IV, Fig. 4.1. shows an estimate of approximately 450-500 Pg that is , almost twice too high. Kauppi (2003) referring to earlier FAO reports and IPCC Third Assessment report has discussed the inconsistency of IPCC versus FAO data, an important point when estimating carbon sinks and sources. References: FAO 2005.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Global Forest Resources Assessment 2005. FAO Forestry Paper 147. http://www.fao.org/forestry/site/fra2005/en/ ; Kauppi, P.E. 2003. New, Low Estimate for Carbon Stock in Global Forest Vegetation Based on Inventory Data. <i>Silva Fennica</i> 37(4):451-457. http://www.tiedekirjasto.helsinki.fi:70/handle/1975/170 (Govt. of Finland)
478	6	31		32	It should be considered whether emission of methane (-hydrates) might also be relevant to mention in this context. (Govt. of Norway)
479	6	32	6	32	What does this mean: "previously underestimate CO2 stocks". Suggest delete. (Govt. of Germany)
480	6	32	6	32	The confidence reading for this conclusion (** = High), differs to that provided in the TS (medium), this apparent inconsistency needs to be rectified. (Govt. of Australia)
481	6	32	6	32	Suggest to change "C stocks" to "carbon stocks". (Govt. of Mexico)
482	6	32	6	32	Relevance to 'previously underestimated C stores' is overly technical and vague for a policy audience. In addition C should be spelt out as carbon. (Govt. of Australia)
483	6	32	6	32	Provide a list of C stocks: ... such as ... (Govt of Switzerland)
484	6	32	6	32	Please specify the previously under-estimated C stocks. (Govt. of Norway)
485	6	32	6	32	Please replace "C stock" by "carbon stock". (Govt. of The Netherlands)
486	6	32	6	32	"Under estimated C-stocks". It is not clear how under estimated C-stocks can amplify Climate Change (Govt. of India)
487	6	32	6	32	"...especially from previously under-estimated stocks" leaves the reader wondering what these might be. A few examples from the URL would clarify the text. (Govt. of Japan)
488	6	34	6	34	What categories and regions to be aware of needs to be mentioned (Govt. of India)
489	6	34	6	34	We propose the following change: "... if global average temperature INCREASE exceeds 1.5...". (Govt. of Norway)
490	6	34	6	34	Very poorly constructed summary point: phrase 'irreversible extinction' - is there any other form of extinction that is not irreversible; expression 'high risk' is not part of the IPCC uncertainty lexicon - TS page 20, line 35 uses 'likely'; 'roughly 20-30%' delete 'roughly' if a modifier is necessary try 'an estimated'. At this point the authors should also note the finding of Chapter 4 that ecosystems and species do have some capacity to adapt naturally and that some range changes may be beneficial for some species. (Govt. of Australia)
491	6	34	6	35	This statement has one star, representing 'medium confidence' i.e. a 50% chance the statement is true, but also a 50% chance it is false. Statements which

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					are as like to be false as true are not particularly helpful - can this be re-worded to make a statement which is more useful? (Govt. of New Zealand)
492	6	34	6	35	This sentence has several errors and inaccuracies. Obviously, the word "increase" is missing after "global mean temperature". Chapter 4 FGD states: "Due to climate change alone it has been estimated that by 2100 between 1% and 43% of endemic species (average 11.6%) will be committed to extinction (...), whereas following another approach (...) it has been estimated that on average 15% to 37% of species (combination of most optimistic assumptions 9%, most pessimistic 52%) will be committed to extinction by 2050 (i.e. that their range sizes will have begun shrinking and fragmenting in a way that guarantees their accelerated extinction)." (p. 46, lines 35-41). To reflect better the underlying text in the chapter, the text should be changed to "For a global mean temperature increase of 1.5-2.5°C, 20-30% of species will be committed to extinction on global average, whereby the rate varies from 1% to 80% across biota (medium confidence)." (European Commission)
493	6	34	6	35	This sentence appears to incorrect in that the projections are not for species extinctions per se but for commitment to extinction due to loss of suitable habitat. There is no sense of time frame here either. In addition, when is an extinction not "irreversible"? Suggest "Roughly at a global level 20-30% of species are likely to be committed to extinction if global average temperature rise exceeds 1.5-2.5°C. * N [4.4] Substantial commitments to extinction could occur by 2050". (Govt. of Germany)
494	6	34	6	35	shouldn't this be 'irreversibly committed to extinction'. I was unaware that extinction was reversible. (Greenpeace)
495	6	34	6	35	Need to add the word "increases" between "temperature" and "exceeds" (Govt. of Canada)
496	6	34	6	35	More enough evidence are needed to support the conclusion especialy for the temperature threshold, because in TS it just shows "increase risk" with medium confidence rather than "high risk". Please revise it. (Govt. of China)
497	6	34	6	34	It is unclear what is meant by likely to be at "high risk". Risk is commonly defined as a probability times an impact and that appears not to be the usage here? Suggest that this sentence be reconsidered since it has a number of qualifiers which when taken together is extremely confusing (roughly, medium confidence, likely, high risk). Suggest also deleting "irreversible" since that should be assumed for any extinction (is some other alternate definition of extinction being used here?). If there is no clear likelihood judgement possible for this statement, an alternative could be to simply state the range of results of (and number of) studies that come up with 20-30% of species. (IPIECA)
498	6	34	6	34	Is there another type of extinctions than irreversible? (Govt. of Finland)
499	6	34	6	35	In order to give be a better input to the policy makers and the community with regards to the figures presented in this sentence (20-30% of species are in a likely condition of irreversible extinction), it would be convenient to provide a breakdown of which are the type of species that are mostly in an endangered situation. (Govt. of Chile)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
500	6	34	6	34	Between words "temperature" and "exceeds" the word: "increase" should be put. (Govt. of Poland)
501	6	34	6	35	add 'endemic' before species and after temperature add 'increase'. (Govt. of The Netherlands)
502	6	34	6	34	Suggest clarification of "species" and insert "flora and fauna species". (Govt. of Japan)
503	6	35	6	35	(i) Temperature rise is more exact. (ii) Must be clear what is relative time for 1.5-2.5 degrees celsius. Presumably the authors mean with reference to current global temperature. (Govt. of Australia)
504	6	37	3	40	This sentence is too long and it should be broken up to facilitate easier reading comprehension. (Govt. of Japan)
505	6	37	6	37	Suggest to change "CO2" to "carbon dioxide" and the same all over the SPM (Govt. of Mexico)
506	6	37	6	37	Same comment as for page 6, line 35 re temperature rise/reference date. (Govt. of Australia)
507	6	37	6	40	Give some examples to substantiate the statement. (Govt. of Thailand)
508	6	37	6	37	Add "increases" before atmospheric (Govt. of India)
509	6	37	6	37	1.5-2.5 warming would not damage natural ecosystem so much according to Table SPM-1, so 1.5-2.5 is not appropriate. Please delete it or rewrite a series of temperature threshold to describe different ecosystems rather a simple aggregated threshold. (Govt. of China)
510	6	38	6	38	It is unclear what is meant by a "major" change. Suggest either giving a quantitative measure or deleting. (IPIECA)
511	6	40	6	40	Suggest inserting "ecosystem" before "goods and services". (Govt. of Australia)
512	6	40	6	41	It is proposed to move the sentence on the impact of climate change and availability of "goods and services" to a section such as "Water" or "Food" rather than in the case of the "Ecosystems" section where it is currently located. (Govt. of Chile)
513	6	40	6	40	Add "provided to humans" at the end of the sentence for clarification. (European Commission)
514	6	42	7	8	This whole food section seems to miss the point that 'global agricultural production' and hunger are very rarely connected...especially for those most at risk in sub-Saharan Africa, India, S. America and SE Asia. It should at least reference the range of additional millions at risk from hunger in tables 20.4 and 20.6 (up to 91 million by the 2080s, or up to 451 million if one totals the regional impacts from table 20.5)...and given the numbers referenced in the same tables for increased water stress, seem conservative indeed.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Greenpeace)
515	6	42	7	8	The U.S. Government has comments on the specific findings included in this section, but reserves these pending the suggestion that the authors reconsider the current findings and choose findings from the underlying chapter or Technical Summary that provide major findings on future impacts AND adaptation, basis for statements, and singular assessment of uncertainty. (Govt. of USA)
516	6	42	7	9	The bullets in this section all cover impacts on crops and food production. The associated chapter also included forest products so it seems there should be some statements on forest products impacts. Also, the bullets listed under "Food" could more completely summarize the findings of Chapter 5 in the underlying text. The current SPM does not mention the relative impacts of climate change and socio-economic pathways, a key point for policymakers. (Govt. of USA)
517	6	42	7	9	Some comments about "food" paragraph: Only the impacts of average temperature changes are assessed, it should be important to describe the impact of extreme temperature events, that are expected to increase in frequency, for crop production (i.e. heat waves, and froze days that are very important for quality productions in the Mediterranean basin) this aspect is not even mentioned in chapter 5.4. (Govt. of Italy)
518	6	42	7	8	Since it is mentioned in Chapter 5, it would be opportune to mention also the decrease of cattle production (meat and milk) under higher temperatures. This information has an important economic and social value. Although this issue is mentioned in some regional chapters, the reference could be inserted in the last bullet. (Govt. of Argentina)
519	6	42	7	8	SECTION FOOD PRODUCTION COMMENT: This section does not seem well balanced compared to the TS (Govt. of Germany)
520	6	44	6	45	This statement has one star, representing 'medium confidence' i.e. a 50% chance the statement is true, but also a 50% chance it is false. Statements which are as likely to be false as true are not particularly helpful - can this be re-worded to make a statement which is more useful? (Govt. of New Zealand)
521	6	44	6	46	Suggest adding some words (shown in CAPS) to this sentence to make clear that such studies include associated changes in CO2 and rainfall: "Crop yield potential is likely to increase at higher latitudes for global average temperature increases (AND ASSOCIATED CO2 INCREASES AND RAINFALL CHANGES) of up to....." (added text taken from page 21 of TS line 27.) (Govt. of Canada)
522	6	44	6	46	Congruent content to bullets in the same section on page 7, line 3-4 and page 7, line 1-2. Suggest the three be merged and new bullets referring to food production other than agricultural production be inserted. Text referring to impacts on fisheries (a vital food source for many human societies) should be inserted. "Local extinctions of particular fish species are expected at edges of ranges. (5.4.6)" from Box TS-5, page 30, line 47 of Technical Summary should be inserted into Food section text of SPM. Other text we suggest be added to this section from Box TS-5 of Technical Summary is line 40-41 "Smallholder and subsistence farmers, pastoralists and artisanal fisherfolk will suffer complex, localized impacts of climate change" and line 37-39, "Projected changes in the frequency and severity of extreme climate events, together with increases in risks of fire, pests, and disease outbreak, have significant consequences on food and forestry production, and food insecurity, in addition to impacts of projected mean climate". (Govt. of Japan)
523	6	44	7	8	Section Food, Comment: Food production: is there any knowledge about how warming affects crop pests and thereby food production globally/locally?

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Finland)
524	6	44	7	5	Replace with text from TS page 21: " In temperate regions, moderate warming benefits cereal crop and pasture yields, but even slight warming decreases yields in seasonally dry and tropical regions (medium confidence). Modelling results for a range of sites find that, in temperate regions, moderate to medium increases in local mean temperature (1-3°C), along with associated CO2 increase and rainfall changes, can have small beneficial impacts on crop yields. At lower latitudes, especially the seasonally dry tropics, even moderate temperature increases (1-2oC) are likely to have negative yield impacts for major cereals, which would increase the risk of hunger. Further warming has increasingly negative impacts in all regions (medium to low confidence) (see Figure TS-7). [5.4]" This a) gives more useful information b) is more accurate c) avoids introducing regions inconsistent terminology with those mentioned in the TS and Chapter. (Govt. of Germany)
525	6	45	6	45	For consistency with the TS insert "and rainfall changes" after "CO2 fertilisation". (Govt. of Australia)
526	6	47	6	47	Footnote 9: The authors should also include a reference to Endbox 2 to make it clear what the confidence readings mean. (Govt. of Australia)
527	6	47	6	47	Footnote 9. The depiction of 'confidence level in a statement' using a star * rating is easy to interpret and less intrusive than the text version. It would be good to see these annotations used throughout the Report. (Govt. of Australia)
528	6	47			Note 8: Please give the reference concerning the figure of 0.6 °C. The WG I has made no statement on the precise value of temperature increase from the "preindustrial area" to 1990. The closest possible statement in the SPM of WG1 is the increase in temperature of 0.76 °C from 1850-1899 to 2001-2005. Is the temperature during the preindustrial area considered to be the same as the temperature in the 1850-1899 period? (Govt. of France)
529	7	1	7	2	This statement has one star, representing 'medium confidence' i.e. a 50% chance the statement is true, but also a 50% chance it is false. Statements which are as like to be false as true are not particularly helpful - can this be re-worded to make a statement which is more useful? (Govt. of New Zealand)
530	7	1	7	2	There is an inconsistency between Chapter 5, p43, line 7 and this summary statement. Chapter 5 describes that "even slight warming in seasonally dry and tropical regions reduces yield" while the SPM at this point describes that "at lower latitudes, especially the seasonally dry tropics crop yield potential is likely to decrease". The chapter 5 sentence could be interpreted to mean seasonally dry regions anywhere (which would be in line with Australian expectations of yield impacts in dry temperate cropping regions), while the interpretation from SPM P7, L1 would be interpreted as "seasonally dry tropics" only. The concept of impacts on food supply being broadly attributable to high and low latitudes wasn't developed in Chapter 5, temperate and tropical were used instead. Suggest that this inconsistency is addressed by using the construction in Chapter 5. (Govt. of Australia)
531	7	1	7	1	The sentence "especially in the seasonnaly arid tropics" seems to be incoherent with chapter 5.4 where only "tropics" are mentioned. SPM should summarize and not add!! (Govt. of Italy)
532	7	1	7	2	Need to mention the geographic regions. (Govt. of India)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
533	7	1	7	2	It would be better if the range for "even small global temperature increases" is indicated (e.g, by less than 1 °C). (Govt. of Pakistan)
534	7	1	7	2	For the following: "...to decrease for even small global temperature increases" a quantification of temperature is suggested. (Govt. of Japan)
535	7	2	7	2	Please replace 'hunger' with 'famine' (Govt. of UK)
536	7	2	7	2	Insert "(1-2 degrees)" after "small global temperature increases" (Govt. of Australia)
537	7	2	7	2	An additional sentence should be included along the lines of "Further warming has increasingly negative impacts in all regions". (Govt. of Australia)
538	7	2	10	20	The chapters 9-16 in the IPCC fourth assessment report part two assesses the climate change literature on present day and future climate change impacts on regions, vulnerabilities to these impacts and strategies for adaptation. In the SPM, the main findings are summed up for each region. However, these summaries only emphasises impacts and vulnerabilities. Adaptation is addressed later in the SPM, but not with a clear region focus. Thus, it is suggested that the SPM follows the structure from the Report. This can be done by including a few additional sentences on adaptation in the regional summaries. For the region Europe the following sentences might be included:” For moderate global warming the adaptive capacity is high, although higher in the North than in the South and East due to their different socioeconomic systems. Hence, climate change is likely to create additional imbalances since negative impacts are likely to be largest where adaptive capacity is lowest.” This paragraph is taken from the Report, chapter 12 page 34. (Govt. of Norway)
539	7	2			With regards to “risk of hunger” it would be better to specify in which areas of the globe it is expected this outcome to be more likely to happen, according to the information compiled. (Govt. of Chile)
540	7	4	7	4	When speaking of increases in temperature, it would help policy readers to understand the reality of underlying studies if there was clarification on whether associated climate changes (eg. rainfall, CO2 fertilisation, extreme events) are taken into account. (Govt. of Australia)
541	7	4	7	5	This statement has one star, representing 'medium confidence' i.e. a 50% chance the statement is true, but also a 50% chance it is false. Statements which are as like to be false as true are not particularly helpful - can this be re-worded to make a statement which is more useful? We note the statement discusses an event which is assessed as having a likelihood of occurrence of greater than 90%, which appears somewhat inconsistent. (Govt. of New Zealand)
542	7	4	7	5	This sentence does not appear to be justified in the relevant section of the chapter 5.6 and looking across the regional chapters is difficult to see how it can be consistent with the aggregated regional findings. Suggest deleting and include the formulation from the TS as proposed above. (Govt. of Germany)
543	7	4	7	5	These two lines repeat the lines 44-45 of page 6. Please delete. (Govt. of France)
544	7	4	7	5	There are no enough evidences to support the conclusion above 3 , please delete “but above this it is very likely to decrease”. (Govt. of China)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
545	7	4	7	4	Add from TS 22 lines 10-11: "Climate change increases the number of people at risk of hunger marginally, with respect to overall large reductions due to socio-economic development (medium confidence)" and TS 22 lines 16-18 "Climate change and socio-economics combine to alter the regional distribution of hunger, with large negative effects on sub-Saharan Africa (low to medium confidence) [5.4, T5.6]. (Govt. of Germany)
546	7	7	7	8	This para seems weaker compared to the the conclusion in the ES chapter 5 : "Projected changes in the frequency and severity of extreme climate events have significant consequences for food and forestry production, and food insecurity, in addition to impacts of projected mean climate (high confidence). Use these sentences for the SPM. (Govt. of The Netherlands)
547	7	7	7	8	Revise first part to read "Increased frequency of heat stress, drought, floods and pest and pathogen outbreaks would affect local production negatively" Added material in 5.ES p.3, l. 21-28. The second part of phrase "especially in subsistence sectors at low latitudes" appears in the TS but not in Chapter 5, nor is it well supported by Chapter 5. (Govt. of Canada)
548	7	7	7	7	Replace "Increased frequency of droughts and floods" to "The increased frequency of droughts and floods projected for many regions", based on TS FGD p. 18, lines 25-26. (European Commission)
SPM-549	7	7	7	8	Replace "affect local production" with " affect local food and forestry production, and food security" and add after negatively: "beyond the impacts of mean climate change". This is the message contained in TS-22 lines 20-28 and adds to the message. (Govt. of Germany)
550	7	7	7	8	Need to specify areas in the SPM (Govt. of India)
551	7	7	7	8	Can we add lines 13-14, page 23 of Technical Summary to emphasize their constrained adaptive capacity and also the fact that this group belongs to a system that is complex diverse and risk prone (line 24, p.12 to line 8, p13 of Chapter 5); hence the urgent need for adaptation. (Govt. of Philippines)
552	7	7	7	7	Based on approved WGI SPM, the sentence should be changed into: "Increased frequency and severity of extremes climate events, such as heat stress, droughts....." (Govt. of China)
553	7	7			I suggest to changeand floods would affect local... byand floods shall affects local..... This is very important recognize that the effects of climate change already are provoquing impacts to the food local production. (Govt. of Bolivia)
SPM-554	7	8	7	8	A message such as the following from TS22 might be useful at this point: "Simulations suggest rising relative benefits of adaptation with low to moderate warming (medium confidence), although adaptation may stress water and environmental resources as warming increases (low confidence)." (Govt. of Germany)
555	7	10	7	22	This section lacks any sense of time dimension. At least in lines 19-20 this should be addressed (eg by 2100) (Govt. of Australia)
556	7	10	7	22	Can we highlight adaptation by adding the statement in lines 6-7, p.4 of Chapter 6 specifically, "adaptation costs for vulnerable coasts are much less than

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					the costs of inaction." (Govt. of Philippines)
557	7	10		22	The U.S. Government has comments on the specific findings included in this section, but reserves these pending the suggestion that the authors reconsider the current findings and choose findings from the underlying chapter or Technical Summary that provide major findings on future impacts AND adaptation, basis for statements, and singular assessment of uncertainty. (Govt. of USA)
558	7	10		22	Information presented in this section is very useful to highlight local weaknesses from coastal systems seeking to adapt to climate change and sea level rise. This is relevant to provide information regarding to relationships among impacts and vulnerability with human (social) related pressures on coastal areas. This is a subject with scarce local research, and it is an important aspect worth to be highlighted in the way it is currently done in the paragraph. In this respect, providing specific data related with sea level rise and temperature projections for the present century are considered appropriate for the process of assessment of policymakers. Also discussion of negative impacts related with oceanographic, meteorological and fisheries indicators, related with sea level rise are important to be included. (Govt. of Chile)
559	7	12	7	13	This needs to be revised to recognize that impacts are already being felt and being felt most particularly in densely populated regions. In addition, surely the probability is 'virtually certain'. Suggest the following text: "A high proportion of coastal regions, including the most densely populated, are virtually certain to be exposed to continuing and increasing risks from climate change and sea-level rise within coming decades, exacerbated by growing human pressures in coastal areas." (Govt. of Canada)
560	7	12			Since not all the coasts in the world are affected in the same way by sea level rise, it is proposed to precise the sentence including at the beginning of the sentence "some" or "several" coasts are very likely to be exposed to increasing risks... (Govt. of Chile)
561	7	13	7	22	Please consider moving upwards the sentence on line 19 starting: ..especially in densely populated and low-lying settlements where adaptive capacity is relatively low and which already face other challenges such as tropical storms or local coastal subsidence. The numbers affected will be largest in the mega-deltas of Asia but small islands face the highest relative increase in risk. *** D [6.3, 6.4, 16.3] and ending on line 22. Continue then with the text starting on line 15. (Govt. of Finland)
562	7	13	17	26	This section makes an important point stated on lines 16 to 18 which should be retained, and may well be judged to be a robust ("generally") finding of the literature. Suggest, however, that the figure, which highlights and might be contingent on the results of a single study, be removed. (IPIECA)
563	7	15	7	16	What does "a major decline" mean. It is suggested to replace this phrase by "regional extinction" since Chapter 6 FGD p. 9 line 16 mentions that "coral is replaced by other organisms". (European Commission)
SPM-564	7	15	7	15	The point on coral reefs seriously understates the risk. Reword to something like "It is likely that coral reefs will experience major decline, with regional extinctions and replacement by algal systems due to....as before" Chapter 4 Box 4.4

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Germany)
565	7	15	7	15	The phrase "major decline" is not helpful. Unless a better quantifier is used the authors should delete "a major decline due to". (Govt. of Australia)
566	7	15	7	17	Suggest "Coral reef systems will experience a major decline and extinction in major areas due to a combination of bleaching due to sea-temperature rise, increased acidity of the oceans, as well as increases in storm intensity. At. 2.3 to 3.1 deg above pre-industrialised temperatures, they are expected to be extinct globally" Box 4.4 and Table 4.1 (Greenpeace)
567	7	15	7	17	Later (page 16, 44-45) discussion of corals point to other stresses, and SPM-1 gives quantitative measures. This seems to make 3 different statements about corals. Suggest integrating to make these clearly self consistent. (IPIECA)
568	7	15	7	16	In this case a statement that an occurrence is 'likely' [> 66% probability] is given a confidence level of > 90%. While possibly correct, this is confusing. (Govt. of New Zealand)
569	7	15	7	16	How is the statement from line 47, p10 to line 1, p.11 of Chapter 6 ("Recent preliminary studies land support to the adaptive bleaching hypothesis indicating that the coral host may be able to adapt or acclimatise as a result of expelling one clade of symbiotic algae but recovering with a new one, creating 'new' ecospecies with temperature tolerances. Adaptation or acclimatisation might result in an increase in the threshold temperature at which bleaching occurs.") incorporated in the statement that "it is likely that corals will experience decline due to bleaching and mortality due to rising seawater temperatures?" (Govt. of Philippines)
570	7	16	7	16	Clarification/quantification of projected percentage is suggested. Is the reader to assume that all salt marshes and mangroves on the globe will be negatively affected by sea-level rise? (Govt. of Japan)
SPM-571	7	16	7	16	Add after "temperatures", "and the effects of increased CO2 on the ocean" (Govt. of Germany)
572	7	19	7	19	This SPM states "hundreds of millions" while figure SPM-2 gives estimates that appear much smaller. Fix. (IPIECA)
573	7	19	7	19	In regard to: "...hundreds of millions of people are vulnerable to flooding due to sea-level rise.", this section is supposed to be about knowledge about future impacts; thus "are" should be stated in the future tense. (Govt. of Japan)
574	7	19			The statement "Hundreds of millions of people are vulnerable to flooding due to sea-level rise..." is not coherent with the information in table SPM 1, which states "1-15m more people at risk of flooding." (Govt. of Norway)
575	7	21	7	21	We suggest to add the word "salinization" after tropical storms. Salinization is mentioned several places in the TS and report, but not in chapter C. So it should be mentioned, either here or e.g at p.6 under "Water" (Govt. of Norway)
576	7	21	7	21	Under Coastal Systems and Low-lying Areas, in the above mentioned line, it would be necessary to improve the sentence, replacing "The number of

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					people affected” in lieu of “The numbers affected” (Govt. of Argentina)
577	7	21	7	22	Rephrase the sentence: 'The number of people...' instead of 'The numbers ...' (Govt. of UK)
578	7	21			Instead of "or" in the line "challenges such as tropical storms or local coastal subsidence". Please add "and/" since tropical countries like the Philippines are highly vulnerable and have the least adaptive capacity to address impacts of sea-level rise and at the same time face challenges such as tropical storms and local coastal subsidence. (Govt. of Philippines)
579	7	22	7	22	Please clarify what 'relative' refers to. (Govt. of UK)
SPM-580	7	23	7	23	Add three points from the TS: TS-24 lines 38-39: "Adaptation for the coasts of developing countries is virtually certain to be more challenging than for coasts of developed countries (high confidence). TS-24 line 47: "Adaptation costs for vulnerable coasts are much less than the costs of inaction (high confidence)." and TS-25 lines 4-5: "The unavoidability of sea level rise even in the longer-term frequently conflicts with present-day human development patterns and trends (high confidence)." (Govt. of Germany)
581	7	24	7	40	We propose as an addition 'Socio-economic and environmental impacts for industry, settlement and society will be even higher where disaster risk reduction strategies to respond to existing climate variability and extremes are lacking.' (UNISDR)
582	7	24	7	26	Suggest to change "settlement" to "settlements" (Govt. of Mexico)
583	7	24	7	40	Knowing the important efforts made by international bodies, in particular the ISDR, it would be important to report that the establishment of environmental watching systems, mainly hydrometeorological, responsible for the monitoring of weather and climate and able to produce and distribute early alert advisories is becoming a must, particularly in developing countries, where people dwelling conditions and production systems are very exposed to any abnormal weather or climate event. (Govt. of Argentina)
584	7	24		40	This section has few statements of future impacts; it only discusses costs, benefits, and vulnerability. It takes a different approach than other sub-sections. Again, this section needs to provide major findings on future impacts and adaptation, and basis for statements. (Govt. of USA)
585	7	24		40	The U.S. Government has comments on the specific findings included in this section, but reserves these pending the suggestion that the authors reconsider the current findings and choose findings from the underlying chapter or Technical Summary that provide major findings on future impacts AND adaptation, basis for statements, and singular assessment of uncertainty. (Govt. of USA)
586	7	26	7	26	In regard to: "Benefits and costs...". By having "benefits" come before "costs" one may interpret that benefits may/will outbalance the costs. Yet, this bullet goes on to state that the net effects/impacts will likely be negative. Reversing the word order to read " costs and benefits..." is suggested. (Govt. of Japan)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
587	7	27	7	28	The sentence "Some of the effects in temperate and polar regions will be positive and others elsewhere will be negative" is a relatively obvious statement that doesn't add much to the text. We question that the impact on higher latitudes are (solely) positive, and whether the impacts elsewhere will be (solely) negative. We would ask the authors to consider a more balanced statement, or simply remove this sentence and focus on the following sentence, which highlights the issue of net effects, likely the key issue in this paragraph. (Govt. of Norway)
SPM-588	7	27	7	27	The reference to benefits in the polar regions seems completely wrong here. A search of the Chapter 7 finds little reference to this and instead to the very many negative consequences of warming. In Chapter 15 on the polar regions one finds a more complete cataloguing of benefits of warming but these far outweighed by the impacts. Remove "polar" from this sentence or add that in the case the negative consequence far outweigh the positive. (Govt. of Germany)
589	7	27	7	28	The mention of positive and negative effects without any precision does not help much. It would be better to be more explicit on the effects: .. Such as ... (Govt of Switzerland)
590	7	27	7	28	Suggest deletion of the sentence beginning "Some of the effects". The finding that some effects of climate change will be beneficial in polar areas seems to come from a limited finding on increased tourism and less road icing. This is probably not of significant enough stature to be included in the SPM, especially as it features neither in the ES for Chapter 7 nor the TS. (Govt. of Australia)
591	7	27	7	27	I believe that both the literature and the underlying Chapter 15 shows the effects of warming in the polar region to be overwhelmingly negative, and therefore the wording in this sentence is misleading. Suggest rewording to "Some of the effects in temperate regions will be positive and others will be negative; for the polar regions the effects are mostly negative". (Greenpeace)
592	7	27	7	28	Give some examples of positive and negative effects (Govt. of Thailand)
593	7	27	7	28	Change "In the aggregate, however," to "Aggggregate". (European Commission)
594	7	27	7	27	Change "and others elsewhere" to "but most effects of climate change". (European Commission)
595	7	27		28	The sentence "some of the effects.... " is not clear. We would ask the authors to consider whether the following rephrasing communicates the intended message: "Some positive effects are expected in temperate and polar regions, while effects generally will be negative elsewhere." (Govt. of Norway)
596	7	28	7	29	Under larger or more rapid warming' phrase is unclear for policy reader. Need to be more precise. Note that this point is not developed in TS or chapter. (Govt. of Australia)
597	7	28	7	28	The descriptor "more likely" is not 'calibrated' in the IPCC guidelines and at the least requires an explicit statement of the alternative - it is 'more likely' than what? (Govt. of New Zealand)
598	7	31	6	31	It would be helpful to clarify whether the likely switch of terrestrial ecosystems to a source of carbon is associated with a particular temperature increase. (Govt. of UK)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
599	7	31	7	33	Use of the term "vulnerable" is not appropriate here as there is no consideration of adaptive capacity. Rather, these things are those with highest exposure or highest sensitivity. Simplest solution would be to change "are" on line 31 to "include". (Govt. of Canada)
600	7	31	7	33	Lines 31 to 33 would have a much greater policy impact if they incorporated the specific text in the underlying Chapter on Industry, Settlement and Society, p. 3, lines 21 to 25 and referred to those types of economic areas most at risk. Change to: "The most vulnerable industries, settlements and societies are those in coastal and river flood plains, those whose economies are closely linked with climate-sensitive resources such as agricultural and forest product industries, water demands and tourism, and those in areas prone to extreme weather events, especially where rapid urbanization is occurring." It is important that the term "climate-sensitive resources" be well understood. (Govt. of Canada)
601	7	31		33	Communities in polar (permafrost) regions might be added to this list. (Govt. of Norway)
602	7	35	7	35	Write: "Poor communities can be specially vulnerable, in particular those which are concentrated ...". Rationale: poor communities in all regions will be affected (Govt of Switzerland)
603	7	35	7	37	The verb tense expressions for this bullet need to be reviewed. Specifically, "can be" in line 35 and 36. The reader wonders if these should be expressed in the future tense. Also, like the bullet before it, this bullet focuses on vulnerability with no mention of impacts. Inserting text which refers to impacts as well would be helpful. (Govt. of Japan)
604	7	35	7	35	The finding that poor communities are especially vulnerable to climate change isn't made as explicitly in Chapter 7. Along with the poor, the old and very young are also highlighted as being at especial risk. Suggest that this point is restructured to make this clear. In addition it seems doubtful that poor communities tend to be concentrated in relatively high-risk areas and are more dependent on climate-sensitive resources. The economic cost of climate change impacts would be relatively greater in areas with greater investment. The authors need to more clearly explain this point. (Govt. of Australia)
605	7	35	7	35	Suggest to change "can be" to "are", or include likelihood language if not (Govt. of Mexico)
606	7	35	7	35	Change "can" to "tend to". (European Commission)
607	7	36	7	36	Change "can be" to "are typically". (European Commission)
608	7	37	7	37	Replace "local water and food supplies" by "locally sourced water and food supplies". (Govt of Malawi)
609	7	38	6	38	Please clarify what level of CO2 concentration is associated with a temperature increase between 1.5 and 2.5 deg C. (Govt. of UK)
610	7	39	7	40	This statement on loss increases from weather disasters makes one wonder about the origins of past increases in losses. Please include a statement in the previous section that discusses these increases, based on the evidence in Section 1.3.8.4, Figure SM1.1, and Section 7.5.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of The Netherlands)
611	7	39	7	40	This sentence sounds self-explanatory (i.e. does not really tell anything new). (Govt. of Finland)
612	7	39	7	40	"economic costs" change into "economic and social costs" (Govt. of The Netherlands)
613	7	40	7	40	Clarifying the term "substantial" is suggested. (Govt. of Japan)
614	7	42	7	55	Suggest adding at the front of this section: "However, the balance of impacts will be overwhelmingly negative (see Figure 8.3). Most projections suggest modest changes in the burden of climate-sensitive health outcomes over the next few decades, with larger increases beginning mid-century. The balance of positive and negative health impacts will vary from one location to another, and will alter over time as temperatures continue to rise. 8.4". 9.4.5, (Greenpeace)
615	7	42		55	The U.S. Government has comments on the specific findings included in this section, but reserves these pending the suggestion that the authors reconsider the current findings and choose findings from the underlying chapter or Technical Summary that provide major findings on future impacts AND adaptation, basis for statements, and singular assessment of uncertainty. (Govt. of USA)
SPM-616	7	43	7	43	Add the very high confidence statement (TS-21 lines 10-11): Climate change currently contributes to the global burden of disease and premature deaths (very high confidence). (Govt. of Germany)
617	7	44	7	49	The following sentence should be added at the beginning of this paragraph: "Current climate change is already contributing to the global burden of disease and premature deaths" (based on TS FGD p. 27, lines 10-11). (European Commission)
618	7	44	7	55	Please give more details about "adaptation" such as thermoregulatory adaptation to warmer weather, physiological adaptation, behavioral adaptation and so on. (in case of heat-related adaptability) (Govt. of Thailand)
619	7	44	7	8	It would be helpful to explain the strong dependence of these projections on carbon fertilisation assumptions and difficulties in modelling due to interactions with changes in heat and rainfall extremes, pest changes etc. Show clearly the assumptions made about carbon fertilisation (e.g. strong/weak) in each point. Also, explain "Global agricultural production potential" and its association with the crop yield measures described in the other points (Govt. of UK)
620	7	44	7	44	In which regions more particularly? (Govt of Switzerland)
621	7	44	7	44	For clarity insert "the health status" between "affect" and "millions". (Govt. of Australia)
622	7	44	7	44	Change "is likely to affect" to "will adversely affect". (European Commission)
623	7	45	7	49	The authors need to ensure that the "confidence reading" for each of the possible health impacts is, as stated, "High". In particular the confidence of the

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					finding that there will be an altered burden of water related diseases should be confirmed. (Govt. of Australia)
624	7	45	7	45	Replace "consequent disorders" by "related disorders". (Govt of Malawi)
625	7	48	7	48	Insert after ";",:,, increased frequency of cardio-vascular diseases due to heat/humidity rise" (Govt. of Georgia)
626	7	48			Please add: ..and the altered dynamics and/or spatial distribution of some infectious disease vectors (Govt. of Finland)
627	7	49	7	52	Please consider combining the paragraph about malaria to the end of this sentence: concentrations of ground level ozone; and the altered spatial distribution of some infectious disease vectors, such as the expansion and contraction of the range of malaria.. 49 ** D [8.4, 8.ES, 8.2] (Govt. of Finland)
628	7	51	7	51	WHERE does the range of malaria expand and WHERE does it contract? (Govt. of Canada)
629	7	51	7	51	The sentence is not explicite with the words "mixed", "expansion and contraction" (where?) (Govt of Switzerland)
630	7	51	7	51	The authors should unpack the statement that there will be an "expansion and contraction" of the range of malaria. Provide further information on where it will expand and where contract (e.g what latitudes, altitudes?). (Govt. of Australia)
631	7	51	7	55	More elaboration and description on these bullets...how or why this is the case and in the end, what wins out. TS clearly states that the net outcome will be negative...important to mention this. Suggest using the following text from chapter 8: "The analyses suggested that climate change will bring some health benefits, such as lower cold related mortality and greater crop yields in temperate zones, but these benefits will be greatly outweighed by increased rates of other diseases, particularly infectious diseases and malnutrition in low-income countries" [Chapter 8, Page 26] (Govt. of Canada)
SPM-632	7	51	7	52	Expand this point by replacing the present sentence with text from TS-27 lines 21-23 Climate change "will have mixed effects on malaria (very high confidence); in some places the geographic range will contract, elsewhere the geographic range will expand and the transmission season may be extended [8.4.1]; " (Govt. of Germany)
633	7	51	7	52	Change sentence to "Climate change will have mixed effects on malaria, including a range expansion in some regions and a range contraction in others." (European Commission)
634	7	52	7	52	In the TS the confidence for this finding is very high, yet here it is only high. This inconsistency needs to be addressed. (Govt. of Australia)
635	7	52			It would be better to be more specific with regards to the phrase "expansion and contraction of the range of malaria", in terms of explaining what sort of expansion/contraction is expected. (Govt. of Chile)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
636	7	54	7	55	The phrase "fewer deaths from cold exposure" may be rephrased as "fewer deaths from reduced cold exposure." (Govt. of Pakistan)
637	7	54	7	55	Suggest to change "from cold exposure" to "exposure to cold weather" or "exposure to cold temperatures" at end of sentence (Govt. of Mexico)
638	7	54	7	54	Deleting this bullet is suggested. At the beginning of this section it states that Section C is "a summary of the main projected impacts". It is difficult to conceive that "In some places, climate change is likely to bring some benefits to health such as fewer deaths from cold exposure" is a summary of a main future impact on global human health. (Govt. of Japan)
639	7	54	7	54	"in some places .. ": where? (Govt of Switzerland)
SPM-640	7	54	7	55	Expand and balance this point by using text from the TS-27 line 25 -TS28 lines 3-4 "bring some benefits to health, including fewer deaths due to exposure to the cold, but it is expected these will be outweighed by the negative effects of rising temperatures worldwide. " (Govt. of Germany)
641	7	55	7	55	To more accurately capture the findings of Chapter 7 insert at the end of the current sentence "but it is expected that these benefits will be outweighed by the negative effects of rising temperatures worldwide." (Govt. of Australia)
SPM-642	7	55	7	55	ADD FIGURE Figure TS-9. Direction and magnitude of change of selected health impacts of climate change (Govt. of Germany)
643	7				I suggest to include one paragraph related to the climate change impacts in to infrastructure in line with others paragraphs. (Govt. of Bolivia)
644	8	1	10	39	This section needs to be restructured to ensure that the key vulnerability for each region is listed first. In addition it may be worth repeating at this point the basis upon which the vulnerabilities for each region have been selected. (Govt. of Australia)
645	8	1	10	39	There seems to be little consistency in the findings of key vulnerabilities for different regions between the SPM and the TS, the authors should review to ensure that there is greater consistency and that some of the key findings in the TS (particularly Box TS-6) are captured (Govt. of Australia)
646	8	1	10	20	There is only very limited information about climate impacts in different regions. (The AR4 SPM FGD contains about 4 statements per region, compared to about 6 statements in the AR4 SPM SOD and about 8 statements in the TAR SPM.) The coverage of regional impacts should be considerably expanded (to a level comparable to the TAR), using statements from Box SPM-2 in the SPM SOD (which is no longer contained in the FGD), Box TS.6 in the TS FGD, and the Executive Summaries of Chapter 9-16 FGD. The limited information and too strong selection of statements on negative impacts could even mislead the reader. Example: It does not seem to be adequate to see only 4 regional and simplifying statements on Europe two of which are on flooding; for Northern Europe the statement suggest basically positive impacts only which seems not to be justified or at best only part of the climate impact story for Northern Europe; see also line 29 in this table (European Commission)
647	8	1	10	20	The selection of findings per region seems to be arbitrary and key themes are missing as compared to ES of the chapters. See particularly Africa, Asia

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					please add themes health, inundation, biodiversity (Govt. of The Netherlands)
648	8	2	8	1	SECTION COMMENT: REGIONAL INFORMATION NEEDS TO BE EXPANDED AS IT TOO ABBREVIATED HERE (Govt. of Germany)
649	8	2	8	2	For most of the impacts identified there is no sense of the timescale in which these impacts begin to become significant. There are details on timing (dates or degrees C) in the TS and chapters - we suggest authors try to summarise timing dimensions in the SPM. (Govt. of Australia)
650	8	2	10	22	There is an opportunity to include at least one region-specific impact on human health in the "Regions" section. The North America section includes one such impact: the adverse health effects of heat waves on city dwellers. As was stated in the U.S. Government comments on the second-order draft, the Arctic health issues are salient and were well-documented in the report. At least one bullet on health-related impacts in the Arctic should appear in the Polar summary. Similarly, neither the Africa nor the Asia section of the SPM mention the shift in vector-borne, rodent-borne, and other infectious diseases, though Chapter 8 makes a good case for changes in the range and transmission season of malaria. In the Europe summary, the dichotomy between Northern and Southern Europe is misleading. It would be helpful to point out than even in Northern Europe there are projected to be increases in heat-related mortalities, absent adaptation. (Govt. of USA)
651	8	2	10	22	The U.S. Government has additional comments on the specific findings included in each regional sub-section, but reserves these pending the suggestion that the authors reconsider the current findings and choose findings from the underlying chapter or Technical Summary that provide major findings on future impacts AND adaptation, basis for statements, and singular assessment of uncertainty. (Govt. of USA)
652	8	2	10	20	From the conclusions selected for this section, a more accurate title should be "Main expected adverse impacts for region". (Govt. of Chile)
653	8	4	8	19	This section seems weak and arbitrary compared to the executive summary of chapter 9. Use (a selection of) sentences in bold font from there. (Govt. of The Netherlands)
654	8	4	8	33	Give examples of places in Africa and Asia will be affected, the same way Australia-New Zealand, Europe and Latin America parts do. (Govt. of Thailand)
SPM-655	8	5	8	5	Insert headline finding from Chapter and TS "Agricultural production and food security (including access to food) in many African countries and regions will likely be severely compromised by climate change and climate variability (very high confidence)" (Govt. of Germany)
656	8	6	8	8	We find that the current text on future impacts in Africa does not adequately reflect the vulnerability of the continent. We therefore suggest that the text should include that: "The population at risk of increased water stress in Africa could increase by 250-600 million people by 2050s." (Govt. of Norway)
657	8	6	8	6	The words "some regions" need to be explained. Specific areas of Africa should be identified as has been done with the other continents. Africa as a continent is very large, hence impacts are likely to be varied. (Govt of Malawi)
658	8	6	8	6	One of the key findings of chapter 9 is that the impacts of climate change in Africa are likely to be greatest where they 'co-occur' with a range of other

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					stresses. This is an important finding and should be included in the SPM. (Govt. of Australia)
659	8	6	8	6	It would be helpful if the authors could provide some detail as to which regions will experience water shortage. (Govt. of Australia)
660	8	6	8	8	Conflict could be mentioned in this context. (UNISDR)
661	8	6	8	6	Change "Some regions" to "Parts of North and southern Africa" (based on TS FGD p. 34, line 5). (European Commission)
662	8	6	8	6	Can those regions be specified? (Govt. of Thailand)
SPM-663	8	6	8	6	Add a point on loss of species from TS and Chapter "[TS4.2]Climate change and variability are likely to result in species loss, extinctions and also constrain the 'climate spaces' and ranges of many plants and animals (high confidence) and [9-ES] likely have a negative effect on tourism as between 25 and 40% of animal species in national parks in sub-Saharan Africa will become endangered [9.2.2, 9.4.4, 9.4.5]. (Govt. of Germany)
664	8	6	8	6	"Some regions ... ": where? (Govt of Switzerland)
665	8	6	19	6	Suggest: "There will be substantial reductions in areas of suitable climate for 81-97% of the 5197 African plants examined, and 25-42% lose all area by 2085. Further, 25-40% of animal species in national parks in sub-Saharan Africa will become endangered, negatively effecting tourism." (Greenpeace)
666	8	6		33	Why are some sub-section findings limited to physical impacts (Australia/Latin America) while others focus on vulnerabilities? Consistency is needed. (Govt. of USA)
667	8	6			Please add some text from chapter 9 as the SPM has little examples from Africa: Some regions especially in Northern and Southern Africa, as well as the east west band from Senegal to Sudan, ... (Govt. of Finland)
668	8	8	8	8	The statement: "...large increases in number of people at risk" requires quantification. (Govt. of Japan)
669	8	10	8	10	Where? (Govt of Switzerland)
670	8	10	8	11	This finding concerning an increased risk of hunger seems weaker than the correlate finding in the TS, which notes that food security and agricultural production will likely be severely compromised by climate change. This finding also has a very high degree of confidence attached. Suggest that this point is redrafted to more adequately reflect the TS and Chapter 9. (Govt. of Australia)
671	8	10	8	11	Suggest to change to "Reductions in the area suitable for agriculture, length of growing season and yield potential due to climate change and climate variability will likely decrease food production and food security severely with a corresponding increased risk of hunger." (Govt. of Norway)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
672	8	10	8	11	Replace sentence by "Agricultural production will be severely compromised by climate change in many regions (e.g., the Sahel, East Africa and southern Africa), leading to increased risk of hunger (very high confidence).", based on TS FGD p. 33, line 7-15. (European Commission)
673	8	10	8	10	Please replace "growing season" with "planting season" or "rainy season" as appropriate, since it is implicitly meant here, that rainfall is a limiting factor for crop production. (Govt. of Denmark)
674	8	10			Please add some examples from chapter 9 here: ..and yield potential, for example in the Sahel, the Great Lakes region and some other parts of East Africa , are likely... (Govt. of Finland)
675	8	11	8	11	With regard to the following statement: "...likely to lead to increased risk of hunger" it is not clear to what degree the risk will increase. Quantification is required. (Govt. of Japan)
676	8	11			Please consider adding a sentence to the end of this paragraph: Reductions in the area of agriculture, and in length of growing seasons and yield potential, are likely to lead to increased risk of hunger and famine. However, growing seasons in certain areas, such as the Ethiopian highlands, may lengthen under climate change. (Govt. of Finland)
677	8	13	8	13	This statement is virtually certain, the way it is phrased, but is given a 20% chance of not being correct (i.e. it suggests there is a 20% chance that the projected sea level rise does not threaten large cities in Africa). (Govt. of New Zealand)
678	8	13	8	13	Suggest using the sentence from TS Box TS-6: Sea level rise threatens major delta regions with large populations. (Govt. of Canada)
679	8	13	8	13	Suggest to add "Projected sea-level rise threatens large cities IN NORTH AFRICA, WEST AFRICA, AND SOUTHERN AFRICA". (Govt. of Norway)
680	8	13	8	13	Suggest that to provide more information for policy readers the finding in the TS on SLR impacts is duplicated, (i.e. "Sea level rise threatens major delta regions with large populations and cities, such as the Nile and Niger deltas.") (Govt. of Australia)
681	8	13	8	13	Provide examples for large cities threatened by sea-level rise (e.g., Alexandria). (European Commission)
682	8	13	8	13	It is supposed that this will hapen in the coastal zones? (Govt of Switzerland)
683	8	13	8	13	Clarification of "Projected sea-level rise threatens large cities" is requested. Is the reader to assume that all large cities on the continent of Africa, large coastal cities and inland cities alike, will be threatened by sea-level rise? If this cannot be clarified, then deleting this bullet and replacing it with page 50, lines 34-35 of Box TS-6 of the Technical Summary ("Sea-level rise threatens major delta regions with large populations...") is suggested. Alternatively, text from Chapter 9, page 27, lines 2-24, which touches on the potential impacts on future coastal megacities, specifically along the coast of West Africa where a 50 million inhabitant megapolis stretching 500 kilometers along the coast is expected by 2020 would be acceptable.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Japan)
684	8	13	8	13	After large add coastal, so to read "large coastal cities" (Govt. of Argentina)
685	8	13			Please add some examples from chapter 9 here: Projected sea level rise threatens large, growing coastal mega cities, such as Lagos and Alexandria. Northern Africa, West Africa and southern Africa are shown to be at risk of flooding in coastal and deltaic areas. (Govt. of Finland)
686	8	15	8	16	We propose to expand the text as follows: "Climate change interacting with other human-induced changes is having an increasing negative impact on several ecosystems like forests, grasslands, mangroves and coral reefs with additional consequences for tourism and local fisheries." (Govt. of Norway)
687	8	15	8	16	The statement: "...with additional consequences for local fisheries and tourism" needs to be clarified. Exactly what the writers mean when they write "additional consequences" is unclear. When referring to fisheries, are the writers referring to lagoonal fisheries and aquaculture as written in Chapter 9, page 27, line 23-24 of the URL? (Govt. of Japan)
688	8	15	8	16	As the finding on reefs and mangroves is occurring globally and is already referenced in the SPM, the authors should consider whether its inclusion in the specific context of Africa is necessary. (Govt. of Australia)
689	8	18	8	18	Is there really a 50% chance that decreased fish catches from large lakes will NOT have an important impact on local food supplies, as implied by the confidence assessed for this statement? (Govt. of New Zealand)
690	8	18	8	19	Add "negative" before "impacts". (European Commission)
691	8	18		19	Please add examples/description to the text: Decreased fish catches from large North-West and East African lakes, due to rising water temperatures and over-fishing, will have important impacts on local food supplies (Govt. of Finland)
692	8	19	8	19	There is an inconsistency between the TS and the SPM in regard to the confidence reading for this finding, this needs to be corrected. In addition the link between decreased fish catches and climate change needs to be explained more clearly (Govt. of Australia)
693	8	19	8	19	Suggest to change "important impacts" to "significant negative impacts" (Govt. of Mexico)
SPM-694	8	19	8	19	Replace "important" with "substantial negative" so that the sign and relative significance of the impact are given. (Govt. of Germany)
695	8	19	8	19	important' should be replaced with 'negative' (Greenpeace)
696	8	19	8	19	Decreased surface area of lake and wetlands (in many occasions also climate related) add to this development. (UNESCO)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
697	8	21	8	32	This section seems weak and arbitrary compared to the executive summary of chapter 10. Use (a selection of) sentences in bold font from there. (Govt. of The Netherlands)
698	8	21	8	33	Effects on natural ecosystems should be included. We suggest adding the text from TS, page 35, line 21-22 as a separate paragraph: "Climate change is expected to exacerbate threats to biodiversity resulting from land use/cover change and population pressure in most parts of Asia." (Govt. of Norway)
699	8	21	8	21	Add a point on observed changes: Chapter 10 ES- "New evidence show that climate change has affected many sectors in Asia (medium confidence). The crop yield in many countries of Asia has declined partly due to rising temperatures and extreme weather events. The retreat of glaciers and permafrost in Asia in recent years are unprecedented as a consequence of warming. The frequency of occurrence of climate-induced diseases and heat stress in central, east, south and Southeast Asia has increased with rising temperatures and rainfall variability. (medium 9 confidence) [10.2.3, 10.2.4]." (Govt. of Germany)
700	8	22	8	22	The TS states (page 34, line 53) that "The most serious potential threat arising from climate change in Asia is water scarcity", yet this finding is not reflected in the SPM. Suggest, therefore that a new dot point is inserted about water scarcity in Asia. (Govt. of Australia)
701	8	22	8	22	Add a leading point from the Chapter 10 ES "Future climate change is likely to affect agriculture, risk of hunger and water resource scarcity with enhanced climate variability and more rapid melting of glaciers (medium confidence)." (Govt. of Germany)
702	8	23	8	24	The text states "virtually certain to increase" and yet the confidence rating for the bullet is high confidence. Clarification required. (Govt. of Japan)
703	8	23	8	24	The statement assigns a 99% probability to the likelihood of glacier melt increasing flooding, but then the statement is given only an 80% chance of being correct. Was this intended? (Govt. of New Zealand)
704	8	24	8	24	We suggest to add "This would be followed by decreased flows as the glaciers disappear", L 8, p 35 in the TS (Govt. of Norway)
705	8	24	8	24	add: The risk of glacial lake outbursts will very likely also increase. (UNESCO)
706	8	25	8	25	Add bullet: "Future climate change is likely to affect agriculture, risk of hunger and water resource scarcity with enhanced climate variability and more rapid melting of glaciers. Freshwater availability in central, south, east and Southeast Asia particularly in large river basins such as Changjiang is likely to decrease due to climate change, along with population growth and rising standard of living that could adversely affect more than a billion people in Asia by the 2050s (high confidence) [10.4.2] and Chapter 10 ES p 3 (Greenpeace)
707	8	25	8	25	A point on ecosystems is needed and can be taken from the Chapter 10 ES: Increased risk of extinction for many flora and fauna species in Asia is likely as a result of the synergistic effects of climate change and habitat fragmentation (medium confidence) [(Govt. of Germany)
708	8	26	7	29	It is not clear what message this paragraph is meant to convey. It would be helpful to add the following sentence at the beginning of the paragraph: 'Climate change vulnerabilities of industry, settlement and society are mainly related to extreme weather events rather than to gradual climate change.'

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of UK)
709	8	26	8	27	The qualification "to be at greatest risk" is an ambiguous language. It can be interpreted that there is no greater risk for coastal areas (what about earth quakes?) or that from all regions being at risk of flooding, the coastal areas are exposed to the highest risk of flooding. It is suggested to simply say: .. are likely to be at great risk of increased flooding (Govt. of Austria)
710	8	26	8	27	Adding time reference and quantification of the projected flooding levels to this text is suggested. The writers might consider deleting this text and replacing it with the following from Chapter 10, Figure 10.4 [Hotspots of key future climate impacts and vulnerabilities in Asia]: "(With) 1m rise in sea level, 2,500 km ² of mangroves in Asia would be lost. Approximately 1,000 km ² of cultivated land and sea product culturing area is likely to become marsh, and 5,000 km ² of Red River delta and 15,000-20,000 km ² of Mekong River Delta are projected to be flooded. (10.4.3.2) (Govt. of Japan)
711	8	28	8	28	Add a bullet point : Projected sea level rise is very likely to result in significant losses of coastal ecosystems and a million or so of people along the coasts of south and Southeast Asia will likely be at risk from flooding (high confidence) [10.4.3.1]. (Govt. of Germany)
712	8	29	8	30	This needs to be revised to make clear whether the effects on development will be positive or negative. Could use the terminology from the TS which says "impinge on sustainable development". (Govt. of Canada)
713	8	29	8	30	The bullet requires quantification. Further, just how development may be affected is unclear. While most readers may assume negative impacts, it would benefit all readers to clearly state all the impacts. Refer to Chapter 10, p.31. (Govt. of Japan)
714	8	29	8	30	Delete the sentence, because the meaning of the sentence for climate change impacts is not clear, and the effect of climate change with rapid economic and population on development is existent in every continent not only special in Asia. (Govt. of China)
715	8	29	8	30	Considering that this sentence is classed as new (N) in relationship with TAR, it is opportune to argument a little more. Chapter 10.4 is very rich of "very likely" impacts, some of them should be cited. (Govt. of Italy)
716	8	30	8	30	Water shortages will very likely increase in large areas. (UNESCO)
717	8	30	8	30	Replace "affect development" by "impinge on sustainable development", based on TS FGD p. 35, lines 41-43. (European Commission)
718	8	30	8	30	Add "negatively" before "affect" to reflect the sign of the impact (Govt. of Germany)
719	8	32	8	33	This bullet requires quantification. Specifically, at what temperature and what levels of precipitation will there be a "decline in crop productivity". This bullet infers the projected impacts apply to all of Asia. Adding the percentage of countries in Asia which will be most at risk to this bullet is suggested. The writers might consider deleting the current text and replacing with text from Chapter 10, Figure 10.4 [Hotspots of key future climate impacts and vulnerabilities in Asia]: "In East Asia, for 1 rise in surface air temperature expected by 2020s, water demand for agricultural irrigation would increase

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					by 6% to 10% or more. Rice yields are projected to decrease up to 40% in irrigated lowland areas of central and southern Japan under doubled CO ₂ . Cereal yields could decrease up to 30% by 2050 even in South Asia." (Govt. of Japan)
720	8	32	8	33	The authors should confirm the confidence reading for this projected impact. In the chapter 10 ES it is noted that confidence in decreasing crop yields is only "medium". (Govt. of Australia)
721	8	32	8	33	It is noted that with the exception of Japan all countries in Asia might qualify as developing countries. Usually least developed countries are identified as countries that are exposed to the highest risks from climate change due to their little adaptative capacity. (Govt. of Austria)
722	8	35	8	35	Add a point on observed changes: Chapter 11 ES- "Australia and New Zealand are already experiencing impacts from recent climate change: These are now evident in increasing stresses on water supply and agriculture, changed natural ecosystems, reduced seasonal snow cover and glacier shrinkage (high confidence) [11.2.1, 11.2.3]." (Govt. of Germany)
723	8	35		51	It is surprising that increased fire frequency and intensity in Australia has not been highlighted. (Govt. of USA)
724	8	35			In the Australia and New Zealand part one could consider taking out some of the regional or local examples to get the different regional sections in more balance: now there are several examples from Australia and New Zealand and hardly any from Africa. (Govt. of Finland)
725	8	37	8	38	To avoid misunderstanding it is important to insert "as a result of rising temperatures, reduced precipitation and increasing evaporation". (Govt. of New Zealand)
726	8	37	8	38	This summary point is potentially significant and care needs to be taken in relation to wording. The use of 'ongoing' is potentially misleading in that it could be interpreted to mean 'current' or 'existing' which in turn would imply that current water security issues are largely a result of climate change: delete 'ongoing'. The second issue is that section 11.4 mostly addresses supply (run-off, dam in-flows etc) and explicitly states that these are impacts that exclude adaptation, but water security is a function of supply and demand (including adaptive measures) For this reason it is suggested that an additional sentence be added: 'Adaptation measures can improve water security in such regions [11.2.5, 11.5, 11.6]' (Govt. of Australia)
727	8	37	8	37	The authors should replace 'increase' with 'intensify'. (Govt. of Australia)
728	8	37	8	37	Add "by 2030" after "increase" to reflect the timing information contained in the Chapter 11 (Govt. of Germany)
729	8	38	8	38	A new sentence should be inserted along the following lines: "Reduced soil moisture and run-off are very likely to occur over most of Australia" Refer Ch 11 p13 line 23. This comment in Chapter 11 identifies an issue for Australia at the continental scale, rather than for sub-regions. The wording is more accessible to agriculturalists than the term 'water security', used elsewhere. (Govt. of Australia)
730	8	38	8	38	A new point should be inserted along the following lines: "Agricultural and forestry production is likely to be reduced over much of South and East

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Australia due to drought and fire". This is an important message from Chapter 11 pg. 4 lines 5-8 that has not come through to the SPM. (Govt. of Australia)
731	8	40	8	42	This statement is given a greater than 90% chance of being correct, but the loss of biodiversity is given only a >60% chance of occurring. Is this what was intended? (Govt. of New Zealand)
732	8	40	8	42	The text refers to "Further loss of biodiversity ..both countries". We question whether there is evidence in the underlying report for the use of the word 'further' in relation to New Zealand alpine ecosystems. The reference listed in the report for New Zealand alpine ecosystems (Halloy and Mark, 2003: Chapter 11 page 17 Table 11.6) has projections but not evidence of current losses. (Govt. of New Zealand)
733	8	40	8	42	The point made in ch 11 (page 3 line 48) about significant impacts on natural ecosystems by 2020 and that this will exacerbate existing stresses, is worth adding here. (Govt. of Australia)
734	8	40	8	42	The list of locations suffering losses of biodiversity does not include south-western Australia. This location is highlighted in Chapter 11. (Govt. of Australia)
735	8	40	8	40	It would be helpful if at the start of this sentence the following was inserted "Australia's natural systems have limited adaptive capacity and rates of climate change are very likely to exceed rates of evolutionary adaptation in many species." This is an important message drawn from Ch 11 pg 4 line 17, & section 11.5. (Govt. of Australia)
736	8	40	8	40	Delete "Further" as this implies that significant loss of biodiversity has already occurred in the locations provided, this however is not a direct finding from Chapter 11. (Govt. of Australia)
737	8	42	8	42	The authors need to confirm their finding on the confidence of this point. The finding of "very high confidence" is only mirrored in the finding in Chapter 11 concerning the structure, function and species composition of many natural ecosystems, and this does not list key hot spots. The finding in Chapter 11 concerning the locations listed and their vulnerability only rates a "medium confidence". (Govt. of Australia)
738	8	42	8	42	Delete the final sentence as it is not relevant that some of the sites listed are World Heritage sites. In addition, highlighting specific sites as World Heritage does not accord with the practice of the other regional chapters. This comment needs to be reflected throughout Chapter 11 as well. It should be noted that it is ONLY in an Australian context that World Heritage is mentioned in the entire report. (Govt. of Australia)
739	8	42	8	42	Delete "Many of these are World Heritage Sites". This is not a scientific observation but a value-judged comment; thus its deletion is suggested. (Govt. of Japan)
740	8	44	7	55	This para is very confusing and needs to be clarified. It could be reorganised in bullet points, as it concatenates lots of different issues, which are then not well followed up in the next 2 paras. There are 4 key issues - impacts of extreme events, malnutrition linked to increased famine/drought, changing disease burdens and heat/pollution impacts. All have different sources, different human impacts and different regional distributions (for example malnutrition is not a developed world problem, whereas heat impacts or extreme events are, although adaptive capacity will determine ability to cope

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					with these). It would be helpful also to spell out what the potential implications are for conflicts and political instability. (Govt. of UK)
741	8	44	7	55	It would be helpful to bring out more strongly the low latitude/high latitude dependence of impacts of heat-related mortality - e.g. less cold-related deaths in high-lats, more heat-related deaths in lower lats. (Govt. of UK)
742	8	44	8	46	This point is currently unclear and needs to be restructured to more closely reflect the finding of Chapter 11. Suggest that the construction in the TS is used, (i.e. "Ongoing coastal development such as in the Cairns region, Southeast Queensland and Northland to Bay of Plenty, is very likely to exacerbate risks from projected sea level rise, storms and coastal flooding"). (Govt. of Australia)
743	8	45	8	45	"Northland" and "Bay of Plenty" should be identified as locations in New Zealand to avoid confusion. (Govt. of Australia)
744	8	48	8	49	This text (" ... increased .. Irrigation water.") conflicts with the underlying text (Chapter 11, page 15, lines 9-11) and needs modifying. (Govt. of New Zealand)
745	8	48	8	51	This statement as it stands is wrong, because it makes the blanket statement that New Zealand is going to benefit from temperature increases up to 1-2 deg C. However, sea-level rise, impacts on ecosystems, and water security (all listed previously in this section of the SPM) will almost certainly be negative, including for New Zealand, for any temperature increase. The overall statement could only be justified if the authors believe that these negative impacts are outweighed by positive impacts (e.g. on agriculture and health). But there is no agreed metric to make such an assessment, and making such an assessment implicitly (as is done here) is policy prescriptive - it makes the assumption that economic benefits are more important than loss of ecosystems. It should also be noted that the drought projections for New Zealand make it doubtful that a generic statement of agricultural productivity increase is true for all regions of New Zealand. The sentence needs to be rephrased to be more specific, e.g. to say "Up to about 1-2 deg C global temperature increase, benefits are likely in some areas for some sectors, especially for agricultural productivity and reduced winter illness in some regions of New Zealand [and parts of southern Australia]." Benefits could include longer growing seasons, ... and irrigation water." The final sentence in the draft paragraph should be removed or re-phrased to avoid the objections raised above around the metric used to establish a net benefit or loss. (Govt. of New Zealand)
746	8	48	8	51	This final paragraph is seriously misleading. The most natural interpretation of this text is that net benefits of warming are expected up to 2 C, with net losses over 2 C. The report does not state this. Net losses are likely, even at moderate warming, though they may be offset by benefits in agriculture (energy benefits are very slight). The benefits of moderate warming are given far too much weight (they are not even mentioned in the ch 11 exec summary). In particular, increased hydroelectric potential and irrigation water seem unlikely throughout most of southern Australia given projected precipitation decreases, and evaporative increases (even for small temperature increases). Similarly, growing season will often be restricted by water availability rather than temperature, and therefore may be shorter not longer. The expected negative impacts over the majority of southeastern Australia on these water related issues should be pointed out. If the finding relates principally to Tasmania this should be explicit. (Govt. of Australia)
747	8	48	8	48	Add after "increase", "(up to about 2050)" as this gives the sense of timing contained in the Chapter and its ES. (Govt. of Germany)
748	8	49	8	50	This sentence needs to be revised as it could currently be easily misinterpreted as implying that across Southern Australia there will be "increased

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					hydroelectric potential and irrigation water" for increases in temperature of 1-2 C. Chapter 11, page 14 lines 49-50 state that the Murray Darling Basin (MDB) is likely to experience a 10 - 25% reduction in stream flow by 2050. The MDB is responsible for 70% of Australia's irrigation and also important to hydroelectric generation, it is difficult to see how this prediction could lead to a positive impact. Increased hydro-electric generation for New Zealand in winter is supported Chapter 11, however, it is also stated that this increase in winter is likely to result in lower water availability for irrigation in spring and summer. Suggest placing a fullstop after "demand" and inserting "New Zealand may experience". (Govt. of Australia)
749	8	49	8	49	Insert "(subject to water availability)" after "growing seasons". This is an important qualification for the Australian policy context [chapter 11 pg 3 lines 29-37]. (Govt. of Australia)
750	8	49			It is not always clear whether climate change will actually reduce or increase frost risks for harvests. Many agrometeorologists think that the risk will be increased. Please check if this statement can be maintained as such. In this case, and if it applies also in other parts of the world tha Oceania, it would be good to have it also somewhere in the general section, because it would be an important result. (Govt. of France)
751	8	50	8	51	The sentence 'Greater warming is likely to lead to net negative effects' is ambiguous in that it is not clear whether the sentence is intended to imply that up to about a 1-2 C temperature increase the beneficial effects will outweigh the negative effects overall, or whether the authors intended to restrict the idea that positive impacts my be greater than detrimental effects in particular sectors and/or regions but beyond 2C climate change will become generally deleterious. (Govt. of Australia)
752	8	52	8	52	At present the preceding bullet does not give a full picture of the conclusions. Add an important concluding point from Chapter 10 ES: "Substantial impacts on agriculture and forestry are very likely by 2050: Production is likely to be reduced over much of southern and eastern Australia and parts of eastern New Zealand due to increased drought and fire (high confidence) [11.4.3, 11.4.4]." (Govt. of Germany)
753	8	52	8	52	An additional finding that could be inserted in the SPM is: "An increase in extreme events will increase risks from storms, floods, fires (particularly in south-eastern Australia) and heat-waves." This is a clear message from Ch 11 pg 4 lines 1-4 and lines 21-23 that has not come through to the SPM. It is an important message for the Australian policy context. (Govt. of Australia)
754	8		10		The impacts of climate change mentioned in the SPM illustrate well the expected impacts on natural heritage as well as on buildings and monuments. However, the lack of any reference to archaeological sites is a shortcoming of this SPM. Loss of buried evidences and degradation of conservation conditions, especially as a consequence of permafrost melting, is an acknowledged source of stress for archaeological heritage. (UNESCO)
755	8		10		Section C. Regions: In the description of impacts expected for different regions, World Heritage Sites are mentioned in respect of the Australia and New Zealand regions. The UNESCO World Heritage Centre (WHC) believes this reference is appropriate and reflects properly the concern of the World Heritage Committee about climate change impacts at these sites. However, the WHC wonders why other World Heritage sites similarly affected by climate change are not explicitly mentioned for the other regions. The following sites were mentioned in a report approved by the World Heritage Committee and could therefore be explicitly referred to, with reference to "The impacts of Climate Change on World Heritage properties, Document WHC-06/30.COM/7.1 endorsed by the World Heritage Committee at its 30th Session in Vilnius, Lithuania, July 2006." (available on the WHC website)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Africa: Cape Floral Region (South Africa): species shifting ranges Asia: Sagarmatha National Park (Nepal): glacier melting Australia and New Zealand: Great Barrier Reef (Australia): coral bleaching Americas: Huascarán National Park (Peru): glacier melting Europe: Doñana National Park (Spain): biodiversity changes World Heritage sites in London, UK (Westminster Palace, Westminster Abbey and Saint Margaret's Church; Tower of London; Maritime Greenwich and the Royal Botanic Gardens, Kew): tidal flooding (UNESCO)
756	9	1	9	14	We propose that a paragraph on biodiversity is added for Europe: "It is anticipated that Europe's natural systems and biodiversity will be substantially affected by climate change***. Habitats and ecosystems at particular risk include low-lying coastal areas, tundra and alpine areas." The first part of this paragraph is taken from TS, p.39, l. 27-28, while the last sentence is based on information in the Europe-chapter in the TS. (Govt. of Norway)
757	9	1	9	14	The subsection on Europe omits information on very important climate impacts from the Technical Summary. First, add the following sentence at the beginning: "Wide-ranging effects of current climate change have now been documented in Europe, including impacts on the cryosphere, natural and managed ecosystems, and human health." (based on TS FGD p. 38, lines 11-18). Second, add the following text: "Climate change will magnify regional differences in Europe's natural resources and assets (very high confidence)." (based on TS FGD p. 39, lines 1-2). Third, add the following text: "Climate change will pose challenges to many economic sectors, including agriculture and tourism, and it will alter the distribution of economic activity." (based on TS FGD p. 39, lines 27-39). Fourth, add the following text: "The great majority of ecosystems will have difficulty in adapting to climate change. Alpine communities face up to a 60% loss of species under high emission scenarios by 2100." (based on TS FGD p. 39, line 50 - p. 40, line 6). (European Commission)
758	9	1	9	14	The preliminary results of the multi-sectoral impact assessment of the PESETA study were published 10 January 2007 in section 4 of the Impact Assessment accompanying the EC Communication on "Limiting Global Climate Change to 2 degrees Celsius. The way ahead for 2020 and beyond" (document available at DG Environment Web site http://ec.europa.eu/environment/climat/pdf/ia_sec_8.pdf). Results could be mentioned given the few existing multi-sectoral pan-European studies available at present. (European Commission)
759	9	1	9	14	The preliminary results for the Floods sectoral study of the PESETA project (published in Feyen L., Dankers R., Barredo J.I., Kalas M., Bódis K., de Roo A., and Lavallo C. "PESETA- Flood risk in Europe in a changing climate". EUR 22313 EN (http://peseta.jrc.es/docs/EUR%2022313.pdf)) could be mentioned. (European Commission)
760	9	1	9	15	In some place the following information should be added: 1.In Central and Eastern Europe the increase of temperature and changes in precipitation structure (increase the precipitation in winter period and decrease in summer) as well as increase of evapotranspiration will lead to increase of water

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					shortage causing decrease of agricultural potential in these regions. 2. Climate changes can trigger off activation of existing or appearing new diseases, weeds and pests, which in turn can deplete plant production in agriculture. (Govt. of Poland)
761	9	1	9	1	COMMENT EUROPE: The way that this regional section is written is that on the one hand the south is trashed and on the other hand the north does very well, but Central Europe is overlooked although it is often mentioned in the Chapter. There are also negative effects reported for the North. (see eg from the TS page 39 "Forest productivity and total biomass is likely to increase in the north and decrease in Central Europe, while tree mortality is likely to accelerate in the south [12.4.4]. Differences in water availability between regions are anticipated to become sharper: annual average runoff increasing in north/northwest, decreasing in south/southeast Europe (summer low flow is projected to decrease by up to 50% in Central Europe and by up to 80% in some rivers in S. Europe) [12.4.1]". This text needs balancing. (Govt. of Germany)
762	9	1	9	14	Central Europe is not enough dealt with, as well as alpine regions. Include the sentence from the TS Box TS-6 p 52 lines 1-3 (Govt of Switzerland)
763	9	1	9	1	A bullet on ecosystems and species is needed and could be taken from the TS-39: "It is anticipated that Europe's natural systems and biodiversity will be substantially affected by climate change (very high confidence). The great majority of organisms and ecosystems are likely to have difficulty in adapting to climate change (high confidence). Alpine communities face up to a 60% loss of species under high emission scenarios [12.4.3]. A large percentage of the European flora (one study found up to 50%) is likely to become vulnerable, endangered, or committed to extinction by the end of this century [12.4.6]." (Govt. of Germany)
764	9	1			As mentioned for North America, decreased snowpack will also affect alpine regions of Europe with the same consequences (see the recent OECD report Climate Change in the European Alps: Adapting Winter Tourism and Natural Hazards Management, 2007). (UNISDR)
765	9	2	9	2	We propose that the section about Europe starts with the water-related findings. Based on information in the TS, we propose the following wording: "Water stress caused by reduced rainfall is likely to increase over Central and southern Europe. Sea-level rise and increased rainfall and storminess are expected to increase floods, coastal flooding, erosion and land-slides in northern and western parts of Europe." The existing phrase "Coastal flooding is likely to threaten up to an additional 2.5 million people each year by 2080." could potentially be added at the end of this paragraph, but we question the coherence of this statement compared to the text for the other regions (for example this threat should also be quantified for Asia, which is probably much more affected by flooding than Europe). If the sentence is included, we think that the relevant areas should be specified. (Govt. of Norway)
766	9	2	9	2	In the TS a significant finding is that Europe's natural systems will be substantially affected by climate change, with very high confidence - suggest that this finding be included in the SPM, (i.e. "It is anticipated that Europe's natural systems and biodiversity will be substantially affected by climate change (very high confidence). The great majority of organisms and ecosystems are likely to have difficulty in adapting to climate change (high confidence).") This finding would provide more balance in the SPM's treatment of European impacts, which currently focuses on affects to human systems. (Govt. of Australia)
767	9	2	9	2	Add bullet on observed changes eg "For the first time, wide ranging impacts of changes in current climate consistent with projections of impacts due to anthropogenic climate change have been documented in Europe (very high confidence) including in the retreat of glaciers and extent of permafrost, lengthening of growing season, shift of species and the European heat wave in 2003 which had major impacts on biophysical systems and society"

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(points from Chapter 12ES page 3 lines 6-13) (Govt. of Germany)
768	9	3	9	5	We propose that this paragraph is changed grammatically as follows: "In Southern Europe, climate change is very likely to have negative impacts by, reducing water availability and hydropower, endangering crop production, and increasing the frequency of wildfires and increasing risk to health due to more frequent heat waves." (Govt. of Norway)
769	9	3	9	3	This sentence looks as though it is missing several words. At the very least it should be made clearer by saying "...is very likely to have negative impacts including through increasing health risks..." otherwise it looks as though changes in factors such as hydropower lead to an increasing health risks. (Govt. of Australia)
770	9	3	9	9	There is also a risk of heat waves in Northern Europe, at least in its Southern part (e.g. Northern France, Belgium, Germany, Netherlands, England...) This risk should not be understood as concerning only Southern Europe. Actually, it is not said in Chapter 12 that the heat wave risks are limited to Southern Europe. To be more precise, it would be preferable to mention heat waves in lines 11-12 rather than as concerning only Southern Europe. (Govt. of France)
771	9	3	9	14	Suggest this section needs some balancing. Add: "Climate-related hazards will mostly increase, although changes will vary geographically (very high confidence)." ; and "Winter floods are likely to increase in maritime regions, snowmelt-related floods in Central and E. Europe, flash floods throughout Europe [12.4.1]. Coastal flooding related to increasing storminess and sea level rise is likely to threaten up to 2.5 million additional people annually" Chap. 12 ES, p. 3 (Greenpeace)
772	9	3	9	9	One of the key findings in the European chapter is that Climate-related hazards will mostly increase, although changes will vary geographically. Suggest that is made the key impact and that the examples of impacts in Southern and Northern Europe are treated as sub-points, under the "headline" finding. In addition, it seems incongruous to focus on the benefits to Northern Europe in the SPM, when the majority of Chapter 12 points out the costs, rather than benefits of climate change on Europe as a whole. (Govt. of Australia)
773	9	3	9	5	In addition, the decrease in water availability will involve a greater concentration of pollutants, increasing the waste water treatment and purification costs.(TS, page 18, lines 48 to 50) (Govt. of Spain)
774	9	3	9	3	I would say "In southern-central europe" considering the dramatic impact of heat wave events in France and Germany over the last decade. (Govt. of Italy)
775	9	3	9	5	Add at the end of the paragraph "particularly in the Mediterranean region" (TS page 38 line 28) (Govt. of Spain)
776	9	3		5	Why are health risks due to heat waves less certain in Southern Europe than in North American cities? (Govt. of USA)
777	9	6	9	6	Water stress is a substantial issue and needs to be reflected here: "Water stress is likely to increase, as well as the number of people living in river basins under high water stress (high confidence) over Central and southern Europe. " TS-39 (Govt. of Germany)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
778	9	7	9	9	We suggest that the current text is changed as follows: "In Northern Europe, MODERATE climate change is likely to bring SOME benefits in the form of reduced exposure to cold periods, increased crop yields, increased forest productivity, and augmented hydropower potential." Increase in productivity of Atlantic waters is not consistent with the TS and we propose that it is removed. (Govt. of Norway)
779	9	9	9	9	Please insert: However, negative impacts are expected due to lower salinity in the Baltic. In combination with an increasing global sea level, this may lead to additional negative impact from coastal flooding in the surrounding countries. Uncertainty remains with respect to impacts from extra-tropical storms in this region. (Govt. of Denmark)
780	9	11	9	14	Suggest the two bullets be combined as both are concerned with the same subject of floods. (Govt. of Japan)
781	9	11	9	11	Add "Climate-related hazards will mostly increase" (Govt. of Germany)
782	9	14	9	14	There is no context to the figure "additional 2.5 million people". Is this a big increase? (Govt. of Australia)
783	9	14			The expression is a bit unclear: is it meant that every year 2.5 million people more will be affected by coastal flooding (is the number cumulative?) (Govt. of Finland)
784	9	14		14	Is it reasonable to list this possibility of coastal flooding and resulting likelihood, when the underlying text states it was for a single SRES scenario, A1F1. If so, insert "Under the A1F1 SRES scenario, coastal flooding is..." (Govt. of USA)
785	9	16	9	31	Could it be possible to have some explanations refereing to the relation climate change-El Niño? (Govt of Switzerland)
786	9	16		31	Given the variety of ecosystems in Chile, long coastal and mountain areas, a range of climate change related effects would be likely to occur in the country. It is therefore recommended to include a note about Chile like it is done with other countries in this report. If it is not possible in the current assessment, it is proposed to do it in the next one. (Govt. of Chile)
787	9	17	9	17	One of the key findings of Chapter 13 is that "By the 2020s, between 7 and 77 million people are likely to suffer water stress due to climate change (medium confidence)." This seems much more important than a number of findings presently contained in the SPM, and should be included as a key impact for Latin America. (Govt. of Australia)
788	9	18	9	18	This judgement needs a sense of occurring over time, such as "would lead to gradual replacement of tropical forest". (Govt. of Australia)
789	9	18	9	18	Suggest to change "soil water" to "soil humidity" (Govt. of Mexico)
790	9	18	9	18	Quantify "increases in temperature and decreases in soil water". (Govt. of Japan)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
791	9	18	9	18	Add "Under future climate change, there is a risk of significant species extinctions in many areas of tropical LA (high confidence)." Chapter 13 ES (Govt. of Germany)
792	9	18	9	18	Add "Projected" before "Increases". (European Commission)
793	9	20	9	20	Suggest to change "species extinctions are likely" to "the extinction of some species is likely" (Govt. of Mexico)
794	9	20	9	20	"Biodiversity" should be included. Suggest altering last sentence to: " In tropical forests, biodiversity loss through species extinctions is likely". (Govt. of Norway)
795	9	22			In the case of "drier areas" it is proposed to indicate with examples specific areas or specific countries likely to be affected, analogously to the previous paragraph. (Govt. of Chile)
796	9	23	9	23	Clarify "some important crops". Specifically, what important crops are. Although this may be common knowledge to Latin American policy makers, for those policy makers in other regions, it would benefit to be more specific. (Govt. of Japan)
797	9	24	9	24	The last sentence seems not to be of the requisite level of importance for inclusion in the SPM, suggest deletion. Otherwise the authors need to explain why the soybean crop is singled out. (Govt. of Australia)
798	9	24	9	24	It is suggested to substitute soybean by soya bean. (Govt. of Austria)
799	9	30	9	31	The disastrous economic conditions in the fishmeal industry in Ecuador, Peru and Northern Chile, were due to El Niño events, as described in many studies and reports produced during the 20th century. El Niño displaces the flow of feeding plankton which trophic chain starts with the Antarctic krill and moves to the north on the Von Humboldt current. This oceanic circulation condition brings warmer waters from the north and the anchovies and other important fish species, feeding on the Antarctic origin plankton, move to the west to keep in contact with their food. Therefore, it is not the simple rise of sea surface temperatures which produces the dislocation of valuable fish stocks, but the interplay between ocean currents. Also under Latin America, the well-known accelerated retreat of the inter-tropical glaciers and the severe problems resulting from GLOFs should be mentioned. Snowmelt providing for the flow of the majority of rivers on the Pacific basin would be further reduced with net economic impacts, a fact which, due to its implications on natural and human systems, should be reported for appropriate decision making. (Govt. of Argentina)
800	9	31			It is very important include the effects of glacier retraction in Latin America, specially in Andean region (Bolivia, Ecuador, Peru y Colombia) in this context I suggest include one paragraph in relation this. (Govt. of Bolivia)
801	9	33	9	47	Effects on natural ecosystems should be included. Suggest removing last sentence (line 46-47) (which is dealing with adaptation - and not covered under the other regions) and adding: , and coastal wetland loss are projected to increase with sea level rise (D[14.4.3]). (Govt. of Norway)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
802	9	33		48	The highlighted impacts in the sub-section do not match up well with the Executive Summary in the associated chapter (i.e., Chapter 14 – North America). They are well referenced to sections in the chapter but it seems odd if the points considered worthy of being highlighted in the SPM are not considered worthy of highlighting in the chapter Executive Summary. (Govt. of USA)
803	9	34	9	34	A bullet point on ecosystems is needed eg from the ES of Chapter 14 add: Disturbances like wildfire and insect outbreaks are increasing and are likely to intensify and although recent climate trends have increased vegetation growth, continuing increases in disturbances are likely to limit carbon storage, facilitate invasive species, and disrupt ecosystem services. Over the 21st century, pressure for species to shift north and to higher elevations will fundamentally rearrange North American ecosystems"Replace "The main projected biophysical effects are likely to be" by "Major biophysical impacts of climate change will be". (Govt. of Germany)
804	9	34			Amplify this point as it is quite strongly made in the Chapter 14 ES: "Climate change will constrain North America's already heavily utilized water resources, increasing competition among agricultural, municipal, industrial, and ecological uses (very high confidence). Higher demand from economic development, agriculture, and population growth will further limit surface and groundwater availability. In the Great Lakes and major river systems, lower levels are likely to exacerbate challenges relating to water quality, navigation, recreation, hydropower generation, water transfers, and bi-national relationships. [14.2.1, 14.4. 1, 40 14.4.6, Boxes 14.2, 14.3]" (Govt. of Germany)
805	9	35	9	37	This statement doesn't reflect the seriousness of the situation as outlined in the chapter. Suggest: "Climate change will constrain North America's already heavily utilized water resources, increasing competition among agricultural, municipal, industrial, and ecological uses (very high confidence). Rising temperatures will diminish snowpack and increase evaporation, affecting seasonal availability of water. Higher demand from economic development, agriculture, and population growth will further limit surface and groundwater availability. In the Great Lakes and major river systems, lower levels are likely to exacerbate challenges relating to water quality, navigation, recreation, hydropower generation, water transfers, and bi-national relationships. [14.2.1, 14.4. 1, 14.4.6, Boxes 14.2, 14.3]" Chapter 14 ES, p. 3 (Greenpeace)
806	9	39	9	40	This is an interesting notion for US. Is there similar information concerning other regions in the background reports? (Govt. of Finland)
807	9	39	9	40	It would be important to be more specific when it is mentioned that there will be "increasing impacts on forests". Decrease in productivity? Will some species migrate or disappear? Will forests become C sources? (Govt. of Canada)
808	9	42	9	42	Replace "experience many more, with potential for" by "experience more and stronger heat waves, which are associated with". (European Commission)
809	9	42	9	42	Quantify "cities with a history of heat waves". Are the writers referring to recent contemporary history? The time frame for this unclear. (Govt. of Japan)
810	9	42	9	42	A more general point on health is needed eg from the ES of Chapter 14 add: "Without increased investments in countermeasures, hot temperatures and extreme weather are likely to cause increased adverse health impacts from heat-related mortality, pollution, storm-related fatalities and injuries, and infectious diseases (very high confidence)."

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Germany)
811	9	43			This example seems to be too specific - maybe instead of "over age 65" use a more general term such as elderly people (Govt. of Finland)
812	9	46	9	47	This last sentence is the FIRST time in this section that the issue of adaptation is mentioned. It seems incongruent here because of that. Suggest adding material on adaptation and readiness to other sections. (Govt. of Canada)
813	9	46		47	The impact of human actions is expressed well here. In some other places, such as when coral bleaching is discussed (p. 7, lines 15-16), it would be good to refer to multiplicative effects or other implications of the matter. (Govt. of Finland)
814	9	46		47	"Current adaptation" is not described previously in the SPM. Examples include? (Govt. of USA)
815	9	47	9	47	Please insert: The impacts form icestorms in North America remains uncertain. (Govt. of Denmark)
816	9	47	9	47	More information could be added from Chapter 14 ES: Sea level is rising along much of the coast, and the rate of change will increase in the future, exacerbating the impacts of progressive inundation, storm-surge flooding, and shoreline erosion. Storm impacts are likely to be more severe, especially along the Gulf and Atlantic coasts. Salt marshes, other coastal habitats, and dependent species are threatened by sea-level rise, fixed structures blocking landward migration, and changes in vegetation." (Govt. of Germany)
817	9	50	9	50	Insert the following sentence from Ch 15 ex summary and put it in bold: "In both polar regions, there is stronger evidence of the ongoing impacts of climate change on terrestrial and freshwater species, communities and ecosystems (very high confidence). Recent studies project that such changes will continue (high confidence) with implications for biological resources and globally important feedbacks to climate (medium confidence)." Rational: The existing text is too weak in putting forward the wide ranging impacts identified in ch. 15. (Govt. of Norway)
818	9	50	9	50	Add a bullet on the recent retreat of Arctic sea ice eg from TS46 "The retreat of Arctic sea ice over recent decades has led to improved marine access, changes in coastal ecology/biological production, adverse effects on many ice-dependent marine mammals and increased coastal wave action (high confidence)." (Govt. of Germany)
819	9	51	9	51	Replace "The main projected biophysical effects are likely to be" by "Major biophysical impacts of climate change will be". (European Commission)
820	9	51	9	54	It should also be reflected that the changes in natural ecosystems have detrimental effects on the <i>lower trophic levels</i> , in addition to migratory birds, mammals and higher predators such as noted. End of sentence could read ".....and changes in natural ecosystems with detrimental effects on many organisms, including migratory birds, mammals and higher predators". (Govt. of Norway)
821	9	51	10	5	Conclusions presented here are more related with the Arctic Region rather than the Antarctic, this imbalance of information should be explicitly reflected in the paragraph.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Chile)
822	9	51		51	Change "thickness and extent" to "size" or "sea level contribution". In some areas glaciers and ice sheets are getting thicker, even though they may be shrinking. (Govt. of USA)
823	9	52	9	52	Why is only the extent, and not thickness, of sea-ice a 'main effect'? Suggest adding sea ice to list of glaciers and ice sheets for which both reductions in extent and thickness are projected. (Govt. of Canada)
824	9	52	9	52	This sentence should read, "...ice sheets, reductions in the extent of sea ice and northern migration of the line of permanent permafrost, an increase in the depth of permafrost seasonal thawing...." (Greenpeace)
825	9	52	9	53	The term "thickening of the active layer" is preferable to "an increase in the depth of permafrost seasonal thaw" (increase in seasonal thaw also works) (Govt. of Canada)
826	9	52	9	52	Please replace "changes" with "reductions" and insert "thawing of" before "permafrost". (Govt. of Denmark)
827	9	52	9	52	Describe the projected effects on Arctic and Antarctic sea ice separately. It is not informative or really credible to write that there may be just "changes" in the extent of sea ice. (Govt. of Germany)
828	9	52		52	Change "...sea ice and permafrost, and increase in the depth..." to "... sea ice and permafrost, changes in timing and magnitude of freshwater fluxes, an increase in the depth..." (Govt. of USA)
829	9	54			"Mammals and higher predators" is an interesting classification and partly overlapping (Govt. of Finland)
830	9	55	10	1	An additional paragraph should be inserted that points out that the positive feedbacks of reduced albedo (very high confidence) and net carbon loss due mainly to methane from permafrost (medium confidence) are expected for the future. (Govt. of USA)
831	10	1	10	2	This must be tongue-in-cheek...there are a very long list of negative impacts in the chapter, and a few possible benefits mentioned. Suggest it either explains these, or is omitted. (Greenpeace)
832	10	1	10	2	There is only a brief notation in the section on Polar Regions (page 10 lines 1-2) of the impacts on "infrastructure and transport"; perhaps expected changes in sea passages or routes should be noted. (Govt. of Canada)
833	10	1	10	1	The Arctic is defined in a variety of manners, and it may be valuable to include a definition as to how Arctic is defined in this document (especially since many of the other regions described in the proceeding pages also include an Arctic component). The Arctic constitutes a number of unique regions with distinct characteristics. Recent warming has been more dramatic in some areas than others and local features of the natural world and societies also create differences in what impacts will occur and which will be most significant in each sub-region. Eg. is the ACIA definition of the Arctic the one which is

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					used here? (Govt. of Norway)
834	10	1	10	2	It is confusing to the reader why the writers comment that "For Arctic human communities it is virtually certain that there..." and yet the confidence level for the bullet is only high confidence. Clarifying the incongruence between the text and the level of confidence attached to the text is suggested. (Govt. of Japan)
835	10	1	10	1	Could it be possible to have some comparison between positive and negative impacts (which one is dominant?) (Govt of Switzerland)
836	10	1	10	2	Change the sentence to. "For Arctic human communities and indigenous peoples living conditions the net effects are more likely to be strongly negative under larger and or more rapid warming particularly through changes in snow-, ice-extent and permafrost, although there may also be positive effects in some sectors or regions". Rational: The main interest would be related to the net effects. Furthermore as the sentence is in the draft it start with: "it is virtually certain", which seems to indicate a very high confidence. Yet, judging by the stars associated with the statement, the confidence is only high. Please check this. (Govt. of Norway)
837	10	1	10	2	1) Awkward sentence. Suggest splitting into two sentences. A) For arctic communities, it is virtually certain that there will be both negative and positive impacts. B) Infrastructure and transport will be particularly impacted by changes to cryospheric components (such as....). 2) Would like to see more emphasis given overall to impacts on human communities, settlements. In particular, the statement made with respect to human communities in the Arctic lacks in detail. It should be clear that overall impacts in the long run are negative not positive. Suggest following wording based on words from p. 46 in Technical Summary: Indigenous people have exhibited resilience to changes in their local environments for thousands of years. However, it is certain that climate change will increase the vulnerability of small remote communities and have a negative impact on human health. 3) At a minimum, this bullet should recognize the need for adaptation by adding the following sentence: Adaptation may be required to benefit from positive impacts. (Govt. of Canada)
838	10	1		2	Why does this statement that it is "virtually certain" only have high confidence and not very high confidence? Please use only one approach to describe certainty. (Govt. of USA)
839	10	2	10	2	It is unclear in the current sentence whether the impacts on infrastructure and transport will be negative, positive or both. Suggest that examples are given for each of these outcomes. (Govt. of Australia)
840	10	2		2	In addition to infrastructure and transport, these changes are affecting the native people's way of life or livelihood (as are other non-climate-related socio-economic factors), which should be considered. (Govt. of USA)
841	10	2		2	Change "... on infrastructure and support" to "... on infrastructure, support, and way of life, as climate-driven stresses are modified." The U.S. Government notes that some climate-driven stresses (e.g., deaths from excessive cold) could be tempered. (Govt. of USA)
842	10	4	10	4	The expression "niche habitats" should be substitute just for "habitat" (Govt. of Spain)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
843	10	4	10	6	Change sentence to "In both polar regions, ecosystems are vulnerable to climate change as climatic barriers to species invasions are lowered. Such invasions have already occurred on many sub-Antarctic islands with detrimental consequences for native species." (based on Chapter 15 FGD p. 37, lines 39-44). (European Commission)
844	10	4	10	4	"highly likely" is not defined on the IPCC likelihood scale. (Govt. of New Zealand)
845	10	4		5	Since the expected temperature increases are much higher in the Arctic than in the Antarctic, this argument might be explained in more detail. (Govt. of Norway)
846	10	7	10	20	The judgements for the small island section are emphatic and give no sense of gradual impacts over time - this should be amended. (Govt. of Australia)
847	10	7		17	This section does not actually indicate the characteristics of "island" that make them more vulnerable to change, even though characteristics of islands is a high confidence, major finding from the chapter. (Govt. of USA)
848	10	9	10	11	There seems to be a discrepancy between the confidence reading for this finding between the SPM/TS and Chapter 16. In chapter 16 the exact finding of the SPM is only rated as having "high confidence" not "very high confidence". This inconsistency needs to be addressed. (Govt. of Australia)
849	10	9	10	10	The term "well-being" seems to us as an inappropriate term in order to summaries the very important impacts identified in the chapter about Small Islands. (Govt. of Norway)
850	10	9	10	11	As noted in Comment 1, this sentence is a prime example showing that the uncritical combination of likelihood and confidence statements in the SPM FGD leads to rather absurd conclusions. If taken seriously, this sentence assigns "very high confidence" to the statement "There is a 10-34% likelihood that sea-level rise will *not* exacerbate inundation, storm surge, erosion, and other coastal hazards." (European Commission)
851	10	13	10	14	It is not clear what is meant by water resources in this sentence– water availability and/or water quality? It is better explained in the Technical Summary. (Govt. of Canada)
852	10	13	10	14	Change sentence to "Climate change will seriously compromise water resources in many small islands (e.g., in the Caribbean and in the Pacific)." (European Commission)
853	10	14	10	14	There seems to be a discrepancy between the confidence reading for this finding between the SPM/TS and Chapter 16. In chapter 16 the exact finding of the SPM is only rated as having "high confidence" not "very high confidence". This inconsistency needs to be addressed. (Govt. of Australia)
854	10	14	10	14	The phrase "seriously compromised" needs to be unpacked. If the authors could provide some examples and quantify "seriously compromised" (e.g. by providing a reduction in the size of potable water resources), it would be of assistance. (Govt. of Australia)
855	10	14	10	14	The meaning of "likely to be seriously compromised" is unclear. The term compromise often infers a sacrifice or loss of one party in lieu of another; thus the reader is confused as to what water will be compromised against. Clarification is suggested.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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					(Govt. of Japan)
856	10	16	10	17	The finding of Chapter 16 should be replicated here as it uses much stronger language and a stronger likelihood reading. Replace sentence with "With higher temperatures, middle and high-latitude islands are virtually certain to be colonized by non-indigenous invasive species, previously limited by unfavourable temperature conditions" (high confidence). (Govt. of Australia)
857	10	16	10	17	The exact meaning of "increased invasion by non-native species is likely to occur" requires clarification. It is unclear from this bullet whether non-native species which have already been introduced will increase or if the writers are inferring that invasion will follow introduction of non-native species. In the latter case, is this not the same as poleward shifts? Even in the case where non-native species are not new to middle and high-latitude islands, would upward shifts be a more appropriate way of expressing this? There needs to be a distinction between poleward and upward shifts vs. the invasion of non-native species. Additionally, from an environmental history perspective, considering how flora and fauna have traveled the globe for centuries, contemporary definitions of non-native species is sometimes questionable. (Govt. of Japan)
858	10	16	10	17	Examples needed here (Govt. of Thailand)
859	10	16	10	17	Change sentence to "Climate change has already led to the replacement of local species by non-indigenous species on some islands (high confidence). Future climate change will lead to further colonization by non-indigenous species on mid and high-latitude islands (very high confidence)." (based on Chapter 16 FGD p. 3, lines 47-50). (European Commission)
860	10	16		16	What is the connection between climate and increased invasion by non-native species for small island states? Seems removed from direct climate impacts. (Govt. of USA)
861	10	19	10	20	The finding in chapter 16 from which this statement is drawn concerns the effects of climate change on tourism more broadly. The authors should confirm that the construction in the SPM adequately reflects the findings of Chapter 16. (Govt. of Australia)
862	10	20			"attractiveness for tourists" This is one example of the climate change - global change dilemma. One could argue that to cut greenhouse gas emissions, long distance tourism to the Pacific islands should be avoided. This is the climate mitigation view point, but is this sustainable from the point of view of the economies of the islands? On the other hand, maybe also these islands should take part in the climate change mitigation work. (Govt. of Finland)
863	10	23	10	24	To use same structure as in TAR, to say that "There is high confidence that magnitudes..." (Govt. of Mexico)
864	10	23	10	39	SECTION COMMENT: This is very important and the table SPM-1 and SPM-2 particularly so. The results of the discussion of Key Vulnerabilities from Chapter 19 needs to be strengthened,f by including the text from TS-68, lines 5 to 38 (update since TAR on "reasons for concern", a concept from TAR that has been widely used by policymakers. In addition, a figure comparable to figure SPM-2 of the TAR WG II report, using the "burning-amber" framework to show how the reasons for concern increase with temperature, should be included with high priority, as this figure from TAR is one of the most widely used, and an update of it in the AR4

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					is therefore necessary. (Govt. of Germany)
865	10	23	10	23	For the benefit of policy readers the phrase "Magnitudes of impact" needs to be defined or explained in a footnote. (Govt. of Australia)
866	10	23	10	24	Change sentence to: Magnitudes of impact is systematically estimated to be considerably higher for higher global average future temperatures." Rationale: The sentence should highlight the results of the estimates which are of relevance for policymakers not only that it is possible to estimate this. (Govt. of Norway)
867	10	23	10	39	"Please indicate what types of knowledge gaps identified in TAR have been filled since TAR? (Govt. of Canada)
868	10	26	10	26	the degree of consistency which should maintain the different sections of this SPM suggest the erasing of the qualifying "many" before additional studies. The lack of basic observations, as already commented in regard to figure SPM-1 so recommends. This sub-section also shows the tendency to use abbreviations for any expression. This trend is particularly cumbersome in documents to be translated in different languages and generates other sets of abbreviation in those languages, bringing more confusion to readers. Similar and also some acronyms with double signification should be obviated in the SPM (Govt. of Argentina)
869	10	26	10	26	Suggest to change "the IPCC Third Assessment" to "the TAR", to be consistent with rest of SPM (Govt. of Mexico)
870	10	28	10	28	The authors need to confirm that "likely" is used in IPCC terminology. If it is not, another word should be used to prevent confusion. Suggest delete "is likely to" and replace with "may". (Govt. of Australia)
871	10	31	10	34	This explanation of how the entries in Tables SPM-1 and SPM-2 were chosen needs some work. For example it is stated that entries were selected using a two-fold test of (a) importance to human welfare; and (b) confidence in the assessment, however, entries such as "amphibian extinction" don't seem to have a direct link to "human welfare". It is suggested that the authors review their methodology for entry selection and provide some clearer conception of how the entries were chosen. In addition the phrase "some confidence" needs to be explained, it seems that the authors have chosen impacts for which there is confidence of "medium" or above - if this is the case, it needs to be more clearly stated. (Govt. of Australia)
872	10	31		39	This paragraph/approach is problematic. Authors are providing an "assessment of key vulnerabilities...intended to provide guidance to decisionmakers...for identifying levels of climate change...that could result from 'DAI' with the climate system." It is unclear whether the key vulnerabilities described link back to key vulnerabilities identified elsewhere in AR4 or are solely the conceptions of Chapter 19 authors—that is, the authors' 'assessment' of what might be key vulnerabilities, rather than an assessment of the literature on key vulnerabilities. In Chapter 19, the author's themselves state on page 5, lines 9-22, that the chapter assesses key vulnerabilities linked to specific levels of global mean temperature increase and that the list of key vulnerabilities represent the authors' collective judgments. They also note that the "assessment of key vulnerabilities and review of particular assemblages of literature needed to do so is unique to the mission of Chapter 19." It would be more appropriate for the authors to be assessing the literature on key vulnerabilities. The approach here of authors' linking of the discussion to DAI and self-identification of key vulnerabilities bring in a policy component that is inappropriate for the AR4, which is intended to be an assessment of what current scientific literature states regarding key

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					vulnerabilities. In addition, DAI is more than a judgment informed by the state of the knowledge but also on the nature of those impacted and the perception of acceptability of risk by the broader society. Delete lines 34-39, starting from “Some of these impacts...”. Lines 26-29 and 31-34 could then be joined into a single paragraph. (Govt. of USA)
873	10	31		33	The SPM needs to be cautious about figures of speech. A statement like “Entries have been selected that are judged to be important for human welfare and for which there is some confidence in the assessment” is loose. “Some” is not defined; is there a range of confidence levels for the information used in the charts? And is “the assessment” understood to be the IPCC source chapters? (Govt. of USA)
874	10	32	10	32	Suggest to change "...there is some confidence..." to "...there is the highest confidence..." (Govt. of Mexico)
875	10	32		39	Insert “by the authors of this report” ,after “judged”. (Govt. of USA)
876	10	33		34	This may be misleading. Item 10 cited in the footnote is a valuable framework but is not evenly applied across regional/sectoral chapters, as indicated in the text. (Govt. of USA)
877	10	34	10	37	Rewrite the sentence without the words "guidance to policymakers" (it sounds too policy-prescriptive) (Govt of Switzerland)
878	10	34	10	37	It is unclear why the authors have altered the construction of this finding from what appears in Chapter 19. Suggest reverting to the construction in Chapter 19 (i.e. "The identification of potential key vulnerabilities is intended to provide guidance to decision-makers for identifying levels and rates of climate change that may be associated with “dangerous anthropogenic interference” (DAI) with the climate system, in the terminology of UNFCCC Article 2.") (Govt. of Australia)
879	10	36	10	39	Ask to comeback last version of this sentence and add some key words, e.g. Ultimately, the definition of “dangerous anthropogenic interference with the climate system”(DAI) cannot be based on scientific arguments alone, but must incorporate value judgments and therefore be made through a political process informed by the state of scientific, economic and other knowledge, like feasibility. Because the new sentence is blurry for this political process. (Govt. of China)
880	10	39	10	39	Footnote 10: The "Criteria of choice" needs a more detailed explanation. It is unclear at present whether each of the impacts have been chosen because they are likely, big, soon, persistent, global, non-adaptable and there is confidence in them, or, if only one or more of the "criteria of choice" are sufficient. (Govt. of Australia)
881	11	0	12		Table SPM-1 and SPM-2 implies that there is a time period over which these impacts occur. In the case of permafrost and material presented in Ch 15, it is not clear that the considerable lag times have been appropriately considered. Furthermore, is is not clear from the material in Ch. 15 how the values presented for permafrost extent and active layer were arrived at. Our suggestion to deal with both comments is as follows: (1) Clearly indicate whether impacts are expected to occur within the time period suggested or remove any suggestion of time periods from the figure. (2) If time periods are removed

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					from the figure, the caption etc. needs to indicate that the impacts indicated may lag somewhat behind the changes in air temperature/climate (may represent equilibrium response). (3) For permafrost/active layer, consider reducing confidence to allow for uncertainty in model input parameters, if warranted by underlying chapter. (Govt. of Canada)
882	11	0	13		Table SPM-1 and Table SPM-2: The arrows at the top of the graph in SPM display important information, however they are better represented in Figure TS-4. Thus, replacing the current arrows with those from Figure TS-4 is suggested. (Govt. of Japan)
883	11	0	13		Table SPM-1 and Table SPM-2: Although these tables are useful, when considering the page spacing, it stands out that half of page 13 is unused. The writers should consider adding text from the Technical Summary and/or URL to fill out the tables more. Many policymakers will refer to the tables not only in their own reading of the SPM, but also when giving briefings on this SPM to government leaders, media and the general public; thus the more information in these tables, the more informations can be relayed efficiently. For example, in the Asia section the current comments only refer to increased water scarcity and coastal flooding. The writers could consider inserting text from the Technical Summary Box TS-6 or Chapter 10, page 18 to improve comments relating to sea-level rise and crop yields. Additionally, regarding the Polar regions, Antarctica is under-represented in the current text and inserting text from Chapter 15, p.3 of the Executive Summary regarding the reported decline in krill abundance and its impact on their predators and ecosystems is suggested (Govt. of Japan)
884	11	0			This table is very big and we think that it might become more readable if the upper half was extracted to form a separate figure. This figure could then be labelled "Expected temperature increases for different CO2-stabilisation profiles and scenarios." (Govt. of Norway)
885	11	0			The asterisks used in Table SPM-1 to represent Confidence Levels are hard to see and could be easily missed by readers. These asterisks are a crucial part of this Table, acting as a guide for policymakers. Clearer representation is required. (Govt. of Japan)
886	11	0			Table SPM-1: We applaud the inclusion of stabilisation scenarios, which allow consideration of impacts at CO2e levels below those occurring in the SRES scenarios. However the inclusion of these WRE scenarios adds difficulties. We note that the SRES projections in this table are not consistent with the WG1 projections and we are concerned that the methodology behind these WRE scenarios is also not consistent with the WG1 methodology for projections. It is essential for the credibility of these reports that the three Working Groups are consistent with each other. We suggest that Table SPM-1 includes stabilisation scenarios, but only if they are consistent with the WG1 methodology for projections. (Govt. of New Zealand)
887	11	0			Table SPM-1: The SRES temperature projections used here appear to be inconsistent with those used in the WG1 projections. It is essential for the credibility of these reports that the three Working Groups are consistent with each other. In this case, the WG1 likely ranges are defensible and should be used. As the WG1 likely range is only available for 2090-2099 and 2020-2029, the 2050s projections may need to be dropped from Table SPM-1. (Govt. of New Zealand)
888	11	0			Table SPM-1: The numerical data in the Food and Water sections need to be examined. There is a slight concern that the current presentation might be biased towards the negative impacts of climate change. Positive impacts of climate change should also be integrated with the negative effects. Impacts occur due to the effects of multiple stresses therefore it would benefit the policymaker to be able to view two separate categories within the incremental impacts: 1) the effects that are specifically climate change-driven and 2) the effects that would occur even without (anthropogenic) climate changes.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					These distinction is useful for policymakers. (Govt. of Japan)
889	11	0			Table SPM-1: The caption should be further improved by inserting "in the 21st century" after "global impacts". This is because some impacts (e.g. sea level rise) will be even stronger in coming centuries. (Govt. of Austria)
890	11	0			Table SPM-1: Please consider revising the sentence treating further weakening of the MOC to reflect the uncertainty of the issue better (Govt. of Finland)
891	11	0			Table SPM-1: It is suggested to indicate that the impacts included in this table are based only on impacts that have been identified in studies and that there might be even more impacts that have not been identified so far and that this is especially significant for impacts linked to temperature increase beyond 3 degrees centigrade because of the small number of studies as well as higher order impacts. (Govt. of Austria)
892	11	0			TABLE SPM-1: Despite all the very valuable information this table contains, it is simply ineffective as a communication tool. Our concern is that too much information is being put into one Table and as a result the main message is lost. In particular, the top panel is confusing and provides too much information. We suggest that the top panel should be replaced with Figure SPM-7 from the AR4 WG1 report. This would allow the Table to be reconfigured to emphasize the key vulnerability information. In addition, the SLR information is too small and easily lost. Specific concerns with the top panel are: a)The reader is referred back to the TAR in order to get info about the WRE scenarios - this is not sufficient, b) There is no information provided for the reader to make a link between the WRE scenarios and the SRES scenarios, c) THREE different sets of information are provided to describe the WRE scenarios (CO2 conc, CO2 equiv. conc, and warming by 2300), and yet no detailed info is provided for SRES scenarios, d) the inclusion of 5 tick marks for each arrow is too much information for the SPM. (Govt. of Canada)
893	11	0			Table SPM-1. The arrows fpr the SRES scenarios gives the impression that they are presented on a timeline based on the upper row (2020, 2050, 2080). It might be a help to pronounce those tick marks on the lines spanning the temperture respons for the various SRES scenarios (cf. page 12, line 43 and 45). In some cases, not all of the tick marks are visible (overlapping?) (Govt. of Sweden)
894	11	0			All page 11 and tables SPM -1 and SPM-2 (page12) are illegible and not easily exploitable by and for the decision makers. It would be desirable to replace them by one synthesis or to remove them. (Govt. of Mali)
895	11	1	10	39	This section is patchy and lacks a consistent approach to timing and scale. The reader is left with the impression that these are the only impacts in a region which is surely not true. It would be helpful if for consistency each regional section could include at least one food and one water-related quantitative example. We have provided some suggestions below for Africa and Asia but the same criterion should be applied to all regions. The presentation of the section could be improved by introducing some graphics summarising the impacts for each region, for example Figure 9.5 on Africa, Figure 10.4 on Asia and Figure 12.3 on Europe. This would help also to show the spatial distribution of impacts in the same region. (Govt. of UK)
896	11	1	11	55	Table SPM-1: To be consistent with Table SPM-2 in the adopted WG1 SPM, one should label the sea level rise numbers with "excluding future rapid dynamical changes in ice flow", as this potentially significant contribution is left out form these projections.

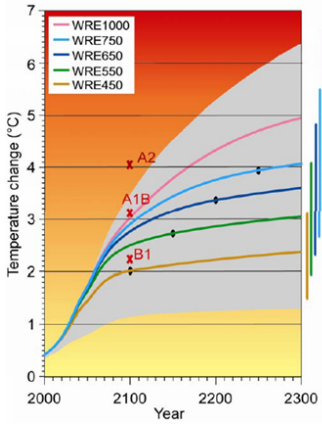
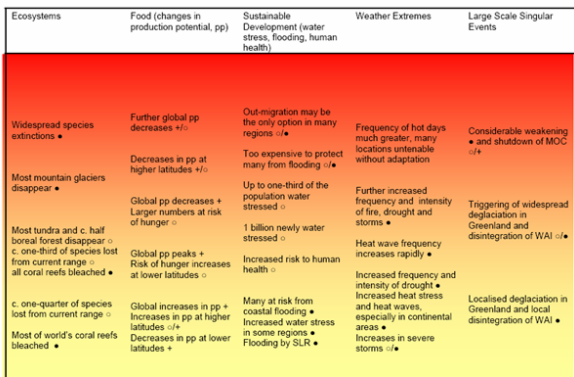
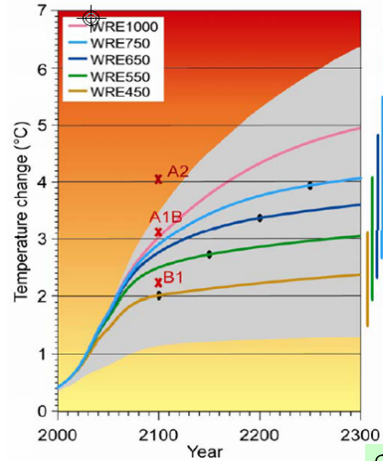
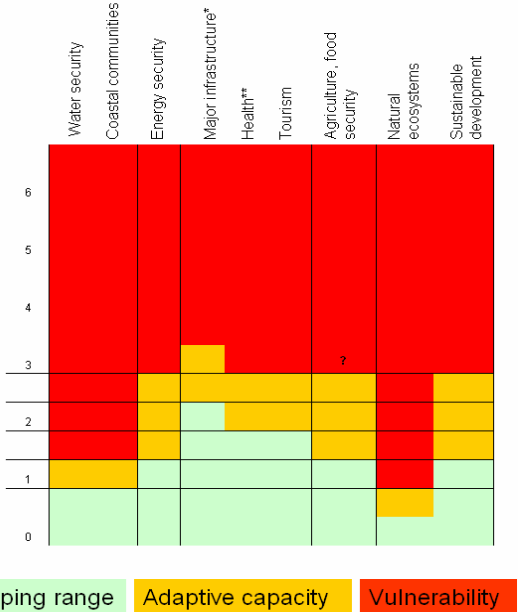
IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Germany)
897	11	1	11	55	Table SPM-1: This Table is an excellent summary figure. Just one little note on the top rows with the temperature ranges for different scenarios and time-slices. It might be worth considering a simplified option, where one only uses the bands similar to those of figure WG1 SPM-7 in the adopted WG 1 SPM for each of the considered time-periods for both the SRES scenarios and the "year 2000 constant concentration" case. The range between the SRES scenarios on the upper side, which do not assume any additional climate initiatives (i.e. which are "business-as-usual" scenarios) and the "year 2000 constant concentration" on the lower side case could then be labelled as the "space including climate initiatives". Although this "year 2000 constant concentration" does neither represent the effect of warming of past emissions (as some future emissions were needed to keep concentrations constant), it might serve at least as an indicative lower bound for feasible mitigation scenarios within this century. This note is simply meant to deal with the very unfortunate lack of information on mitigation scenarios in this assessments' WG 1 contribution. (Govt. of Germany)
898	11	1	11	55	Table SPM-1: The authors need to review the confidence readings provided for each of the projected impacts as in a number of cases they do not match the confidence readings provided in the chapters (e.g. local retreat of ice in Greenland and WAIS is given *** in the table but only "high confidence" in Chapter 19). (Govt. of Australia)
899	11	1	11	55	Table SPM 1: It would be useful for purposes of comparison, if on the scale of temperature increases from 1861-1890, a mark for where global temperatures at 2007 are. (Govt. of Australia)
900	11	1	12	56	Tables SPM-1 and SPM-2 need to be simplified and beautified - they should be easily understood by Policymakers and suitable for public presentations. The tables effectively replace the TAR burning embers diagram, but they fail to deliver. Australian authors have made this comment to the IPCC Technical Support Unit (TSU) many times, and suggested ways in which the Tables might be simplified, but without success - in fact one author created the very first version of Table SPM-2 (attached as SPM Fig 3 regional v1), but the TSU has turned it into something quite different. In their current form, the tables will not be used in public presentations because they are too complex. [COMMENT CONTINUED BELOW]

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Regional “hot spots” of vulnerability, according to criteria in Ch 19 Assuming: A2 emissions scenario, with little adaptation (Govt. of Australia)
901	11	1	12	56	[COMMENT CONTINUED] The top half of Table SPM-1 could be replaced with a simple plot of global warming versus time (see left-hand side of attached slide 2). This could be a stand-alone plot, since it applies to both Table SPM-1 and SPM-2. This would allow the deletion of the top haf of Table SPM-1, so the text in the remainder of this table (and Table SPM-2) could be made large enough to be seen in a power point slide. Both tables need to be made visually attractive by a professional graphic designer - at the very least they need colour - perhaps the colour gradation found in the TAR burning embers diagram. Some of the detail in the top half of Table SPM-1 could be presented in a small table, equivalent to Table 6-1 of the TAR Synthesis Report http://www.grida.no/climate/ipcc_tar/vol4/english/048.htm. The suggested new figures are attached.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					    Coping range Adaptive capacity Vulnerability (Govt. of Australia)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
902	11	1	13	22	The design of Tables SPM-1 and SPM-2 is praiseworthy; however the effects of climate change are referred to the temperature increase above those registered in 1990. As mentioned in the title of the Tables, these are changes in global average surface temperatures. To obviate confusions, it is suggested that heading of the Tables and the ordinate 's reference be equally written. This is particularly important because, as mentioned in the coordinate the increases refer to the global average surface temperature registered in 1990 and no reference of the year is mentioned in the Tables ' designation Further, although it is recognized that the SPM cannot contain information other than hat presented in the WG II 's chapters, being the water issue an important one, the lack of equivalent information in all the regional chapters does not permit to learn about the water stress in each one of them, neither compare the global estimates with the integration of the regional ones. The model 's limitations, regarding global and, particularly, regional precipitations projections, explain the lack of homogeneity of this type of information of great importance for decision makers to find out whether or not the MDGs would be achieved. This situation should be informed. The same comment is valid in respect to food security, both in the global and regional scales. Both issues are very important if the equity concept is applied, when the analyses for a future UNFCCC protocol brings to a new stand the commitment of old and emergent industrial countries, in a world where the poor and indigenous communities will suffer most the effects of climate change. (Govt. of Argentina)
903	11	1	13	22	The asterisk (*) code for uncertainties is not legible in the review version. If this is not improved in the print version, consider color coding. (Govt. of USA)
904	11	1	13	22	Main Comment on Tables SPM-1 and SPM-2 Tables SPM-1 and SPM-2 could be useful but, as is, the U.S. Government is concerned that they will mislead readers, and are too complicated for an SPM. There are significant inconsistencies across the top and bottom portions of Table SPM-1 and between sectors and regions across SPM-1 and SPM-2. Also, the tables mix and match and simplify several types and amounts of uncertainty. For example, authors cannot associate, with certainty, specific levels of carbon in the atmosphere with specific temperature increases or climate change. Authors also cannot predict the long-term impacts of stabilizing carbon in the atmosphere at a specific level. For example, if CO2 is stabilized at 650 ppm, that may stop global warming at a specific level, or it may only slow down the rate of temperature increase. The overall impact on climate at a given stabilization level is similarly uncertain. Finally, spread over 2.5 pages of text, the tables are extremely cumbersome and difficult to connect to the appropriate legends, captions, and notes. At best, the tables can be illustrative. Therefore, they should back away from trying to do too much and focus on providing the most parsimonious illustration of sample impacts across sectors and regions possible. Overall, readers need significant guidance on the proper use of the tables. To that end, the tables must be properly and very notably caveated to indicate that they are not to be used to guide decisionmaking but to illustrate the relationship between climate change, especially global warming, and potential impacts in the near term (100 years). The U.S. Government believes the tables need to be substantially re-worked as follows: 1) The WRE profiles and SRES scenarios (lines 1-22) should be deleted because the link between the top and bottom parts of the table is extremely weak: a) the top part gives the false impression that the impacts shown actually stem from the same climate and socio-economic modeling projections that produced WRE and SRES, when in fact this is not the case; b) inclusion of the top part suggests that it is justified to use the table to estimate avoided damages (as suggested on page 18, lines 24-29, of the SPM) by simply choosing an SRES baseline and WRE stabilization scenario and their associated ranges of GMTs when the inconsistencies between SRES and WRE and the impacts studies make the true avoided damages difficult, in not impossible, to know from the tables; c) the WRE profiles were not considered in WG I of AR4, and their associated warming projections out to 2300 are very confusing to match with the impacts shown in the lower part of the table, which we understand to relate to temperature projections by 2100; and (d) the

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					SRES and WRE scenarios are not the most recent emissions and stabilization scenarios that include revised socio-economic assumptions, improved modeling, and scenarios for other emissions. 2) The entire table fails to communicate the important message to policymakers that there are near-term and long-term effects to consider, and many near-term impacts may be insensitive to future emission scenarios, whereas long-term effects are more sensitive to future emission scenarios, and thus the different the different factors that determine future emissions. This message could be communicated without the top part of SPM-1, which the U.S. Government finds more confusing than useful. The U.S. Government therefore suggests shading the impacts box (lines 24-50) differently to correspond to the following four temperatures ranges, which should be taken directly from WG I 4AR: (a) the far left area should be shaded to show observed changes; (b) 0.8°C relative to 1990 to correspond to average temperature projection to 2030 according to all SRES scenarios [authors need to double check]; (c) 1.7°C to correspond to the B1 projection for 2100 (low end of SRES); and (d) 4°C to correspond to the A1F1 projection for 2100 (high end of SRES). 3) The criteria for selecting the impacts reported in the table needs to be clearly noted. As is, it appears that the authors may have subjectively selected impacts. The criteria should be objective. Recognizing that there are no single correct criteria, objective criteria will at least distance the authors from the choices and provide readers with a methodology from which to work to entertain alternative criteria. The criteria should be noted in the SPM text as well as the table notes. 4) The placement of the text in the lower part of the table (lines 24-50) is problematic because (a) they currently only appear at the temperature threshold at which an impact may occur, so there are many impacts listed under 1°C and no impacts listed under 5°C; and (b) the length of the sentence seems to imply something about the temperature range over which an impact may occur. 5) Some of the information in Section C is tied to decades in the 21st century in the text, not to temperature increases as in the figure. The mapping from the former to the latter needs to be explained and placed in context relative to the assumptions used for the other impact estimates. (Govt. of USA)
905	11	1	13	22	Continued. 6) The notes under the table do not provide the crucial guidance to readers that is needed. They are lacking key information, not well structured, and poorly written. Also, many of these points are germane to all of Section C and so important to the table that they could be made in the main SPM text as well. Among other things, the notes should clearly state: a. How SRES is captured by each of the impacts studies. “SRES” is being used very loosely throughout the SPM. Technically, SRES only refers to the emissions scenarios and their underlying storylines and socio-economic assumptions. GCMs have generated SRES-based climate scenarios. It needs to be noted whether each impact study is using only SRES-based climate scenarios (usually only GMT) or both the SRES-based climate and SRES socio-economic scenarios. It is very misleading to describe impacts as the impacts of an SRES scenario when only the SRES-based climate is considered. b. That significant inconsistencies exist: inconsistencies between socio-economic and emissions scenarios that underlie climate scenarios and those used or implied in impacts studies, as well as inconsistencies in assumptions across sector and regional studies that confound attempts to look across sectors and regions. c. As discussed already, the criteria used to select the impacts should be included in the tables. d. Definitions for where the line is drawn for impacts and adaptation. For example, farmers will shift their planting date and their input mix (e.g., fertilizer and irrigation use) as growing season lengths and rain patterns change. Where is the boundary between impacts and adaptation? What effects are being reflected within impacts estimates? e. Clear statements of what adaptation responses are reflected (something more informative than “adaptation not enhanced by climate change policy”),

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					what non-climate policies are considered (e.g., development, conservation), and a more precise definition of “climate policy.” f. A warning to readers on the difficulties and dangers of attempting to estimate avoided damages from Tables SPM-1 and SPM-2 given fundamental inconsistencies across studies and uncertainties. g. Should the authors choose to keep the top portion of Table SPM-1, the outer tick discussion in the notes should be rewritten. As is, it is not helpful. Authors should consider the key of the figure on page 16 of the Technical Summary, which is far superior. 7) The captions of both tables should be modified to more strongly emphasize that the entries are illustrative and that readers should consult the reader guidance to ensure proper use of the information. For example, for Table SPM-1, the caption could be modified to read: “Examples of global impacts projected for varying changes in global surface temperature. Please note that this table only provides a sample of potential impacts. Readers are advised to consult the table notes for guidance on proper use of this information.” (Govt. of USA)
906	11	1		50	Define the distinction between C02 concentration and CO2-equivalent concentration. (Govt. of USA)
907	11	3	11	3	WRE needs to be defined in the Table SPM-1 explanation (Govt. of Pakistan)
908	11	3	11	22	The table is difficult to understand because different SRES scenarios including different policy options and have a large range of concentration stabilized, but the five CO2-stabilisation profiles (WRE) are not be connected with them using bars and tick marks in a same periods and temperature ranges. Need more clear explanation of relations between them and show how to deal with their uncertainties. Re-design the table. (Govt. of China)
909	11	6	8	29	The country level details of Africa have been summarised out of existence and what is left with in the summary for policymakers are bland descriptive statements that reveal very little of the richness of research underpinning them. The following statements (ch.9) could be added to add value to this section: - Projected reductions in crop yield in some African countries could be as much as 50% by 2020 and crop net revenues could fall by as much as 90% by 2100, with small scale farmers being the most affected. - A 3C temperature increase could lead to 0.4-1.8 billion more people at risk of water stress, in addition to the 200 million (25% of Africa's pop) currently experiencing water stress. - Around half of the sub-humid and semi arid parts of the Southern African region are at moderate to high risk of desertification. - Sea level rise will likely reduce areas of the Nile Delta; 12-15% of existing agricultural land is projected to be lost. - In the Western Indian Ocean region, a 30% loss of corals reduced tourism in Mombasa and Zanzibar and resulted in financial losses of around US\$12-18 million. (Govt. of UK)
910	11	11	12	39	Table SPM 1: the WRE 350 temperature signature could be used to help bring home the point that we need to do something urgently, suggest at the end of line 39 on page 12, a note be added to the effect of: 'Note that current atmospheric CO2 levels exceed WRE350 stabilisation levels' {line 11, Page 11 shows warming of 1-2C with atmospheric stabilisation concentrations of 350ppm in 2100.} (Govt. of Australia)
911	11	21	8	33	The following statements (ch.10) could be added to strengthen this section: - a 2.5% - 10% decrease in crop yield is projected for parts of Asia in 2020s and 5-30% decrease in 2050 compared to 1990 level; in particular, rice

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					production in Asia could decline by 3.8% by the end of the 21 century, against a 25% population increase in Asia by 2050; - A 2.5C temperature increase in South Asia could lead to a drop in farm level net revenue yields of between 9% and 25% from a drop in yields in non-irrigated wheat and rice - The increase in the risk of famine in the range of 7-14% by 2020s, 14-40% by 2050s and 14-137% by 2080 is likely. - Under the full range of SRES scenarios, 120 million - 1.2 billion will experience water stress by the 2020s. - Between 24% and 30% if the reefs in Asia area projected to be lost during the next 2- 30 years (Govt. of UK)
912	11	23	12	30	For Table SPM-1 and Table SPM-2, the coordinate difference between "Temb increase 1990" and "Temp increase 1861-1890" should be based on the new result form AR4 of WGI, please check it. It is the same with foot note 8 in SPM 6. (Govt. of China)
913	11	23		50	Seems like a row covering "managed forests/forest products" should be included in this table. (Govt. of USA)
914	11	24	11	24	Is there a scale of impacts on irrigation water availability? Does the risk increase or not? (Govt. of Germany)
915	11	26	11	24	Show scale of impact with temperature. (Govt. of Germany)
916	11	28		28	With regard to providing estimates of impacts on water scarcity, the U.S. Government wonders whether the authors could provide estimates for net changes in people at risk of water scarcity instead of for people at increased risk of water scarcity. The net change would be of interest to policymakers. (Govt. of USA)
917	11	28		28	The Summary for Policymakers and the assessment in general emphasize the impacts of warming. Changes in moisture regimes are considered in terms of major events (e.g., drought, flooding) and to some extent water resources. However, it appears that the assessment does not consider complex changes in moisture over the long term as an aspect of climate change. In the Summary for Policymakers, the emphasis on warming, for example in Table SPM-1, likely oversimplifies the overall impacts of climate change. Uncertainties in the estimates of precipitation can be of greater importance than temperature. Please revise or caveat these statements accordingly. (Govt. of USA)
918	11	29	11	33	Lacking evidence to prove the widespread coral mortality at 2.5-3.5 , please change to 3.5-5 (see TS, page 69 line 23). (Govt. of China)
919	11	29		29	With respect to species and ecosystems—in light of the uncertainties associated with changes in climate variables and the fact that many of the estimates regarding shifts in ranges and species extinction are based on studies that employ the modeled association between current climates and present-day species distributions to predict future ranges and extinction risks under radically different climatic regimes where atmospheric CO2 concentrations are higher, and rates of plant growth, water use efficiency, energy requirements of species—predator-prey relationships and, possibly, species-area relationships would all be different from what they are today. Future outcomes may also be confounded by unanticipated evolutionary changes (Chapter 4, page 5, line 31 - page 6, line 1) as well as the possibility that species have broader climatic tolerances than indicated by their observed ranges would indicate. Chapter 4 claims that “these methods have nonetheless proved capable of simulating known species range shifts in the distant (Martinez-Meyer et al., 2004) and recent past (Araújo et al., 2005), and provide a pragmatic first-cut assessment of risk to species decline and extinction (Thomas et al.,

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					2004a).” The U.S. Government notes that neither the Martinez-Meyer nor the Araújo studies dealt with periods during which CO2 concentrations were as high as are projected for the future. Therefore, their claim that they provide “first-cut assessment of risk” of species decline or extinction is suspect. Moreover, even if they provided a first-cut assessment, that would not constitute anything higher than a low level of confidence in the results. In addition, it is possible, as evidenced by the environmental initiatives that have been undertaken over the past decades not only in the United States but also around the world (e.g., restoration of habitats, reductions in hunting and fishing quotas, reserving land for conservation purposes, agreement to manage or restrict fishing and hunting of various species, etc.), efforts will be made, even in the absence of climate change policy, to reduce pressures from non-climate-change-related threats to ecosystems and species which would, then, reduce the vulnerability of these systems to climate change. But none of these are factored into these analyses. Reconsider statement of “major extinctions around the globe” as high confidence. (Govt. of USA)
920	11	30	11	30	The descriptions of the risks to coral reefs need some improvement: Suggest replace "coral mortality" with "loss of coral reef ecosystems with transition to simpler communities" (Govt. of Germany)
921	11	31	11	32	The feedback of ecosystems should be considered in process of determining terrestrial biosphere tends towards a net carbon source, so temperature range should increase here, and “Carbon removal by terrestrial biosphere gradual decline” should replace “Terrestrial biosphere tends towards a net carbon sources”. (Govt. of China)
922	11	33	11	33	What does "major change" mean? Suggest "major loss, degradation and/or transition to different vegetation type" or similar. (Govt. of Germany)
923	11	33		33	This line in Table SPM-1 is very confusing. Is the difference between 45% and 90% of boreal forests at risk associated with the corresponding differences in temperature increase? Why are Amazon forests different from other tropical forests in this synthesis? (Govt. of USA)
924	11	33		33	The term “Risk” is confusing here since the entire figure represents statements about risks. Change “Risk” to “Forest area transformed”. Such a formulation suggests that if one thing disappears, something else will take its place, and it does not imply any judgment that one situation is necessarily preferable to the other. Also, the text “forests subject to major changes” should be changed to “forests subject to additional major changes” to recognize other major changes, e.g., deforestation. (Govt. of USA)
925	11	34	11	35	(Tropical/low lat crops)The placement of this on the temperature scale seems in correct. Needs to be moved to the left to start under 0.5oC above 1990 as effects start at this range or lower. Show where yields are expected to decline (ca 2oC) in addition to adaptive capacity. (Govt. of Germany)
926	11	36	11	36	It seems unclear at which temperature the crop yield potential at mid/high latitudes starts to increase. This unclarity applies as well to other places in the figure. The meaning of the arrows should be explained more. (Govt. of Norway)
927	11	36	11	36	In Table SPM-1, This conclusion of “Yields of all crops decline at mid/high latitudes” differed with Table SPM-2, which concluded wheat yield increase in Europe under this temperature. The arrow should extend.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of China)
928	11	36	11	36	(mid/high lat crops)The placement of this on the temperature scale seems in correct. Needs to be moved to the left to start under 0.5oC above 1990 as effects start at this range or lower. Show where yields are expected to decline (ca 2-3oC for mid latitudes. (Govt. of Germany)
929	11	37	11	37	Table SPM 1: Should the range be -10m to +100m? (Govt. of Australia)
930	11	37		37	The information on people at risk is not traceable. The topic is not discussed in the section of chapter references in footnote 21, and those numbers do not appear in any part of the chapter. Needs verification or deletion from the figure. (Govt. of USA)
931	11	39	11	39	Table SPM-1: The phrasing of "increasing damage from floods and storms" under "COASTS" is problematic. The statement is based on information in Section 6.3 and Box 6.2. However, this section and this box do not make any statements on damage. Rather, they provide information on the height extreme water levels and flood return periods. Please delete "damage". (Govt. of The Netherlands)
932	11	39	11	41	Table SPM-1, Row "Coasts". For clarification, "Risk of flooding" should be changed to "Risk of annual flooding". The figure "1-15m" should be changed to "3-15m" based on Chapter 6 FGD Table 6.6 (note that this temperature level can only be reached in 2080, by all scenarios except B1). The "left" entry should be amended by "in 2050s", the right entry by "in 2080s", and a similar clarification should be made for the row "Sea Level Rise" (lines 52-53) because the long-term impact of this degree of warming may well be several meters SLR (see row "Singluar events" in the same table). (European Commission)
933	11	42	11	44	Reference to "changed distribution" can be made more precise as adverse effects are already being observed and are consistent with projections. We suggest rewording. (Govt. of Germany)
934	11	42	11	44	Can a better breakdown be given of how the risks change with increased temperature? (Govt. of Germany)
935	11	46	11	46	The long term commitment starts at about 1.3oC for the Greenland Ice Sheet and would suggest showing this separate from Antarctic. Also needs to quantitatively indicate the scale of SLR entailed (whhat does "several" mean?) in this commitment. Show the WAIS seperately. (Govt. of Germany)
936	11	46	11	46	The last point does not seem different from the middle point, a sense of the increase risk needs to be given here. For example both the WAIS and GIS meltdown mean ca 12mSLR in the longer term and this temperature also implies more rapid loss of ice (Govt. of Germany)
937	11	46	11	47	Please check the temperature range that is given for the local retreat of ice in Greenland and WAIS (given a high confidence). Cf AR4 WG I SPM page 13 and Ch.10.7/Box10.1 (for Greenland: 1.9-4.6oC, for Antarctica: "present understanding is insufficient for prediction". (Govt. of Sweden)
938	11	46	11	46	Local retreat is already being observed. The band for this is from 0-2oC: If this what is meant, it should be made clear. For the Greenland Ice sheet it would seem that from 1.3oC above 1990 there is a projected from the models assessed in WGI of the ice sheet being in permanent imbalance. Suggest narrowing the "local retreat" temperature band to 0-1 or 1.5oC. The long term commitment starts at about 1.3oC for the Greenland Ice Sheet For

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Antarctic ice sheet separate entry is suggested. It would be useful to indicate the scale of SLR entailed in this commitment. (Govt. of Germany)
939	11	48	11	49	Table SPM-1: The text "Further weakening of the MOC, possibly causing net cooling in N. high lats near Greenland and N.W. Europe" appears to be in conflict with the WG1 assessment, which indicates greenhouse warming will more than offset North Atlantic cooling from MOC slowdown over the 21st century. (Govt. of New Zealand)
940	11	52	12	32	Table SPM-1 and SPM-2: Sea level rise in cm should get a more prominent position in either table, since it provides important information which gets easily overseen in the complexity of this table. (Govt. of Germany)
941	11		12		Table SPM-1, Page 11. The table is somewhat difficult to read. We suggest having a more simple version of this table in the SPM, while having this table in the TS. The general layout of the table could be improved by having the table in the same opening, on facing pages, so that the whole table could be read at the same time without having to turn the page. It would also be helpful to have the whole caption/explanation next to the table. A larger font would make reading easier. We would suggest making the upper part of the table on page 11 smaller and give more room to the lower part. (Govt. of Finland)
942	11				General comment: Table SPM-1 is very difficult to read. (Govt. of The Netherlands)
943	12	0	13		Regarding Table SPM-2 and associated text on pages 8 through 10, it's not clear what scenarios were used to generate the information regarding populations at risk. The text on page 13, lines 3-4, suggests that it might be the A2 scenario, possibly with the exception of water related entries. Whether readers understand this correctly or not, the text/table should explicitly note which scenario(s) were used to generate the results. Where the A2 scenario was used, it should be noted that the A2 scenario uses global population estimates that are much higher than many others (e.g., its estimate for 2100 is 15 billion while IIASA estimates that there is only a 2.5% chance that population would exceed 14.4 billion). Consequently, the populations at risk using the A2 scenario are substantially higher and more unlikely than they would be under other scenarios. (Govt. of USA)
944	12	0			Table SPM-2: Row 3 (Aust/NZ): We question the position of the entry "1-in-50 year flood of Buller River, Westport, NZ inc. by 40%". The increased flood volume noted relates to model runs at 2.7 deg C warmer than 1990. The position in the table, at a global change of approximately 3.3 deg, suggests the regional temperatures have been taken to be about 80% of the average global warming. While this is within the generally accepted range we could not see any source for this figure, either within the SPM or the Chapter 11. It would avoid confusion if the reason for plotting at 3.3 deg global warming was identified here or in the Chapter 11 paragraphs from which the Table entry was drawn. Note that it is clear in the source document that the model runs were at 2.7 deg warming. The source document does suggest that the 2.7 deg C warming corresponds to 'mid-range' projections of regional temperature increase by 2080, but in this context it is a little misleading to describe (as in Chapter 11, p16 lines 10-11) the changes as "by 2080" rather than "a 2.7 deg warmer atmosphere". Similarly the flood changes described in Chapter 11 as being for 2030 are actually for a modelled 1.0 deg change. (Govt. of New Zealand)
945	12	0			Table SPM-2: It is suggested to include also relative numbers of the total population affected by impacts, e.g. in Africa and Asia because such information has significant political relevance. (Govt. of Austria)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
946	12	0			Table SPM-2: It is noted that this table does not inform about the migration of people that has been linked to climate change impacts by scientific assessments e.g. of the International Research Institute for Climate Prediction (IRI). (Govt. of Austria)
947	12	0			Table SPM-2. The upper part of Table SPM-1 should be inserted also in Table SPM-2. (Govt. of Sweden)
948	12	1	12	35	Table SPM-2 does not quite reflect the range of seasonal changes that the “scientific basis” provides for sea ice change at 5 degree warming. We also note that the discussion on sea-ice scenarios in Chapter 15 is limited and does not reflect the uncertainties with respect to the issue. The very short statement in Table SPM-2 could therefore provide basis for misunderstandings. At least to ensure consistency between the SPM and the "scientific basis" the statement on sea-ice in Table SPM-2 should be changed to read "20-35% dec. annual averaged Arctic sea ice - highest red. in summer" (Govt. of Norway)
949	12	1	13	24	Table SPM-2: The authors need to review the confidence ratings provided for each of the regional impacts as in a number of cases they do not match the confidence readings provided in the chapters (e.g. in the Chapter 10 ES the finding that freshwater availability will decrease and could adversely affect more than a billion people in Asia by the 2050s with high confidence), however here confidence is assessed at only *. (Govt. of Australia)
950	12	1	13	24	Table SPM-2: No detail is provided of the basis upon which the examples provided were chosen. The authors need to explain if Table 2 impacts are based on the same "Criteria of Choice" of footnote 10. (Govt. of Australia)
951	12	4		34	In Table SPM2, although the headings of the rows of the Table indicate “Polar Regions”, examples presented only include the Arctic. It is proposed to include a few examples on the Antarctic Region, to reflect more closely the relationship between the headings and the contents of such a Table. (Govt. of Chile)
952	12	7	12	10	For Asia, agriculture is very important, its impacts should list here, add a part to describe that the crop yield will increase 20% according to "Results of crop yield projection using HadCM2 indicate that crop yields could likely increase up to 20% in East and Southeast Asia while it could decrease up to 30% in Central and South Asia even if the direct positive physiological effects of CO 2 are taken into account" 10.4.1.1 . (Govt. of China)
953	12	7		8	With regard to providing estimates of impacts on water scarcity, the U.S. Government wonders whether the authors could provide estimates for net changes in people at risk of water scarcity instead of for people at increased risk of water scarcity. The net change would be of interest to policymakers. (Govt. of USA)
954	12	11	12	12	Table SPM-2: it does not appear to be particularly useful to place three unrelated impacts on the same line. (Govt. of Australia)
955	12	20		22	Section on North America: Line 20, Footnote 17, does not lead to information on 5-20% increase in forest growth. It's not in the underlying chapter. (Govt. of USA)
956	12	21		21	“crop growth” should be “crop yield” (Govt. of USA)
957	12	35			Generally we miss a discussion of the information contained in Table SPM-1 and SPM-2 as well as a concluding statement. We suggest to conclude: "The larger the changes in climate the more risks due to critical climate change impacts exist [please add confidence level]. [TS 4.1]"

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Germany)
958	12	36	13	10	Table SPM-2: As a part of the content of caption is policy relevant please only cite technical information of graph in caption and integrate the interpretation of the results from this graph in the text. Please add upper part of SPM-1 in this graph for further interpretation and discuss the combination of upper part of table SPM-1 and Table SPM-2. . (Govt. of Germany)
959	12	36	13	10	Table SPM-1: As a part of the content of caption is policy relevant please only cite technical information of graph in caption and integrate the interpretation of the results from this graph in the text. Please add some further interpretation by discussion the combination of upper and lower part of table SPM-1. (Govt. of Germany)
960	12	39	12	39	WRE needs to be clarified as has been done in Foot note 9 on page 15 of Technical Summary. (Govt. of Pakistan)
961	12	42	12	49	Table SPM-1: This explanation for Table SPM-1 is particularly dense and technical and does not provide assistance for policy readers. It should be redrafted to more clearly explain the methodology for the top part of the table. The shorthand for instance, inc. / Dec. etc is not obvious. The SPM could be helped by having an expanded, clear step-by-step explanation in the TS. (Govt. of Australia)
962	12	42	12	42	It is important that this explanation links back to WGI and explains where the 19 AOGCMs came from and where the fit in the relation to the climate sensitivity estimates in the WG I AR4. (Govt. of Germany)
963	12	45	12	45	Comment: "The outer tick marks (SRES scenarios only)..." Reference to Endbox 3 should be here. (Govt. of Finland)
964	12	50			Line states "Subject to revision" When? For this SPM? (Govt. of Philippines)
965	12	52	12	50	Table SPM-1 (cont.). The "+/-1 standard deviation" should be related to confidence intervals, which are used elsewhere the text. (For a normal distribution, "+/-1 standard deviation" corresponds to the 16-84% confidence interval.) A statement should be added how climate sensitivity in the 19 AOGCMs compares to the probability distributions for climate sensitivity in the WG I AR4 (e.g., Box 10.2). (European Commission)
966	12	55	12	55	What is meant by "Outlying impacts could occur either side of the entries"? Please clarify. (European Commission)
967	13	1	13	10	Time references in addition to the temperature scale are necessary in Table SPM-1 and Table SPM-2. The table is based on a temperature scale, however on p.13, line 1-3, the writers have noted that a number of socio-economic impacts are also time dependent, which is not clearly displayed in the table. It is important for policymakers to be able to understand the timing of these events; specifically how near or how far in the future they will occur. Statements in Table SPM-1 and Table SPM-2 read without a time reference may be misleading, therefore moving p. 12, line 51 to p. 13, line 10 ahead of Table SPM-1 and Table SPM-2 to act as an introductory text to clarify the timescale statements in Table SPM-1 and Table SPM-2 follow. (Govt. of Japan)
968	13	3	13	4	Add "in the 2020s, 2050s, and 2080s" after "under the SRES A2 scenario".

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(European Commission)
969	13	5	13	6	Add word: "Note that these are estimated climate-induced changes RELATIVE to the estimate number for a future without climate change". (Govt. of Canada)
970	14	0	14		Apparent inconsistencies in the presentation of relevant findings between the SPMs for WG I and WG II will likely be a major focus of criticism and may undermine the credibility of both reports. These inconsistencies should be reduced or explained wherever possible, especially in Table SPM-3. The first two comments are based on the version of WG I Table SPM-1 approved in Paris on February 1, 2007, and pertain to WG II Table SPM-3, and the rest are general comments. 1) Column Headings: Second column from left—Change heading from “Likelihood of trend in 21st C (WG I SPM)” to “Likelihood of future trends based on projections for 21st Century using SRES scenarios.” 2) Footnotes for cell contents: Second column from left—Add footnote to contents of first two cells (i.e., “virtually certain” likelihood of “warmer and fewer cold days . . .” and “warmer and more frequent hot days . . .”) that reads “warming of most extreme days and nights each year”. Add a footnote to the contents of the last cell in the same column (i.e., “Likely” likelihood of “Increased incidence of extreme high sea level . . .”) that reads “In all scenarios, the projected global mean sea level at 2100 is higher than in the reference period. (WGI 10.6) The effect of changes in Regional weather systems on sea level extremes has not been assessed.” 3) Table Caption: It’s important that policymakers understand the methods used to develop the content making up this table. Insert the following sentence before the table and chapter citations. “Conclusions about possible future impacts are limited in that they do not take into account possible socio-economic change other than those already included in the various SRES emission scenarios, or various adaptation and mitigation strategies. [NOTE: The same language should also be repeated in the captions for Tables SPM-1 and SPM-2. These captions are on page 11, lines 54-55, and page 12, lines 33-34.] 4) Column Headings: Third Column from left—Change “Major impacts by sector” to “Possible impacts by sector” to emphasize these are based on projections of future trends and to bring the heading into agreement with the figure caption. 5) Cell content a. General for columns 3 through 6—Indicate level of confidence assigned to each finding (statement in SPM-14 lines 2 through 3 appears to indicate that high confidence is assigned to all entries in Table SPM-1. b. Delete “dermatitis” from the 5th cell in the row “heavy precipitation . . .” c. Delete “increase in stress related disease” from the 5th cell in the row “Incidence of extreme high sea level,” unless a compelling case can be made in the accompanying text that this phenomena poses a unique threat. d. Revise content of 6th cell in the row “Incidence of extreme high sea level . . .” as the contents are not impacts. This could be made stronger if “conflicts and tradeoffs” were discussed. e. Insert “displacement of human populations” to contents of the 6th cell in the row “Incidence of extreme high sea level. f. There should be some mention in this table that in some areas: (a) water scarcity may be relieved (as, for example noted on page 6, lines 14-16 in the current version of the SPM), and (b) agricultural productivity may be enhanced. This would help add more balance to this table. (Govt. of USA)
971	14	2	14	3	To use same structure as in TAR, to say that "There is high confidence that impacts..." (Govt. of Mexico)
972	14	2	14	13	The Table is well designed. It presents the critical lashes of extreme weather and climate events. Since an extended drought, both in time and space, is a

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					climate extreme, the umbrella phrase should read, after intensities, in line 2, "extreme weather and climate events". Further, some cross-cutting references might be added (i.e. those in the Water resources column, relative to heavy precipitation events and tropical cyclones, affecting water supplies because of increasing pollution. However, such addition would complicate this table 's presentation. In consequence it may be accepted as it is now, except the above mentioned change. (Govt. of Argentina)
973	14	2	14	3	Please be explicit, add at the beginning of the sentence: "Risks arising from possible impacts..." [TS 4.1; e.g. p. 22 l. 20-22, p. 24 l. 1-10, p. 26 l. 11-13, p. 27 l. 17-21] (Govt. of Germany)
974	14	2	14	3	One of the two expert judgments of uncertainty should be deleted from this statement. The difference in the evaluation of likelihood and confidence will confuse policymakers. (IPIECA)
975	14	2	14	3	Heading is ambiguous. 'Increase' relative to what? The reader will think that impacts shown in Table SPM - 3 are additional to those shown earlier in the SPM - is this intended? (Govt. of Australia)
976	14	2	14	3	For improved clarity, change the wording to "Projected increases in the frequency and intensity of extreme weather events lead to increasing adverse impacts [high confidence]." (European Commission)
977	14	5	14	5	Suggest to change "the IPCC Third Assessment" to "the TAR", to be consistent with rest of SPM (Govt. of Mexico)
978	14	5		7	Add discussion of process used to choose the sectors included in Table SPM -1. Also, insert explanation of how magnitude of impact was determined (i.e., what constitutes a "major impact"). (Govt. of USA)
979	14	6	14	6	Insert "and/" before "or" to more accurately reflect the finding in the report that some extremes are projected to be both more widespread and intense. (Govt. of Australia)
980	14	9	14	13	Table SPM-3: Thought should be given to changing the heading "Major Impacts by Sector". Major implies primary impacts, which in the case of extreme events will be dependant on a range of different local factors. Suggest that for consistency "Major Impacts by Sector" is replaced with "Selected Possible Impacts by Sector", this also accords more closely with the description provided for the Table. (Govt. of Australia)
981	14	9	14		Table SPM-3: The time frame for this table "projections to the mid to late 21st century" is rather vague. It would help to know from when the supposed projected impacts listed in the table will actually start to become observable. The text we would like to have clarified in the table is as follows below (in point form): (Govt. of Japan)
982	14	9	14	13	Table SPM-3: The authors should make it more clear that the first two columns are taken directly from the Working Group 1 report, and provide a more detailed reference. In addition these columns need to be amended to reflect the changes made in the Working Group 1 report. (Govt. of Australia)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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983	14	9	14	13	Table SPM-3: The authors need to make it clear that the column 2 "likelihood" reading relates to column 1 and NOT column's 3-6. As currently presented an inaccurate picture of the likelihood of the presented impacts is provided. (Govt. of Australia)
984	14	9	14		Table SPM-3: Phenomena and direction of the trend - the first column contains what are treated as two separate headings in WGI SPM. Though it is understood that the reason for this may be spacing, to maintain consistency with the work of WGI, the two should be separated. (Govt. of Japan)
985	14	9	14	13	Table SPM-3: For consistency with Tables SPM-1 and SPM-2 confidence readings for each of the listed impacts should be included. (Govt. of Australia)
986	14	9	14	14	Table SPM-3: Column 1 in this table needs to be reworded in places to match the final version from WG1. Thus in the first box in the third row ("Warmer/fewer ...") each 'slash' should be replaced by 'and' (thus "Warmer and fewer ..". Changes are also needed in rows 3, 5, and 6 of column 1. (Govt. of New Zealand)
987	14	9	14	13	Table SPM-3: 4th Row - last column: Impact of heat waves on society. Impacts on the poor should also be specified. (The poor are least able to afford relief measures such as insulation and air conditioning). (Govt. of Australia)
988	14	9	14		Table SPM-3: Industry/settlement/society - 6th column from the top (last column) - The following text is unclear and needs to be re-phrased: "costs of coastal protection versus costs of land-use relocation". (Govt. of Japan)
989	14	9	14		Table SPM-3: Industry/settlement/society - 4th, 5th and 6th column from the top - "potentials for population migration" should not only be written as in column 4, but also added to column 5 and 6. (Govt. of Japan)
990	14	9	14		Table SPM-3: Industry/settlement/society - 3rd column from the top - An alternative word order is suggested as follows: "Disruption of transport, commerce, settlements and societies due to flooding." (Govt. of Japan)
991	14	9	14		Table SPM-3: Industry/settlement/society - 2nd column from the top - In regard to: "impacts on elderly and the very young", to what degree this is a major impact is debatable and deleting it from the table is suggested. (Govt. of Japan)
992	14	9	14		Table SPM-3: Industry/settlement/society - 1st column from the top - delete "etc". (Govt. of Japan)
993	14	9	14		Table SPM-3: Human health/mortality - 4th column from the top - confusing text. Does the semi-colon infer a connection and/or separation of the text? Also wonder why wild fires are listed in a human health impact category. It is understood that people may die in wild fires, however comments on wild fires are more appropriate in the Agriculture/Forestry section. (Govt. of Japan)
994	14	9	14		Table SPM-3: Human health/mortality - 3rd column from the top - "allergies and dermatitis from floods and landslides". The reader questions the validity of the judgment that this a major impact on human health. (Govt. of Japan)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
995	14	9	14		Table SPM-3: Agriculture, forestry column - livestock death - inserting "increase" is suggested. (Govt. of Japan)
996	14	9	14		Table SPM-3: Agriculture, forestry column - 3rd column from the top - inability to cultivate land could be deleted. Water logging of soils leads to the inability to cultivate land as does soil erosion. (Govt. of Japan)
997	14	9	14	13	Table SPM-3. This table on extreme weather event is important. The SPM should clarify that this is valid for all regions. In the second from the top-leftmost cell ("Warm spells/heat waves...") the term "and intensity" should be inserted after "frequency". This change is based on the WG I TS FGD, which states that "Several recent studies have addressed possible future changes in heat waves, and found that, in a future climate, heat waves are expected to be more intense, longer-lasting and more frequent." (p. TS-43, lines 25-27). (European Commission)
998	14	9	14	13	Table SPM-3. The use of slashes "/" in the table cells should be avoided because it is unclear how exactly they are to be interpreted. This problem is most obvious in the top-left cell ("Warmer/fewer cold days/nights; warmer/more hot days/nights ..."). (European Commission)
999	14	9	14	10	Table 3. Line 1, Water resources-column. Warmer days and nights are bound to affect water resources not only through effects on snow melt, but also on evapotranspiration on general. E.g., when snowing is replaced by raining, winter time floodings, erosion and leaching of nutrients will follow. (Govt. of Finland)
1000	14	9	14	10	Is it possible to include regions that are affected by these major impacts in the summary table? (Govt. of Thailand)
1001	14	9	14	14	In Table SPM-3, the following impacts may be added under the 'Agriculture sector' against different phenomena: (i) "Increased soil erosion" against "Area affected by drought" (ii) "Scattering of livestock herds" against "Number of intense tropical cyclones" (iii) "Land degradation against "Incidence of extreme high sea-level" (Govt. of Pakistan)
1002	14	9	14	10	In Table 1, 6th row 4th line states that people without air conditioning will lose in life quality. This statement is much too general, because in many cases other solutions can be found. We propose to replace "air conditioning" by "adequate housing and sometimes cooling solutions". (Govt. of France)
1003	14	9	14	10	In Table 1, 1st row 7th line, the terms "Number of intense tropical cyclones increase" does not correspond to the statement in the SPM of WG 1, which says now : "Increase of intense tropical cyclone activity". Please make the correction. (Govt. of France)
1004	14	9	14	10	Entry on heavy precipitation in Table SPM-3. Please check the statement "Heavy precipitation events, frequency increases over most areas", as this is largely misleading. This must refer to intensities, so that there is a need to say this. (Govt. of Philippines)
1005	14	9	15	13	Entries for "Heavy precipitation events: frequency increases over most areas" and "Area affected by drought: increases". For countries (like the Philippines) which are expected to be vulnerable to both, there should be delimitations. (Govt. of Philippines)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1006	14	9			Table SPM-3: This table is informative by could be improved by including some indication of where these impacts are most likely to occur. (Govt. of Canada)
1007	14	9			Table SPM-3: It is suggested to add another column identifying the regions where the described phenomena will be most significant. (Govt. of Austria)
1008	14	9			Table SPM-3: It is noted that the the phenomena of warmer/fewer cold days/nights and more hot days/nights with regard to industry/settlement/society is not well described when it comes to reduced effects of snow, ice. The description does not provide additional information compared to those included under "water resources" and the wording "reduced effects of snow, ice etc" is difficult to understand/interpret. Less effort required to remove snow/ice from streets, airports; higher risks for water shortage and floods; (Govt. of Austria)
1009	14	9			Table SPM-3: It is noted that the phenomena of increasees of intense tropical cyclones might also trigger migration of population. (Govt. of Austria)
1010	14	9			Table SPM-3: In the chart on major impacts by sector, the impacts identified for industry/settlement and society should include disruption to commerce for the row in the chart labelled "Warm spells/heat waves: frequency increases over most land areas..." Warm spells at unpredictable times of the year do have widespread impacts on global supply chains and consumer demand cycles. In a commerce world of just-in-time delivery, supply chains can be easily caught out by rapid changes in seasonal demands for goods. More over economic infrastructure including roads are sensitive to fluctuating temperature conditions. Chapter 7 does not just identify flooding as a phenomenon that causes disruption. Note p. 21 for example where heat waves impact on infrastructure and thus economic activity. (Govt. of Canada)
1011	14	9			Table SPM-3, caption: The following language is proposed: Examples of all entries can be found in the full Assessment. It is noted that this list of examples is still missing. (Govt. of Austria)
1012	14	9			Table SPM-3 Comment: There could be some mention about effects on winter tourism in the last column (Industry/settlement/society) (Govt. of Finland)
1013	14	9			Please add references to allow tracking of examples of entries (Govt. of The Netherlands)
1014	14	12	14	13	Table SPM-3 would be more useful if the reader could easily access the underlying material. Please incorporate sources of the material in this table in square brackets like is done in the rest of the report. (Govt. of Canada)
1015	15	1	12	56	We strongly recommend that the SRES projections be made consistent with WG1. (Govt. of UK)
1016	15	1	12	56	We are concerned about some of the impacts shown. A number of these are time-dependent, thus a time frame should be given. Also, many are only based on one study - thus the numbers give false accuracy. Unclear how sea level rise and temperature rise have been linked - this relationship is complex, particularly for the stabilisation scenarios shown. (Govt. of UK)
1017	15	1	12	56	This diagram is too complex and should be split into two. We have a number of issues with specific elements.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					We are concerned that the WRE stabilisation levels shown will confuse policymakers. The temperature ranges shown for 2300 are far lower than those given for apparently equivalent stabilisation levels in WG1. We assume this is due to the high aerosol loading of the WRE scenarios. We would strongly prefer that a selection of stabilisation levels from WG1 (e.g. from Table TS-5) be presented, just showing the stabilised temperature range. A less-agreeable alternative would be to recalculate the CO2e including the aerosol forcing. (Govt. of UK)
1018	15	1	15	23	This section needs an introduction that reads "The economic and social impacts for various systems, sectors and regions will vary according to the local severity of the physical impacts of climate change. These varying impacts will influence the capacity of various systems, sectors and regions to adapt to climate change." (Govt. of Australia)
1019	15	1	15	2	The sentence "Some systems, sectors and regions are likely to be especially affected by climate change [high confidence]." is (almost) a tautology. It is one more example that the unjustified combination of likelihood and confidence language often produces statements that convey no useful information. We suggest to replace this sentence by the following text: "Some systems, sectors, and regions can now be identified as especially vulnerable to climate change [high confidence]." (European Commission)
1020	15	1	15	2	The sentence "Some systems, sectors and regions are likely to be especially affected by climate change [high confidence]." do not convey useful information as it is not clear how systems, sectors and regions could be affected. As it is within the mandate of WG II to assess the vulnerability of sectors and regions please specify as follows: "Some systems, sectors, and regions can now be identified as especially vulnerable to climate change [high confidence]." (Govt. of Germany)
1021	15	1	15	23	The dot points setting out those systems/sectors and regions that will be especially affected by climate change need to be more closely linked to adequately reflect the bolded heading. Suggest that for each dot point on systems/sectors, chapter references from the regional chapters that relate to the especially vulnerable systems are included. (Govt. of Australia)
1022	15	1	15	1	The authors need to define what they mean by "especially". Does it mean that these systems are particularly vulnerable, or that the impacts are most significant? (Govt. of Australia)
1023	15	1	15	1	The authors need to confirm that "likely" is used in IPCC terminology (i.e.>66% probability of occurring). If it is not another word should be used to prevent confusion. Suggest delete "are likely" and replace with "may". (Govt. of Australia)
1024	15	1	15	2	One of the two expert judgments of uncertainty should be deleted from this statement. The difference in the evaluation of likelihood and confidence will confuse policymakers. (IPIECA)
1025	15	1	15	23	It is opportune to make some additions of critical facts already mentioned in previous section of this SPM or in the respective chapters. In the first bullet (lines 5 to 6, the very important freshwater wetland ecosystems must be added, not only because of their local and regional importance, but for the reason that they are stops or seasonal dwellings of migratory species, even for those going from a region to another.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					Also the lake, lagoons, and even reservoirs, containing edible species (i.e. tilapias, in Lake Victoria) and other valuable component of the feeding trophic chain, equally affected by temperature increases, shall be mentioned. The third bullet misses the necessary reference on the impact of extreme weather and climate events, clearly reported as enhanced processes by WG I AR 4. Regarding regions, it is unacceptable to have missed the opportunity to reiterate the dramatic loss of the remarkable biological diversity of Latin America, particularly in the Amazon Basin. Further, the huge deforestation rates will, as modeled years ago, affect the recycling of the northeastern trade winds, with a potential loss of about 50 percent of rainfall on the largest basins of the region (Amazon, Orinoco and River Plate Basins), with the consequential loss of flow affecting hydraulic energy generation and water supply in large areas of South America, currently holding 35 percent of the world fresh water resources. No doubt that this is and important as well as critical outcome of the Earth ´s warming combined with deforestation practices Another critical issue corresponds to forest fires. From the point of view of health, long-distance air pollution transmission and changes in radiation balances, which affect energy transfer, the large amount of provoked fires plus the climate change exacerbated wildfires, also increasing as a side-effect of increasing deforestation rates, should have a place in this SPM. Transboundary air pollution brings many insidious problems of great interest in decision making. (Govt. of Argentina)
1026	15	1	15	1	Is the word 'likely' used here in the calibrated sense, i.e. to mean > 66% probability? Consistent useage is needed. (Govt. of New Zealand)
1027	15	1	15	1	“Affected”, can be replaced by “impacted” (Govt. of India)
1028	15	1	15	1	"Especially" should be replaced with "particularly". (Govt. of Japan)
1029	15	1	16	54	As some countries may be considering using indicators and other measures to track progress, it is important to add insights on these such as that from Page 18 Lines 34-36: " Indicators may fail to capture many of the processes and contextual factors that influence adaptive capacity." (Govt. of Canada)
1030	15	1		23	The U.S. Government suggests deleting this section as a separate item and integrating the key points into the appropriate sub-sections in Section C. These are important points that would add to the understanding of sectoral/regional vulnerabilities. Otherwise, a definition of “especially” would be needed and the statement on line 1 should begin with “In the absence of adaptation....” The U.S. Government notes that these impacts do not track to Chapter 19 references. (Govt. of USA)
1031	15	3	15	3	Suggest inserting here the main conclusions of Chapter 19: - "Global mean temperature changes of up to 2°C above 1990-2000 levels (see Box 19.2) would exacerbate current key impacts, such as those listed above (high confidence), and trigger others, such as reduced food security in many low-latitude nations (medium confidence). At the same time, some systems such as global agricultural productivity, could benefit (low/medium confidence). • Global mean temperature changes of 2 to 4°C above 1990-2000 levels would result in an increasing number of key impacts at all scales (high confidence), such as widespread loss of biodiversity, decreasing global agricultural productivity and commitment to widespread deglaciation of Greenland (high confidence) and West Antarctic (medium confidence) ice sheets. • Global mean temperature changes greater than 4°C above 1990-2000 levels would lead to major increases in vulnerability (very high confidence), exceeding the adaptive capacity of many systems (very high confidence).

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Greenpeace)
1032	15	3	15	3	Comment withdrawn (Govt. of Germany)
1033	15	4	15	4	Suggest to change "Regarding systems and sectors, these are:" to "Regarding affected systems and sectors, the most important are:" And the same in line 13 (Govt. of Mexico)
1034	15	4	15	4	Replace the sentence with: Systems and sectors which will be especially effected by climate changes are: (Govt. of Norway)
1035	15	5	15	6	This sentence does not seem to be properly worded. Please rephrase, insert "ecosystems" after "mountain", and make consistent use of punctuation marks. (European Commission)
1036	15	5	15	5	The phrase "Ecosystems especially" implies that ALL ecosystems are "likely to be especially affected by climate change", rather than just the listed tundra, boreal forests, etc. The authors need to confirm this finding. (Govt. of Australia)
1037	15	5	15	6	The grammar as presented in this dot point is confusing. The authors seem to group terrestrial ecosystems, coastal ecosystems and marine ecosystems, without being explicit about this grouping. Suggest restructure to make this clearer (e.g. "Some vulnerable ecosystems: terrestrial ecosystems (such as tundra, boreal forest, mountain, Mediterranean-type ecosystems); coastal ecosystems (such as mangroves and salt marshes); and marine ecosystems (such as coral reefs and the sea ice biomes) [4.ES, 4.4, 6.4].") (Govt. of Australia)
1038	15	5	15	5	Include glaciers (Govt of Switzerland)
1039	15	5	15	5	Delete: "Ecosystems especially: " and start with: " Tundra, boreal forest.....etc" (Govt. of Norway)
1040	15	5	15	6	Awkward phrasing. Suggest rewording to: Some natural ecosystems, especially the following: (provide list as in existing text). (Govt. of Canada)
1041	15	5	15	5	Add reference to tropical forests (Govt. of Germany)
1042	15	5	15	6	"Ecosystems especially" is an awkward wording. The following revision is suggested: "Ecosystems: In particular, tundra, boreal forest, mountain, Mediterranean-type ecosystems; along coasts, mangroves and salt marshes; and in oceans, coral reefs and the sea ice biomes." (Govt. of Japan)
1043	15	6	15	6	The authors need to confirm that ALL oceans will be "especially affected" by climate change. (Govt. of Australia)
1044	15	7	15	7	Replace "coasts" by "coastal regions". (European Commission)
1045	15	7	15	7	Insert "and extreme weather events" after "sea-level rise" to more closely match chapter 6. (Govt. of Australia)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1046	15	8	15	9	This statement is contradictory to what is indicated in Chapter 10 especially for countries like the Philippines. (Govt. of Philippines)
1047	15	8	15	8	Replace "middle" by "mid-latitude". (European Commission)
1048	15	8	15	9	It would be good to add the sentence: "Even in regions where precipitation will increase, the changes in its annual structure (more precipitation in winter and less in summer) together with increase of evapotranspiration can cause the increase of water shortage in summer and decrease of crop yield". (Govt. of Poland)
1049	15	10	15	10	The authors need to specify that this is in the dry tropics and midlatitudes as water availability is likely to increase in the wet tropics (low latitudes). (Govt. of Australia)
1050	15	11	15	11	It is noted that "areas" is quite ambiguous in this context because it could address countries, regions or even a more local part of a country. It is suggested to substitute this word by a more specific term. (Govt. of Austria)
1051	15	11	15	11	For policy makers a bland statement that "Human health" will be especially affected, is not helpful. The authors need to provide the particular aspects of human health that will be especially affected by climate change (i.e. heat related mortality, etc.) (Govt. of Australia)
1052	15	12	15	12	Include a bullet point: Alpine regions (Govt of Switzerland)
1053	15	13	15	13	This select set of regions that are "especially affected by climate change" appear to be influenced by perceived local adaptive capacities rather than the relative local severity of the physical impacts of climate change, and are by their nature, selective. The opening sentence for these dot points should be amended to reflect this selectivity and to be less definitive. Suggest the following change "Regarding selected regions, these include:" (Govt. of Australia)
1054	15	13	15	20	The Mediterranean region should be cited in the bullets points of the regions especially affected by climate change: Decreases in summer and winter precipitation (very high confidence), reductions on food and fiber production (high confidence), longer fire-season and increased fire occurrence in forests and grasslands (very high confidence), ecosystems seriously endangered with dominance of shrubs over trees (very high confidence), most sensitive natural in Europe located in various parts of the Mediterranean, local plant species losses of up to 62 % are projected for the Mediterranean and Lusitanian mountains by the 2080s under the A1 scenario (Chapter 12) and up to twenty times this region is cited in the TS as one of the most vulnerable region, in relation with increases of forest fires, decreases of water resources, severe ecological impacts of its ecosystems, losses of coastal wetlands, heat waves, decrease in crop productivity, decline of hydropower potential, changes and disappears of aquatic ecosystem, reduction in summer tourism, etc. (Govt. of Spain)
1055	15	13	15	13	Replace the sentence with: Regions which will be especially affected by climate change are: (Govt. of Norway)
1056	15	13		20	Provided there are studies included in the bibliography to support statements in this subject, it appears as appropriate to include Latin America in the list of regions likely to be especially affected by climate change. This is a region particularly vulnerable to climate change suffering increasing extreme events, as it is shown in Table SPM3 relating impacts and frequency and magnitude of extreme events.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Chile)
1057	15	13		20	Conclusions regarding glacier retreat and shrinking along the Andes should also be included. (Govt. of Chile)
1058	15	14	15	14	Point is poorly drafted. Perhaps redraft as: 'The Arctic, because of high rates of temperature rise in the region which are (IPCC likelihood , e.g. "likely") to impact on natural systems'. (Govt. of Australia)
1059	15	14	15	14	It is not clear what is meant by "high rates of projected warming on natural systems". Human systems (where they exist) are exposed to the same rate of warming. Please clarify. (European Commission)
1060	15	14	15	14	Insert 'the impact of' before 'high rates'. Thus: "The Arctic, because of the impact of high rates of projected warming ..." (Govt. of New Zealand)
1061	15	14	15	14	Add italicized words: "The Arctic, because of the impacts of high rates of projected warming on natural systems." (Govt. of Canada)
1062	15	15	15	16	The last words "as well as climate change" should be removed as they sound circular argument as the title of the list is "...especially affected by climate change..." (Govt. of Finland)
1063	15	15	15	16	It is suggested to substitute the wording "climate change" by a more specific wording that identifies the phenomena that result in the most significant impacts from climate change for Africa (e.g. water scarcity) (Govt. of Austria)
1064	15	15	15	16	It is not clear what is meant by "because of current low adaptive capacity as well as climate change". Please clarify. (European Commission)
1065	15	15	15	16	Delete "as well as climate change" as this is redundant in the context of the section. In addition, the authors should consider including wording around Africa's increased vulnerability due to non-climate related stressors. (Govt. of Australia)
1066	15	16	15	16	add 'and other multiple stresses' (UNISDR)
1067	15	17	15	18	Drop the term "risk of" in "due to high exposure of population and infrastructure to risk of sea-level rise". One cannot be exposed to a risk; instead, one can be at risk of being exposed to a hazard. (European Commission)
1068	15	19	15	20	How's about semiarid zone of Asia? (Govt. of Thailand)
1069	15	19	15	20	Another country that is particularly susceptible to sea level rise and river flooding is the Netherlands, which also has a large percentage of its population and GNP production below sea level (see Chapter 12, page 19). This should be included in this dot point, to provide greater regional diversity. (Govt. of Australia)
1070	15	22	15	22	We propose the following change: "Within other areas, even those with high AVERAGE incomes,... "

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Norway)
1071	15	22	15	23	This text is too vague. Clarification of "some" and where possible, further quantification of this comment is suggested. (Govt. of Japan)
1072	15	22	15	23	This sentence could be deleted as it implies that the physical severity of local climate change impacts are less relevant for areas with high incomes, where, to the contrary, the economic costs of adapting might be higher than elsewhere given the scale of investment. (Govt. of Australia)
1073	15	22	15	22	The phrases "within other areas" and "and also some areas and some activities" are not particularly useful to policy makers as they are overly general. In addition, literally read the sentence as currently drafted states that "even those with high incomes.....(such as the poor)", which is obviously a confusing, if not a nonsensical, finding. Suggest that this sentence is completely redrafted, to make the key message clearer, which is that certain segments of society are more at risk than the general population (e.g. "Certain populations in all regions are more particularly at risk than the general population. For example the poor, young children and the elderly are particularly vulnerable to the impacts of climate change".) (Govt. of Australia)
1074	15	22	15	23	Rephrase the sentence: ' Within other areas, even those with high incomes, vulnerable groups such as the poor, young children and the elderly will be particularly at risk.' (Govt. of UK)
1075	15	22	15	23	It would be important to reflect that one factor of increased exposure and risk is the inability to reduce the present adaptation deficit. Implementing disaster risk reduction strategies is a win-win strategy to address that deficit. This echoes what the summary spells out in the case of North America which holds true for all regions namely, "Current adaptation is uneven and readiness for increased exposure is low." (UNISDR)
1076	15	22	15	23	It is suggested to split the sentence into two and to insert a full stop after "and elderly". It is also suggested to specify the areas as well as activities that can be particularly at risk from climate change. (Govt. of Austria)
1077	15	22	15	23	Examples of some of the areas and activities in which people in other areas are at risk would be helpful. (Govt. of New Zealand)
1078	15	22		23	This sentence is too vague to be useful. Delete. (Govt. of USA)
1079	15	24	15	24	Suggest inserting Table 19.1 here (Greenpeace)
1080	15	25	15	41	Policy makers would have to deal also with the problems caused by a 40-70% loss of species. This could also be highlighted. See also table SPM-1. (Govt. of Sweden)
1081	15	25	15	26	One of the two expert judgments of uncertainty should be deleted from this statement. The difference in the evaluation of likelihood and confidence will confuse policymakers. (IPIECA)
1082	15	25	15	26	For clarification, replace "Some events" by "Some large-scale climate events". (European Commission)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1083	15	25		25	Define “very large impacts”. Is it magnitude, irreversible? (Govt. of USA)
1084	15	28	15	33	This paragraph understates the risk associated with the melting of the Greenland and/or West Antarctic ice-sheets. The Executive Summary of WG I Chapter FGD states: "Except for remnant glaciers in the mountains, the Greenland ice sheet would largely be eliminated, raising sea-level by about 7 m, if a sufficiently warm climate were maintained for millennia; it would happen more rapidly if ice flow accelerated. Models suggest that the global warming required lies in the range 1.9–4.6°C relative to pre-industrial." First, the term "partial deglaciation" should be changed to "partial or full deglaciation". Second, the term "of 4-6 m" should be changed to "at least 4 m" since the stated upper bound of 6 m may well be exceeded by contributions from the Greenland ice sheet alone. (European Commission)
1085	15	28	15	33	This paragraph should be chequed for consistency with the SPM for WG I p.10 about A Paleoclimatic perspective 2. bullet point but especially p.17, 4. bullet point starting with "Contraction of the Greenland ice sheet....." Also the TS p25 L 4-17 (Govt. of Norway)
1086	15	28	15	41	These paragraphs are crossing into the mandate of WG1, care needs to be taken, therefore, that a consistent message on these large scale changes is presented across the reports. (Govt. of Australia)
1087	15	28	15	32	The order of the two sentences forming this paragraph (line 28 to 30 and line 30 to 33) should be inverted. (Govt. of UK)
1088	15	31	15	33	This conclusion includes large uncertainties, please be cautious to this, and 3-5 should be better than 1-2 based on AR4 of WG I. (Govt. of China)
1089	15	31	15	32	These lines say that both ice sheets will be committed to partial deglaciation for global temperature increases of 1-2°C". Need to ensure consistency with WGI report which seems to highlight that the Antarctic ice sheet will remain too cold for widespread melting and will tend toward mass accumulation (SPM page 13 and TS page 48 line 2-4). Also, WG1 10.7.4.3 [Page 10-71; lines 43-56] notes that the ~1°C applies to warming below the ice shelf, but cannot be quantitatively related to global warming values.] (Govt. of Canada)
1090	15	31	15	32	Please check this statement compared to WG I SPM, page 13, and WG I Ch.10.7/Box10.1 (for Greenland: 1.9-4.6oC, for Antarctica: “present understanding is insufficient for prediction”). (Govt. of Sweden)
1091	15	31	15	31	Do not use the word "committed" (cf. SPM WG I) (Govt of Switzerland)
1092	15	31		32	The melting of Greenland ice and the weakening of the Golf stream are very sensitive subjects to the public and one should be very careful with words when writing about them. It could be better to mention a possible threshold temperature, after which in the long run the melting cannot be stopped anymore, if the threshold temperature is mentioned in the background report. (Govt. of Finland)
1093	15	31		33	Rewrite lines to read: “There is medium confidence that both ice sheets would be committed to partial deglaciation for a global average temperature increase greater than 1-2°C, but their resultant contributions to sea level in the next century is not known.”

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of USA)
1094	15	31		41	In spite of the relevance of the subject, there is no mention with regards to the Antarctica, its Peninsula region or the Southern Polar Ocean. A comment for these areas should be added. (Govt. of Chile)
1095	15	32	15	32	This should read "...causing sea-level rise of 4-6 m over centuries to millennia, with total deglaciation resulting in global se-level rise of 10-12 m" (Greenpeace)
SPM - 1096	15	32	15	32	Please specify which reference period/year is used here, since this SPM refers i.a. to 1990, 1861-90 and 1750. (Govt. of Denmark)
1097	15	32	15	32	Please clarify whether the 1-2 deg C temperature increase referred to is relative to present temperatures or pre-industrial (or other). (Govt. of New Zealand)
1098	15	33	15	33	The ultimate loss of both ice sheets would raise sea level some 10-12 metres, also over. If there is medium confidence for a partial deglaciation at these temperatures there would also have to be a similar level of confidence for a full deglaciation but over many centuries to millenia. (Govt. of Germany)
1099	15	34	15	34	Here would be a place to add in a sentence or two about the possibility of more rapid rates of ice sheet disintegration and sea level rise than estimated at present. This is the largest source of uncertainty about SLR projections for the coming century, not just in the longer term, and greater rates of SLR in the coming century would have far-reaching implications in terms of potential impacts. (Govt. of Canada)
1100	15	35	15	41	It is not clear what 'large-scale and persistent changes' are in this context. Are there any changes to the MOC which are not 'large scale'? How long is 'persistent'? Is the projected slowing of the MOC this century a 'large-scale and persistent change' or would only a "large abrupt transition" qualify? What changes to the MOC would render the listed impacts 'likely' (and is 'likely' being used in its calibrated sense to mean > 66% probability of occurrence? Would it be helpful to note if the impacts are consistent across models? (Govt. of New Zealand)
1101	15	35			This paragraph is more likely to be indicated in the work of the WGI, so to keep a document short and focussed it appears unnecessary to repeat it here. (Govt. of Chile)
1102	15	35		41	There is some inconsistency between WG I and WG II treatment of the MOC. In the WG I, it is stated that the long term development of the MOC cannot be estimated, but in the WG II SPM it is written that after 2100 the weakening of the MOC can include changes in marine ecosystem productivity etc. The SPM refers to chapter 19.3.5.3. where this subject is treated quite shortly, however, and references are made only to a few articles. The sentence starting on line 38 should perhaps be revised to reflect the uncertainty of the issue better. (Govt. of Finland)
1103	15	37	15	38	In the sentence stating;" ..., but temperatures over the Atlantic and Europe are projected to increase nevertheless" the following should be added after "nevertheless" : , due to global warming. (Govt. of Norway)
1104	15	39		39	Fisheries are mentioned as being potentially impacted but are not mentioned in the Ecosystems or Coastal summaries. There is little altogether on large marine ecosystems and environments in this summary. More should be added to Sections B and C.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of USA)
1105	15	40	15	41	Please check this statement compared to WG I. Is such net cooling (compared to the pre-industrial and/or present day?) implied in the climate scenario studies? Cf. e.g. WG I Ch 10/Box10.1. (Govt. of Sweden)
1106	15	40	15	40	"Perhaps" is not in the IPCC uncertainty lexicon and should not be used here. (Govt. of New Zealand)
1107	16	1	16	54	This section fails to provide important information on adaptation as a policy response from Chapter 17. Please add: 1) "Adaptation to current climate variability can also increase resilience to long-term climate changes. In a number of cases, however, anthropogenic climate change is likely to also require forward looking investment and planning responses that go beyond short term responses to current climate variability. (17 page 5 lines 19-22), and 2) "A 'wait and see' or reactive approach is often inefficient and could be particularly unsuccessful in addressing irreversible damages" Chpt 17 Page 5 lines 39-40, and 3) "Some elements of adaptive capacity are not substitutable, that is, an economy will be as vulnerable as the "weakest link" in its resources and adaptive capacity (Chpt 17 page 17 line 49.) (Govt. of Canada)
1108	16	1	16	54	The SPM lacks insights on some of the co-benefits of adaptation e.g. Chpt 17 Page 24, lines 44-49 "In addition to their effect on average yield, adaptation measures can also smooth out fluctuations in yields (and consequently social welfare) as a result of climate variability". This concept - of increasing welfare now could be added. (Govt. of Canada)
1109	16	1	19	30	This section of the SPM needs to clarify that adaptation, as used here, means adaptation through human activities. In many instances, natural and even managed ecosystems will adapt successfully to climate change with minimal impacts and without human intervention. Also, this section frames adaptation in the relatively narrow context of climate change (only) and misses the broader context. As a consequence, it misses out on many of the synergies that exist between policies and measures to deal with current climate-sensitive problems with those that would deal with problems due to climate change (e.g., while vulnerability to climate change may be exacerbated by other stresses, relieving the latter will aid in helping systems cope with climate change (page 16, lines 39-40). Revision and clarification are needed. (Govt. of USA)
1110	16	1	19	30	Section D. Current knowledge about responding to climate change. This section deserves a previous comment related to the lack of reference of the beneficial effects arising from climate change. As known, there are regions of the world, like the cold frozen steppes of northern Canada and Siberia, which will see additional cropping grounds. Similar effects may occur in other regions and it will be necessary warn the governments and decision makers about the increasing value of the portion of their territories which may become better fitted for production and for water resources availability. This is very important for countries which lack of basic information has not enable yet to evaluate such resources. Mesoclimate and even microclimate conditions are not well known in many developing countries. Therefore, there is no available information on areas where relocate some crops or cattle or freshwater fish farms, or to protect species. Although this shortcoming must be reflected under Section E, cross reference is necessary here. This is a fundamental matter of equity for opportunities. Decision makers in developing countries shall be guided to defend their climate resources, before international stakeholders/economic groups realize their potentialities (i.e. water availability for a century, or even half a century, due to delayed melting of glaciers and ice-shelf). As shown in announcements in developed country press, investments to acquire large extension of land are promoted. This would be not a negative action on its own; however, it could lead to the irrational exploitation of temporarily available resources, for quick earnings,

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					without any attempt to undertake their sustainable development. As distressingly seen in many circumstances, the lack of information in decision making levels leads to the deterioration of the environment with implications on future climate conditions. Further, the acquisition of basic information, geophysical, social and economic is fundamental to assess the feasibility of adaptation actions and define their expanse. (Govt. of Argentina)
1111	16	1			Section D add: Adaptation measures are seldom undertaken in response to climate change alone (very high confidence) TS 5.1. (Govt. of The Netherlands)
1112	16	1			Canada would like to see inclusion of text that appeared in the previous version of the SPM stating: "All areas, even the most developed, have vulnerable regions, communities and sectors." This is an important, strong statement that is not captured fully in the TS but well supported by all of the regional chapters. Its inclusion is important to counter possible misinterpretations of Figure TS-19 (that indicates low vulnerability for most developed countries) (Govt. of Canada)
1113	16	3		4	This statement doesn't capture the breadth of current adaptation practices. Delete the subordinate clause "but on a very limited basis". (Govt. of USA)
1114	16	4	16	4	The valuation "very limited" to be discussed. Many adaptation measures are just performed in a different context but can be interpreted in the climate context as well (for example new breedings for crops). Better use a more neutral expression. (Govt. of Germany)
1115	16	4	16	4	Suggest that for consistency with chapter 17, the confidence reading given is increased to "very high confidence". (Govt. of Australia)
1116	16	6	16	10	This paragraph includes examples of adaptation for specific biomes and countries. But adaptation strategies encouraged by Multilateral Environmental Agreements could also be mentioned to illustrate global initiatives. In that context, the adaptation framework being developed for World Heritage constitutes an important example of measures that apply to a wide range of climate change impacts, on both natural and cultural World Heritage properties. (UNESCO)
1117	16	6	16	10	More examples should be added e.g. floodprotectionplans Czech republic, coastal protection The Netherlands see 12.2.3 (Govt. of The Netherlands)
1118	16	6	16	10	All examples of adaptation given in this paragraph refer to fairly high level actions. It may be useful to note that examples of adaptation can be found in all levels in society, from the local community level to the overarching national and international level. (Govt. of Norway)
1119	16	6			The difference between automatic/autonomous and on the other hand planned adaptation is not made clear here - for policy makers the distinction between the two types of adaptation is very important however (Govt. of Finland)
1120	16	6		10	More examples of adaptation across the world than the currently presented appears to be necessary, due to the importance of the subject. (Govt. of Chile)
1121	16	7	16	8	Suggest to change "...climate change forms part of the design consideration in..." to "climate change is considered in the design of..." (Govt. of Mexico)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1122	16	8	16	8	Another example takes climate change as part of the design consideration in infrastructure is the Qinghai-Tibet Railway (17.2.2). The construction of railway in Tibet permafrost is one of good examples of adaptation adopted in the infrastructure project, like insulation and cooling systems, therefore it is suggested to add the Qinghai-Tiber Railway as an example here. (Govt. of China)
1123	16	9	16	9	It is unclear what "management projects" refer to. (Govt. of Australia)
1124	16	10	16	10	An example of this kind of government response to heat waves would benefit the reader. (Govt. of Japan)
1125	16	10		10	As the United States and Canada have been leaders in developing heat wave response programs, edit this sentence to read: "...government response to heat waves in the United States, Canada, and in some European countries." (Govt. of USA)
1126	16	12	16	21	what is more extensive adaptation? On page 7 lines 1 and 2 is stated that "...for even small global tempartures increases, which would increase risk of hunger." This would mean that even with a small temp. increase extensive adaptation is needed to reduce vulnerabilities. (Govt. of The Netherlands)
1127	16	12	16	13	This sentence could be made more understandable, eg: "Adaptation will be necessary to address impacts resulting from the warming which is already unavoidable due to past emissions of climate gases". (Govt. of Norway)
1128	16	12	16	18	The word "commitment" in this section of the SPM may be missinterpreted as mitigation commitment. (Govt. of Mexico)
1129	16	12	16	13	"There is already commitment" modify the phrase to include "due to past emissions" (Govt. of India)
1130	16	12		13	In this sentence it is unclear what "already a commitment" refers to – commitment to warming, to adaptation, something else? Needs clarification. (Govt. of USA)
1131	16	13	16	13	The confidence level associated with this sentence should be very high, instead of high only. (Govt. of UK)
1132	16	13	16	13	Please give explanation (footnote?) on what does 'commitment' means? Who commit to whom? (Govt. of Thailand)
1133	16	13	16	18	Do not use the word "committed" (cf. SPM WG I) (Govt of Switzerland)
1134	16	15	16	16	This sentence could also be made easier to understand, like the one above. Further, it should be made clear whether the rise of 0.6 degrees is from today's level or another year. (Govt. of Norway)
1135	16	15	16	16	Since the average surface temperature, as reported in WG I Chapter 10, range from 1.7° C to more than 4° C, by the end of the 21st century, it is suggested to revise the statement in these two lines. (Govt. of Argentina)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1136	16	15	16	15	Should read: "Past emissions are estimated to involve a current commitment to an addition 0.6degC rise in global average temperature by 2100, on top of the 0.6-0.7 which has already occurred. (Greenpeace)
1137	16	15	16	15	Please insert the word 'further' before "0.6 deg C rise ..." to make it clear that the increase is in addition to the warming that has already occurred since pre-industrial times. (Govt. of New Zealand)
1138	16	15	16	16	Please ensure the statement re committed warming is consistent with the approved WGI text. (Govt. of Canada)
1139	16	15	16	15	It is suggested to specify the baseline (1990?) above which there is a commitment of a 0.6 degrees centigrade increase of temperature. (Govt. of Austria)
1140	16	15	16	17	It is not clear from WG I that the constant forcing experiment leading to a 0.6degree C warming by 2100 cooresponds to the unavoidable warming due to past emissions. Therefore, although we agree that it is important to convey the finding that as some warming is unavoidable due to past emissions, and that this also holds for some impacts that we are "committed" to in this sense, we suggest rewording such as in the following way:"Past emissions are estimated to involve some unavoidable warming in the future (see IPCC WG I). There are, therefore, some impacts that cannot be avoided, to which adaptation is the only available and appropriate response to these, bearing in mind that adaptation and mitigation are, in general, complementary strategies (see page 18)". (Govt. of Germany)
1141	16	15	16	15	According to WGI work, 0.6 should be 0.56. We request 0.6 be changed to 0.56 so as to correspond exactly across Working Groups. (Govt. of Japan)
1142	16	15	16	16	A similar map as Figure SPM-1 (Page 5) will be helpful to reflect a spatial pattern of the current commitment of temperature increase from present to 2100. Better yet, policy-making could benefit greatly if past and future trends of sea level increase could be mapped as well. (Govt. of Thailand)
1143	16	16	16	16	According to WGI work, 2100 should be 2099. The reference "[WGI T10.5]" is confusing and required searching on the part of the reader. The reference was found in the TS (Technical Summary) of WGI. Should T not be TS? (Govt. of Japan)
1144	16	17	16	17	add 'variability and extremes to climate change' (UNISDR)
1145	16	18	16	18	Due to the fact that tables SPM-1 and SPM-2 include projected values on potential changes in sectors and regions, for different temperature thresholds, it seems opportune to amend the text in line 18. Instead of reading "of the impacts to which there is a commitment", it should read "of the impacts to which there would be a commitment" (Govt. of Argentina)
1146	16	20	16	21	To improve the meaning of the phrase we suggest the following: More extensive adaptation is required to reduce vulnerability, but there are significant barriers including natural limits, costs, technological, social and behavioural constraints. (Govt. of Norway)
1147	16	20	16	37	Somewhere here the information that negative impact of climate changes on agriculture and water resources as well as on increase of soil erosion can be

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					to some degree reduced by managing proper landscape structure which allows as to control processes of energy flow and mater cycling in the landscape should be put. (Govt. of Poland)
1148	16	20	16	37	Should reference be made here to certain industries' abilities to impact vulnerability through their decisions (e.g. banks through lending practices, and insurers through choices of which projects to cover) ? (Govt. of Canada)
1149	16	20	16	20	Elaboration on barriers and limits is suggested. (Govt. of Japan)
1150	16	23	16	23	The first sentence could mislead the reader to believe there is a linear relationship between temperature rise and impacts. This should be reviewed. (Govt. of Australia)
1151	16	23	16	37	It is strongly suggested to include the notion that reduction of emissions of greenhouse gases now can help to significantly reduce the impacts of climate change in the second half of this century. (Govt. of Austria)
1152	16	24	16	24	The sentence starting in this line looks quite optimistic when saying "Adaptation has the capacity to cope with many of these effects". In many cases adaptation would have a only palliative effect. In consequence the sentence should read "Adaptation may have the capacity to cope with some of these adverse effects". This comment converges with the expression in lines 36 and 37. (Govt. of Argentina)
1153	16	24	16	25	Replace the words "Adaptation has the capacity to cope with many of these changes but its ability to do this diminishes", with: "Adaptive capacity diminishes" The current wording introduces a judgement that is not supported by the report. The proposed wording is consistent with the report and sends a more accurate message. TS pg 66 lines 17-22 pertain. Good policy outcomes will rely on accurate representation of adaptive capacity potential and role, and the current wording is not sufficient. The point that the current wording is trying to make is better left to the subsequent paragraphs where it is well made. (Govt. of Australia)
1154	16	24	16	25	Awkward sentence. The sentence reads as though 'adaptation' were a single entity. How can "adaptation have the capacity to cope" or "have an ability" to do something? Suggest rewording to: "There is capacity (potential?) to cope with many of these effects through adaptation (or through implementation of adaptive measures) but the effectiveness of adaptive responses and the associated costs increase with temperature increases." (Govt. of Canada)
1155	16	24			remove ", ... but its ability With temperature increase." or replace with a statement on increasing costs with increasing temperatures. (Govt. of The Netherlands)
1156	16	24		25	Change to: "Although many of these effects can be addressed through adaptation, at present we do not have a clear picture of the limits to adaptation or the cost." (Govt. of USA)
1157	16	24			"Adaptation has the capacity ... " rephrase into "Adaptation creates the capacity ... " (Govt. of The Netherlands)
1158	16	25	16	27	Please add " and further rendered complicated by non-climatic factors."

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Philippines)
1159	16	25	16	32	It would have been helpful to have more information on "adaptive capacity" and the paper recognizes this, noting "At present we do not have a clear picture of the limits to adaptation, or the cost". Notwithstanding that there could be significant problems for particular regions/people, this leaves the impression that the paper is discounting our ability to adapt. Replace wording on line 29 with wording from p. 61 in Tech Summary: Societies have a long record of adapting to the impacts of weather and climate through an array of practices that include crop diversification, irrigation, water management, disaster risk management and insurance. SPM as it stands suggests only that there are "potential adaptive measures" without specifying that we are capable already of adapting in various ways. (Govt. of Canada)
1160	16	25	16	25	"We do not have" can the phrase be changed to delete "we" (Govt. of India)
1161	16	27	16	27	Repetitive use of commas is confusing. Also, what exactly does "policy environment" infer? Clarification is requested. (Govt. of Japan)
1162	16	27	16	27	(Editorial only) Please delete the commas either side of 'geographical'. (Govt. of New Zealand)
1163	16	27		27	Replace "the policy environment" with "perception of risk and social, economic, institutional, and political constraints." (Govt. of USA)
1164	16	29	16	34	It should be stated explicitly that it is widely recognised and accepted that "adaptation" is in current practice "disaster risk reduction". We suggest either add such a statement after 'planning regulations' or insert the following sentence: "Countries are nevertheless increasingly committed to reducing risk to existing climate variability and extreme weather events, as evidenced in the signing and implementation of the "Hyogo Framework of action 2005 - 2015: Building the resilience of nations and communities to disasters" adopted at the World Conference on Disaster Reduction, 18-22 January 2005, Kobe, Hyogo, Japan [20.5], which commits governments and organizations to integrate climate change adaptation and disaster risk reduction." Alternatively the statement in 20.5 lines 8-10 could be included again: "Reducing vulnerability to current climatic variability can effectively reduce vulnerability to increased hazard risk associated with climate change." Also the personification of adaptation in this section is not helpful (i.e. "Adaptation has the capacity to cope..."). It is ambiguous about who and which systems need to adapt. (UNISDR)
1165	16	31	15	33	This sentence suggests that the combined effect of the melting of the Greenland and West Antarctica Ice Sheets is a rise in sea level between 4 and 6 m, which is not correct. Rephrase the last sentence after the comma: 'The melting of the GIS and the WAIS would result in sea level rise of up to 7 m and 4 m, respectively, over a period of time ranging from centuries to millennia'. (Govt. of UK)
1166	16	31	16	34	Suggest that this sentence is deleted and replaced with the clearer and more informative construction in the Technical Summary at page 62, "There are significant barriers to implementing adaptation. These include both the inability of natural systems to adapt to the rate and magnitude of climate change, as well as technological, financial, cognitive and behavioural, and social and cultural constraints. There are also significant knowledge gaps for adaptation as well as impediments to flows of knowledge and information relevant for adaptation decisions [17.4.1, 17.4.2]." (Govt. of Australia)
1167	16	33	16	33	The sentence in this line calls for amendment.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					In many cases it is not only funding but lack of local capacities. Imported capacities has been blamed as an additional scourge, due account taken of the lack of local capacities to evaluate the recommendations and activities to be undertaken by “imported” specialists and techniques. The failure of hundreds of UNDP projects has demonstrated that the transference to local people was not always appropriate and thousands of millions dollars were swallowed by inefficiency. Political decision, in particular to build-up local capacities, needs to be emphasized. (Govt. of Argentina)
1168	16	33	16	34	It is not clear enough the references "See sections x.5 and x.6 in the core chapters". Please, clarify them. (Govt. of Spain)
1169	16	33	16	33	Inserting "financial" before "resources" is suggested. (Govt. of Japan)
1170	16	33	16	33	Delete “some”. (Govt. of China)
1171	16	33		34	Insert “and for particular communities within developed countries” after “for some developing countries”. Availability of resources and of adaptable institutions is particularly important. (Govt. of USA)
1172	16	34			"x.5 and x.6" should be properly identified in final SPM. (Govt. of Philippines)
1173	16	36	16	37	This statement is of tremendous policy importance, but only very vaguely explained. It should be a high-level (bold-type) conclusion. It could also be explained further which are the major impacts that we are unlikely to be able to adopt to. (Govt. of Sweden)
1174	16	36	16	37	This sentence is vague and hard to understand. (Govt. of Australia)
1175	16	36	16	37	Suggest delete lines 36 and 37 (p. 16). It is unclear what "not expected to cope with" means, and as such there is no added value in this sentence. Phrase does not appear in the TS. (Govt. of Canada)
1176	16	36		37	"However, adaptation alone is not expected to cope with" raises at least two questions: 1. what is exactly meant with adaptation? Now it seems to be limited to continue current practices and excludes transitions to entire different systems 2. what else is needed to cope with projected effects. (Govt. of The Netherlands)
1177	16	38	15	38	Add the following sentence after nevertheless: ' as a result of greater atmospheric warming'. (Govt. of UK)
1178	16	39	16	52	When discussing factors affecting vulnerability there should also be elucidation of factors that increase it. There are many examples where social capital, social networks, values, perceptions, customs, traditions and levels of cognition affect the capability of communities to adapt.e.g. Community organization is an important factor in adaptive strategies to build resilience (chpt 17 page 17, lines 40-42 and 47-48) (Govt. of Canada)
1179	16	39	16	39	Change "can be" to "is", such that it reads "Vulnerability to climate change is exacerbated by the presence of other stresses". Also need to delete "can" from line 42.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Canada)
1180	16	39		40	We think that the word exacerbated is not very well known among non-native English speakers, and we would ask the lead authors to consider using a more commonly known word or expression (increased, worsened o.a.). (This word appears also other places in the document). (Govt. of Norway)
1181	16	42	15	42	It would be helpful to add a sentence on the potential effect of the die-back of the Amazon forest. (Govt. of UK)
1182	16	42	16	48	There is no doubt that even the loss of a butterfly species is an environmental problem. This is to say that, although corals provide a good example of integrated stresses, the very critical situation in many developing regions, resulting from the wild deforestation techniques, to enlarging cropping areas or to produce drugs, have, at least, the same economic, social and environmental importance than coral bleaching. However, directly and immediately affect large groups of poor and indigenous communities whose members had learned to use forest and woods goods and services in a sustainable manner. Therefore it is suggested to add this case, even replacing the current one on corals. (Govt. of Argentina)
1183	16	42	16	42	Suggest deletion of "Multiple" and insertion of "Non-climate related" to more clearly define the scope of the paragraph. (Govt. of Australia)
1184	16	45	16	48	This sentence is poorly drafted and difficult to understand. Suggest that it is significantly refined to make the message clear that some regions are more vulnerable than others due to the interaction between climate change and pre-existing stresses. (Govt. of Australia)
1185	16	46	16	46	Unbalanced economic development is suggested to be put as an example. (Govt. of China)
1186	16	50	16	52	The final two sentences of this section are particularly unclear, suggest deletion or significant amendment to make the point clearer. (Govt. of Australia)
1187	16	50	16	50	"It", please change to "Climate Change" (Govt. of India)
1188	16	50		53	Authors should provide a brief example of "...climate change itself can be a source of multiple stresses." Insert on page 16, after line 52, after "isolation." "In certain circumstances, a system's vulnerability might be diminished by reducing the magnitude of other stresses." And add 18.4 and 20.5 to the bracketed cites. (Govt. of USA)
1189	16		16		There should be a distinction between reactive adaptation (the way ecosystems adapt) and the possible anticipatory adaptation by societies and individuals, as it is done in chapter 17. (Govt. of Germany)
1190	17	1	17	1	The authors need to make clear to what, where or whom "future vulnerability" relates. (Govt. of Australia)
1191	17	4	17	5	Need to clarify that these studies - of the impact of a range of different development pathways - are distinct from studies that look at the impact of the temp projections stemming from those same SRES scenarios. Here, the point is, that some work has been done to evaluate the implications for climate change of the different storylines themselves - right?

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Canada)
1192	17	8	17	9	Suggest that "projected, modelled" is inserted before "impacts" to make the meaning of the sentence clearer. (Govt. of Australia)
1193	17	10	17	11	Suggest that the second half of the sentence from "which" be deleted and replaced with construction in the ES of Chapter 2, which provides more information (e.g. "which, can produce sharp contrasts in exposure to climate change and in adaptive capacity and vulnerability. Therefore, it is best not to rely on a single characterisation of future conditions.") (Govt. of Australia)
1194	17	13	17	18	This text needs to recognize that the numbers shown in the figure represent particular assumptions in addition to the SRES scenarios. Suggest revised text to read: "To illustrate, Figure TS-18 shows estimates ... different assumptions of socio-economic development[, for selected conditions of population growth, climate change, and subsidence rates]. This indicates ... (Govt. of Canada)
1195	17	13	17	14	For clarification, insert "from coastal flooding each year" after "at risk". (European Commission)
1196	17	13	17	26	Figure SPM-2 and the surrounding description should be deleted. The key message that the authors have tried to convey is that different climate change scenarios produce different projected impacts, however, this is not clearly presented in the table and there is a strong possibility that readers will take the figure out of its context and draw conclusions about population vulnerability to sea-level rise. This is inappropriate at this point of the SPM, and obvious questions arise about the level of projected sea-level rise for each of the scenarios and the level of emissions growth - questions which are not within the mandate of Working Group 2. A much less provocative and more easily understood figure can be found in Figure 2.7, which (along with a less technical description of Box 2.7) should be considered as a replacement for current Figure SPM-2 - although this suggestion also suffers from the figure being constructed on the basis of a single study. (Govt. of Australia)
1197	17	14	17	18	"The SPM states that the high degree of vulnerability in the A2 scenario derives from "larger and poorer population". It is important to state further that there are three drivers for this: slower economic growth, high population growth and the less equitable distribution of income, all compared to the other SRES scenarios. In other words, this is an appropriate point to stress that the poor communities are most vulnerable. (Govt. of Sweden)
1198	17	16	17	18	There is a large bias for developed countries who have made substantial contributions to emissions. (Govt. of Philippines)
1199	17	17	17	18	This is a very strong sentence and we question whether it is justified in the scientific literature. If the size of the low-income population is constant will long term emission levels not made a difference. Furthermore it may be a link between the emission level and the size of low-income population. Please reconsider this sentence and the use of study referred to in this para. (Govt. of Norway)
1200	17	20	17	21	The figure and the text are confusing. The drop in 2050 is not explained. Furthermore it should be explained "without SLR" is - storm surge? The lead authors might also consider whether this figure should be used in the SPM depending on the certainty in the results - based on one study. Do other studies support the conclusions?

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Norway)
1201	17	20	17	26	In Figure SPM-2, the title and units of Y-axis may be specified. (Govt. of Pakistan)
1202	17	20	17	26	Fig SPM-2 Legend for Y-axis missing (Govt. of India)
1203	17	20			Figure SPM-2: Whether coastal flooding is an appropriate example to illustrate risks is questionable. The main reason for this is that nothing is really evident until 2080. This may send a message that "business-as-usual" is an appropriate policy choice. Thus, replacing this figure with a more appropriate example is requested. (Govt. of Japan)
1204	17	20			FIGURE SPM-2: 1) Missing units for the Y axis of this Figure, 2) There is a lot of information in this graphic that is not properly explained in the accompanying text (lines 13-18), most notably the lack of discussion about trends over time (from the 2020s to 2080s) within each scenarios, which generally shows declining risk over time. This may not be the message that is important to extract from the graph, nonetheless, this conclusion does jump out at the reader, and not addressing it leaves the reader less certain about understanding the graph, 3) the other rather startling conclusion one could draw from this graph is that there is no coastal flooding risk to anyone from SLR before the 2050s and in some scenarios, not until the 2080s. Is that a justified and correct conclusion? (Govt. of Canada)
1205	17	20		26	Figure SPM-2 needs a title, e.g., "Millions of people at risk from coastal flooding" (Govt. of USA)
1206	17	23	17	23	Figure SPM-2 is from a single paper and would best not be included here as other results differ quantitatively. (Govt. of Germany)
1207	17	23	17	26	Caption needs revision. Suggested text: "Figure TS-18. Results from a recent study showing estimated number of people at risk from coastal flooding (in millions per year). Blue bars represent estimates without sea-level rise, purple bars represent estimates of additional numbers at risk with sea-level rise, and tops of the blue, purple, or combined blue-purple bars represent the total number at risk with sea-level rise. Values are for selected conditions among various cases considered in the original study. They are taken from the upper end of the range shown in T6.6, representing a high population-growth scenario." (Govt. of Canada)
1208	17	25	17	25	The meanings of the phrase "differencesdevelopment" are not clear. Would it be appropriate to delete the words "differences in" appearing before "total numbers" (Govt. of Pakistan)
1209	18	1	16	52	This section is very theoretical and, as it stands, could be deleted. We do see significant value in retaining this section and strongly recommend the following changes. (Govt. of UK)
1210	18	1	18	14	Under the umbrella: Sustainable development can reduce vulnerability to climate change As mentioned before, vulnerability of natural and human systems may also be reduced by profiting from the local/regional benefits which would arise from the Earth 's warming. For instance, the relocation of crops in areas where the projected temperature thresholds and the water availability would be

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					positive, since also reduces vulnerability, in the social and economic sense. Therefore, as suggested in the general comment to Section D, emphasis to other than adverse impacts shall be included. The arguments are identical to those mentioned above. (Govt. of Argentina)
1211	18	1	18	14	The text piece on adaptation is unbalanced as it mentions how sustainable development can affect vulnerability to climate change but not the other way round. For balance, the following sentence from the TS FGD p. 72, lines 8-10 should be inserted in bold face before line 8: "Climate change will impede nations' abilities to achieve sustainable development pathways, as measured for example as long-term progress towards the Millennium Development Goals (very high confidence)." The text in lines 8-14 should be shortened and adapted in order to avoid redundancy with the suggested bold-face statement. (European Commission)
1212	18	1			Please consider adding education as a strategy to enhance adaptation. The capacity building of citizens concerning education for sustainable development is important when promoting adaptive capacity. (Govt. of Finland)
1213	18	4	18	6	The paragraph, particularly second sentence gives impression that sustainable development by itself may not promote adaptation to Climate Change. The second sentence may not be required since, most activities that promote SD also promote mitigation and adaptation (Govt. of India)
1214	18	4	18		is development that increases the vulnerability to climate change sustainable? Shouldn't sustainable development also take into account effects of climate change and contribution to climate change. (Mal)adaptation can also hamper sustainable development. (Govt. of The Netherlands)
1215	18	4		14	The discussion does not flow from the topic sentence. The description is weak. Construct of Section E of the second-order draft (page SPM-19) was better. Why the complete rewrite? The U.S. Government questions the basis for the likelihood statement. The statement on lines 5-6 might not be accurate if it refers to donor programs. Almost every major donor program has initiated an adaptation program for mainstreaming. Lines 13-14: Explain the MDGs in the context of this section or remove. (Govt. of USA)
1216	18	5	18	5	The authors need to explain how, (apart from enhancing adaptive capacity) sustainable development can increase resilience to (presumably) the impacts of climate change. (Govt. of Australia)
1217	18	6	16	10	The following statements could be added : - Examples of adaptations to observed changes in climate include partial drainage of the Tsho Rolpa glacial lake (Nepal); changes in livelihood strategies in response to permafrost melt by the Inuit in the Nunavut (Canada); and increased use of artificial snow-making by the Alpine ski industry (Europe) Australia and North America). - A limited but growing set of adaptation measures also explicitly considers scenarios of future climate change. Examples include consideration of sea level rise in design of infrastructure such as the Confederation Bridge in Canada and a coastal highway in Micronesia, as well as in shoreline management policies and flood risk measures, for example in Maine (USA) [17.2.2]. - Often, planned adaptation initiatives are also not undertaken as stand-alone measures, but embedded within broader sectoral initiatives such as water resource planning, coastal defence, and disaster planning [17.2.2, 17.3.3]. Examples include consideration of climate change in the National Water Plan of Bangladesh, and the design of flood protection and cyclone-resistant infrastructure in Tonga [17.2.2]."

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of UK)
1218	18	6	18	6	May insert the word "change" between the words "climate" and "impacts" (Govt. of Pakistan)
1219	18	8	18	14	The SPM presents as a high-level conclusion that "Sustainable development can reduce vulnerability to climate change". It states immediately below that "climate change can slow the pace of progress toward sustainable development". This point is equally, if not more, important, and should also be elevated to a high-level (bold-type) conclusion. (Govt. of Sweden)
1220	18	8	18	8	Suggest deletion of "on the other hand" as it is redundant and complicates the sentence. (Govt. of Australia)
1221	18	9	18	10	Suggest to change "erosion of the capacity to adapt" to "diminution of the capacity to adapt" (Govt. of Mexico)
1222	18	9	18	9	Suggest to change "adverse impact" to "adverse impacts" (Govt. of Mexico)
1223	18	10	18	11	A more direct reference to the source text is requested for the following: "This point is clearly demonstrated in the section of the sectoral and regional chapters of this report that discuss implications for sustainable development." (Govt. of Japan)
1224	18	13	18	14	The validity of this statement is questionable and clarification is required. MDGs were set in 1996 and the target year is 2015; thus it seems odd to say that "Over the next half century, it is very likely that climate change will impede achievement of the MDGs." (Govt. of Japan)
1225	18	13	18	14	The Millennium Development Goals are targets for 2015. The impacts of climate change, if these impacts are to hamper the achievement of the MDGs, must be felt quickly (within the next 8 years). Not to say that CC won't impact on countries' abilities to meet their MDG targets, but the MDG's are short term goals (8 years). Rephrase to state "The Millennium Development Goals (MDGs) have been set by UN member states as targets to reduce extreme poverty, hunger, illness and early mortality, to improve education and gender equality and to improve environmental quality in developing countries by 2015. It is very likely that the ability of developing countries to meet future targets similar to the Millennium Development Goals will be compromised by climate change." (Govt. of Canada)
1226	18	13	18	13	Suggest that this sentence is redrafted to read "The Millennium Development Goals (MDGs) are one measure of sustainable development." This change more clearly articulates that sustainable development is not a fixed target but an ongoing process. (Govt. of Australia)
1227	18	13	18	14	Lines 2 to 3 on page 23 of Chapter 20 state - it will be difficult to blame climate change for limited towards the Millenium Development Targets, how then can it be that it is very likely that climate change will impede achievement of MDGs? (Govt. of Philippines)
1228	18	13	18	14	Add information about MDG in a footnote. (Govt. of Japan)
1229	18	13			the MDGs provide a framework for development. Targets are set for 2015 not 2050!. Indeed the effects of climate change need to be considered when

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					defining strategies to reach the targets. (Govt. of The Netherlands)
1230	18	14	18	14	Today's climate-related disasters also jeopardize achievement of MDGs. We therefore suggest to use the UNFCCC language of 'current and future climate change and climate variability'. (UNISDR)
1231	18	14	18	14	The construction of this finding in Chapter 20 is more clear, suggest that this text is reverted to (e.g. "Over the next half-century, it is very likely that climate change will make it more difficult for nations to achieve the MDGs".) (Govt. of Australia)
1232	18	14	18	14	It is suggested to delete "Over the next half-century" because it seems very likely that climate change will impede the achievement of MDGs also in the second half of this century. (Govt. of Austria)
1233	18	15	16	18	This is a key point for policymakers but this sentence is unclear. Rephrase: 'Because of past emissions, the world is already locked in to some degree of warming. Even if atmospheric concentrations were held constant at 2000 levels, the world would continue to warm further by 0.6C by 2100'. (Govt. of UK)
1234	18	16	18	16	We suggest to add after mitigation , "resulting in lower emissions of greenhouse gases and consequently less and slower global warming" (Govt. of Norway)
1235	18	16	18	16	This sentence strongly understates the confidence in the fact that mitigating climate change will mitigate the impacts of climate change. It should be changed to "Most impacts of climate change, in particular in the mid-term and the long-term, can be avoided, reduced, or delayed by mitigation actions (very high confidence)." (European Commission)
1236	18	16	18	16	This heading is not really correct. Most of the impacts projected in this report beyond about the 2020s can be delayed, reduced or avoided depending on the level and timing of mitigation. Re word to something: "Mitigation can reduce, delay or avoid most of the impacts and risks projected beyond the 2020s depending on the timing and extent of mitigation actions" Chapter 19 ES puts it another way "Actions to mitigate climate change and reduce greenhouse gas emissions will reduce the risk associated with most key vulnerabilities. Postponement of such actions, in contrast, generally increases risks." (Govt. of Germany)
1237	18	16	18	29	In this discussion of stabilisation there is no comment on the risks of overshoot. As the trajectory in general and overshoot in particular will have a significant influence on the impacts for a given stabilisation target, we would like to find some way of at least mentioning the issue in this section. (Govt. of New Zealand)
1238	18	16	18	29	In this discussion of stabilisation (and generally in the SPM) there seems little recognition of the importance of the rate of change in determining impacts. The sensitivity of both natural systems and human socio-economic systems to the rate of change was a characteristic that was given some prominence in the TAR and we believe the topic continues to deserve attention. Some comment on the effect of the rate of change is appropriate and could be included in this section. (Govt. of New Zealand)
1239	18	16	18	16	"Many medium- to long-term impacts can be reduced or delayed by mitigation [high confidence]."

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Canada)
1240	18	16			It is very appropriate to state that both adaptation and mitigation are two subjects in need of solution. This is in spite that relationships between both of them and their synergies. (Govt. of Chile)
1241	18	17	18	27	Suggest inserting short para here from the Chapter 19 ES: "Actions to mitigate climate change and reduce greenhouse gas emissions will reduce the risk associated with most key vulnerabilities. Postponement of such actions, in contrast, generally increases risks." (Greenpeace)
1242	18	18	18	29	The text seems to be too difficult for a SPM and should be rephrased. This applies especially for L 24-29 (Govt. of Norway)
1243	18	18			Also the uncertainties in development pathways add to the uncertainty. (Govt. of The Netherlands)
1244	18	20	18	20	The phrase, "for example, the sensitivity of climate models to forcing" is too complicated for policy readers suggest that this is either redrafted or deleted. Noting that there are uncertainties in impact assessments completed for stabilization scenarios, is probably sufficient in this context. (Govt. of Australia)
1245	18	20	18	21	Suggest deleting phrase "for example, the sensitivity of climate models to forcing". There are other uncertainties not mentioned, for one thing, and the issue of climate sensitivity to forcing is rather complex and may not be understood by readers without additional explanation. (Govt. of Canada)
1246	18	24	18	29	This para could be deleted. It carries no real message and it broadly repeats content already found in Tables SPM-1 and SPM - 2 (Govt. of Australia)
1247	18	24		29	The current language suggests that the Tables SPM-1 and SPM-2 are legitimate representations of avoided damages for these mitigation estimates. The assumptions behind the mitigation modeling are not related to the assumptions that underlie the Tables SPM-1 and SPM-2 estimates of related impacts. Furthermore, as noted in Chapter 18, the scientific literature does not support the link. The U.S. Government suggests replacing the current text in favor of language from Chapter 18 (page16 lines 2-15). (Govt. of USA)
1248	18	25	16	27	This is correct but needs to reflect also that there is work in the area and we are not completely ignorant, so the following statements (TS) could be added to this section with the studies referenced: - However, there are a growing number of adaptation cost and benefit-cost estimates at regional and project level for sea level rise, agriculture, energy demand for heating and cooling, water resource management. These studies identify a number of measures that can be implemented at low cost or with high benefit-cost ratios." (Govt. of UK)
1249	18	26	18	29	We think the referred figures and tables give very important information which is difficult to read only from them. Hence we propose that this text is expanded in order to convey the main results from these figures and tables instead of just referring to them. (Govt. of Norway)
1250	18	27	18	28	Again, this text refers to Table SPM1 and explicitly directs the reader to look at both the stabilization and SRES scenarios. One of the obvious conclusions from Table SPM-1 is that the suite of stabilization scenarios project smaller future increases in temperature than do the SRES scenarios. The

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					reader is left to wonder why, and providing additional graphs that lay out the emission, atmospheric concentration and temp projections for all these scenarios would be useful to enable proper comparisons to be made. (Govt. of Canada)
1251	18	28	18	29	Insert "emissions scenarios and/or" before "ranges of temperature changes" as Table SPM-2 does not make reference to temperature changes. (European Commission)
1252	18	30	18	30	It needs to be noted here that some impacts cannot be avoided with high confidence. Insert text from Chapter 19 ES: "Given the current climate change commitment and the range of projections for future climate change, some key impacts (e.g., deglaciation of major ice sheets), cannot be avoided with high confidence. The probability of initiating some large-scale events is very likely to continue to increase as long as greenhouse gas concentrations and temperature continue to increase." (Govt. of Germany)
1253	18	31	18	32	We suggest to replace the phrase with: "A combination of adaptation and mitigation measures can both reduce and delay climate change, and enhance adaptation to its impacts, thus diminishing the risks associated with climate change". This seems to be more clear and understandable and stress the necessity and usefulness of both mitigation and adaptation, which is stated in the following text and very clearly in the report. (Govt. of Norway)
1254	18	31	18	31	The word "further" is not clear. Further compared to mitigation or adaptation alone, needs to be clarified (Govt. of India)
1255	18	31	18	32	The current sentence mentions the potential benefits of adaptation and mitigation measures but not their limits. Based on the TS FGD (p. 72, line 53 to p.73, line 2), the following text should be added at the end: "However, even a combination of aggressive mitigation and significant investment in adaptive capacity could be overwhelmed by the end of the 21st century (high confidence)." (European Commission)
1256	18	31		51	Within the portfolio of mitigation and adaptation measures it is proposed also to include aspects such as: implementing integrated basin management approaches to mitigate impacts with regards to availability of water resources to attend needs by ecosystems, human beings and their activities. These approaches can improve integration of criteria considering climate change within the formulation of policies, plans, programmes and other initiatives affecting basins. Also effective systems for protection of specific basins can reduce the climate change effects, providing a mechanism to protect ecosystems and their related processes, and also improving synergies with other UN Conventions, such as The Convention on Biologic Diversity. (Govt. of Chile)
1257	18	33	18	33	An important conclusion from Chapter 19 needs to be included here (Chapter 19 ES): "Adaptation can significantly reduce many potentially dangerous impacts of climate change and reduce the risk of many key vulnerabilities. However, the technical, financial, and institutional capacity and the actual planning and implementation of effective adaptations is currently quite limited in many regions. In addition, the risk-reducing potential of planned adaptation is either very limited or very costly for some key vulnerabilities, such as loss of biodiversity, melting of mountain glaciers or disintegration of major ice sheets. [19.4.1]" (Govt. of Germany)
1258	18	34	18	38	These three sentences seem to repeat, (albeit in a different way) what has previously been stated in the SPM at page 16 lines 15-16. Suggest that this paragraph simply states that "Adaptation and mitigation are complementary strategies to reduce impacts. Adaptation is necessary to deal with impacts to which we are already committed, while unmitigated climate change would, in the long term, be likely to exceed the capacity of natural, managed and

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					human systems to adapt". (Govt. of Australia)
1259	18	34	18	35	Sentence beginning with "On the one hand" has some awkward phrasing. Suggest changing position of the phrase "avoiding impacts" so that the sentence reads as follows: "On the one hand, the effects of reduced emissions on slowing the rate of temperature increase and avoiding related impacts will not emerge....." (Govt. of Canada)
1260	18	34	18	34	"Adaptation and mitigation are complementary strategies to reduce impacts." – this sentence may be dropped as it is valid only in a limited sense; and gives the reader a suggestion as if one strategy could replace the other in combating the long-term adversities of climate change. (Govt. of India)
1261	18	34			Add: People's capacities to adapt and mitigate are driven by similar sets of factors (high confidence)TS 5.2 (Govt. of The Netherlands)
1262	18	36	18	37	Delete "Early", Adaptation strategies can also reduce vulnerability to climate changes over long time scales, thus reducing the impacts. (Govt. of China)
1263	18	36			adaptation will be important in coping with early impacts? How does this relate to sustainable development which has a longer time horizon (Govt. of The Netherlands)
1264	18	37	18	38	Delete sentence starting "Specifically," It gives the erroneous impression that planned adaptation should only be considering committed climate changes. (Govt. of Canada)
1265	18	38		39	likely to exceed the capacity of SOME natural, managed and human systems to adapt. Add SOME. Different systems are referred to: natural, managed, human. The biological system is not mentioned. What is the difference between managed and human systems? (Govt. of The Netherlands)
1266	18	41	18	45	This paragraph goes beyond the scope of the WG2 report and crosses into WG1 and WG3 scopes. It is a point that belongs in the Synthesis Report - not the WG2 SPM. (Govt. of Australia)
1267	18	41	18	43	Suggest this sentence could be broadened by deleting the word scientific and simply saying "research". (Govt. of Canada)
1268	18	43	18	43	"Policies" word may be better than "regulations" (Govt. of India)
1269	18	47	18	47	Replace "introducing adaptation measures" with "integrating adaptation". "Introducing" does not capture the concept of mainstreaming; use of the word "integrating" is critical. (Govt. of Canada)
1270	18	47	18	47	Adaptation measures in a country do not necessarily increase adaptive capacity of the country. Rather use "concerns" instead of "measures". (Govt. of Germany)
1271	18	49	18	49	Replace "adaptation measures" with "consideration of climate change impacts". As originally stated it contradicts concept of mainstreaming by placing adaptation measures in a silo. [Supported by Chapter 17.4.1, p.25, l.23-26]

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Canada)
1272	18	50	18	51	Although drought warning systems are complex and are therefore relatively less well developed globally, many are already in place and should be strengthened. Here the crucial point is to integrate the whole array of available adaptation options and measures encompassed under disaster risk reduction into development planning and assistance, as outlined in the Hyogo Framework for Action 2005 - 2015. "Disaster preparedness" is too restrictive and narrow compared to what is available. The Hyogo Framework is evidence of the consensus that responding to climate-related risks by implementing disaster risk reduction strategies integrated to development will initiate the necessary actions to respond to climate change. [17.2.2] We suggest to replace the second bullet with the following: "implementing measures to reduce vulnerability through existing disaster risk reduction policies, plans and programmes, such as strengthening early warning systems". (UNISDR)
1273	18	50		51	Add "health earlywarning systems" and a sentence reading: "How these adaptations to early impacts increase or decrease vulnerability to long-term risks have not been explicitly considered." (Govt. of USA)
1274	18	51	18	51	The meaning of a "drought warning system" and how it is used is unclear. As it is referenced in Chapter 17, it is discussed in an adaptive management context (drought recovery) but no direct mention of "drought warning system" appears. The reader wonders is this is a mistake; a warning system seems to imply warning of a sudden event such as a flood warning or a storm warning. However, drought, as referenced, is more likely covered under climate prediction or adaptive management. (Govt. of Japan)
1275	19	1	19	2	The meaning of the following text is unclear: "improving connectivity among ecosystems and widening the range of climates covered by reserves". To ensure clarity, consider re-writing this sentence. (Govt. of Japan)
1276	19	1	19	2	The "widening of the range of climates covered by reserves" could be illustrated by a reference to the World Heritage site of the Cape Floral Region Protected Areas (South Africa) which is the subject of extensive bioclimatic modeling in that context. See for example the following study mentioned in the full text of the FAR: Bomhard, B., D. M. Richardson, J. S. Donaldson, G. O. Hughes, G. F. Midgley, D. C. Raimondo, A. G. Rebelo, M. Rouget & W. Thuiller, 2005: Potential impacts of future land use and climate change on the Red List status of the Proteaceae in the Cape Floristic Region, South Africa. Global Change Biology, 11 (9), 1452-1468. (UNESCO)
1277	19	4	19	6	We suggest to add afterand these costs would increase over time, : "and with increase in temperature" . This seems to be consistent with the following text. (Govt. of Norway)
1278	19	4	19	6	The important message here should be that aggregated costs of climate change exceed the benefits. Please change the sentence to: "...aggregated and discounted to the present, the costs of unmitigated climate change exceed the benefits, and the net costs would increase over time [very high confidence]." (Govt. of Germany)
1279	19	4	19	6	The current text hides the key message of this sentence, namely that the aggregated costs of climate change exceed the benefits. Suggest rewording to "Aggregated and discounted to the present, the costs of unmitigated climate change exceed the benefits, and the net costs will increase over time [very

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					high confidence]." (European Commission)
1280	19	4	19	4	Delete "unmitigated" as in this context it is not consistent with the IPCC usage and definition of climate change. (Govt. of Australia)
1281	19	4		6	Need to clarify the statement "...these costs will increase over time." The discounted SCC will increase over time simply because the impact events are getting closer in time and are therefore not as heavily discounted. Is the statement instead referring to increasing "annual costs?" This statement would be consistent with the literature and the discussion in Chapter 20. Do the costs assume no adaptation? (Govt. of USA)
1282	19	5	19	5	For clarity in presentation suggest the phrase "and the costs would" is replaced with "which will". (Govt. of Australia)
1283	19	8	19	13	Different temperatures rising would have corresponding impacts. Tables SPM-1 and SPM-2 do not indicate a clear line at 2 °C warming. Therefore each system should be described separately, such as agricultural system and ecosystem. (Govt. of China)
1284	19	8			Page 19, line 8 - Please consider rephrasing as: "Tables SPM 1 and SPM 2 illustrate that the impacts of climate change are mixed across regions". (Govt. of Finland)
1285	19	8		13	Implications of climate change are dependent on context. Reference to the fact might give the text more weight. (Govt. of Finland)
1286	19	10	19	10	The authors need to ensure that the key message that even for lower levels of climate change the costs will generally outweigh the benefits. (Govt. of Australia)
1287	19	10	19	11	Revise to read "very likely that some low latitude and polar regions will experience costs even for modest increases in global temperature" and add reference to polar regions chapter. The Arctic has already experienced significant costs, and the recent increases in temperatures in some parts of arctic are hardly "modest" - rather they are many times the global average. Add reference to Polar regions chapter, Executive Summary. (Govt. of Canada)
1288	19	10	19	10	Change 2 to 1-3 , because it is much more appropriate in the long term, as we can see in table SPM-1. (Govt. of China)
1289	19	10		10	Projections provide temperature ranges. It is inappropriate for the authors to select one temperature (2°C) as if it represents a scientifically proven threshold. Authors should present a temperature range, to provide readers with adequate representation of underlying uncertainties associated with linking a specific temperature to specific impacts. (Govt. of USA)
1290	19	10		11	In high-latitude regions snow melt and runoff timing are also affected by modest increase in temperature (see references in North America and Asia chapters). (Govt. of USA)
1291	19	11	19	11	The statement "for modest increases in temperatures" should be quantified. (Govt. of Japan)
1292	19	11	19	11	For clarification, insert "net" before "costs".

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Germany)
1293	19	11	19	11	For clarification, insert "net" before "costs". (European Commission)
1294	19	12	19	12	Change "all regions" to "most of regions". For example, wheat yield in Europe will increase 10-30% in 3 according to Table SPM-2. (Govt. of China)
1295	19	13	19	13	It is suggested to insert "from 1990 levels" after 2 degrees centigrade in order to add clarity. (Govt. of Austria)
1296	19	13	19	13	2 is suggested to be changed into 3 which is more appropriate in the long term, as we can see in table SPM-1. (Govt. of China)
1297	19	15	19	25	We strongly recommend to reword this paragraph as follows: 'Many estimates of the aggregate net costs of the damages from climate change across the globe, i.e. the social cost of carbon, are now available. Peer reviewed estimates of the social cost of carbon have a mean value of \$43 per tonne of carbon. However, there are very large deviations around these and other estimates. For example, in a survey of 100 estimates, the value ran up to \$350/tC, but some have run up to \$1500/tC. These deviations are in the large part due to differences in assumptions regarding climate sensitivity, response lags, economic and non-economic impacts, the inclusion of potentially catastrophic losses, as well as deliberate choices on the treatment of generational and inter-regional equity and risk, often expressed through discount rates. However, it is very likely that globally aggregated figures significantly underestimate the damage costs because they do not take into account the most recent evidence and probabilities of higher temperature changes above 2 degrees C, many of which are currently very difficult to quantify. Furthermore, such estimates mask large differences in regional and sectoral impacts. Taken as a whole, however, the range of published evidence strongly suggests that the damage costs of climate change are likely to be significant, and increasing over time. [But if action is taken to mitigate climate change, modelling also demonstrates that the damage costs should fall.]' (Govt. of UK)
1298	19	15	19	25	There is a tremendous range of estimates of the cost of CO2 emissions. The figure of 12 +/- 23 \$/tCO2 is potentially misleading, as it is only a partial accounting of costs. As is discussed in the chapter, efforts to quantify the cost of carbon suffers from the problems that many damages are unquantifiable, impossible to predict, distributed inequitably across populations. We recommend removing this figure from the SPM, as it is extremely likely to attract much more attention than is warranted given its incompleteness and lack of methodological rigor. (Govt. of Sweden)
1299	19	15	19	18	The social cost of carbon range cited goes from \$-3-400/tCO2, which is a very wide range and therefore not very meaningful. It would be more helpful to provide the most likely range of estimates, or a best estimate of US\$43 per tonne of carbon with a standard deviation of US\$83 per tonne (chapter 20) . Also, it is not clear how the positive figure should be interpreted and what the level of confidence is in this estimate. The figure \$12 is significantly below the UK Government estimates of Social Cost of Carbon at \$25/tCO2, as well as Stern's estimates from the PAGE2002 model. (Govt. of UK)
1300	19	15	19	17	Text here is unclear. Text says that estimates are expressed in terms of net benefits and costs (line 15) but then when the estimates are given (line 17) it is unclear whether these are benefits or costs. Are negative values costs and positive values benefits, or the other way around? Finally, in line 25, it notes that net costs are positive. It would still be helpful to reader to have it indicated that this means that aggregate damages from climate change are very likely to be expensive. (Talking about costs as "positive" can be a bit perplexing to some people.) (Govt. of Canada)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1301	19	15	19	25	Shortening this paragraph segment, because it is too fussy. It is not necessary to state “surveys of published estimates” and “from the published literature” in SPM. Please clearly give what is the meaning of “net costs”, and discuss the relationship between adaptation and mitigation. (Govt. of China)
1302	19	15	19	25	One of the significant changes in Chapter 20 that has occurred since the last review process, is the inclusion of some findings of the Stern report in the discussion of the possible monetary damages of climate change. If the inclusion of this report is acceptable under IPCC procedures, reference should be made to the Stern report and its findings in this section of the SPM. The Stern report is well known by policy readers and its exclusion from the SPM,(but inclusion in Chapter 20), is strange. Suggest, therefore, that the following is added after "of this variation", at line 21 "for example, the US\$310 per tonne of carbon estimate published by Stern (2006)." (Govt. of Australia)
1303	19	15	19	18	It is unclear why the finding of Chapter 20 has been altered. The ES of Chapter 20 states, "More than 100 estimates of the social cost of carbon are available. They run from US -\$10 to \$350 per tonne of carbon. Peer-reviewed estimates have a mean value of US\$43 per tonne of carbon with a standard deviation of US\$83 per tonne." Yet the SPM and TS use a different construction with different US\$ findings. The authors need to explain this inconsistency or revert to the Chapter 20 finding. (Govt. of Australia)
1304	19	15		25	We would suggest adding estimates of the potential costs/benefits expressed in economic terms more familiar to policy makers eg. In GDP (be it global, annual, by year, etc.), in line with available data. Also, in the global scale, the range is so large that the information to the decision makers is poor. Obviously variations across regions/countries are considerable, but this range should also be expressed, providing once again valuable information about the division of costs/benefits across regions, which is extremely relevant with regards to the questions of mitigation and adaptation capacity. The costs/benefits to refer only to estimates for CO2 is not sufficient and will leave many, if not most policy makers with empty hands, while formulating their standpoints, policy options and programmes. a share/GDP indicator would also take int account the equity issue. Also exmaples of high exposure areas would be valuable information. (Govt. of Finland)
1305	19	15		25	This paragraph needs a number of revisions: 1) The SCC (social costs of carbon) numbers discussed are not consistent with that in Section 20.6 or in the Chapter 20 Executive Summary (page 3). The U.S. Government could not find the exact mean and standard deviation values used in the SPM. It appears that the SPM may be drawing heavily on Table 20.3 for their summary SCC numbers. This doesn't make sense since that table is presented to illustrate the evolution of estimates from only three models and does not summarize the peer-reviewed SCC estimates discussed elsewhere in Section 20.6.1. 2) The SPM should also summarize the Section 20.6 discussion of GDP losses over time. GDP losses are a more intuitive complement to the SCC representation of aggregate damages. 3) The Chapter 20 Executive Summary discussion of the SCC aggregate damage estimates provides a much better characterization of the literature on this topic. The SPM should consider adopting it in lieu of the current text. 4) It would be useful to add a sentence or two defining SCC for the lay reader that describes how it is generated, illustrating the key components of uncertainty and the implications of the current limited consideration of all impacts. (Govt. of USA)
1306	19	15		30	This paragraph concentrates on damages only - there might be some benefits occurring as well. (Govt. of Finland)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1307	19	16	16	34	It would be helpful to emphasise that the inability of natural systems to adapt to the rate and magnitude of climate change, is a very important limit. This is partially included in the term environmental but we would suggest the word biological is added. (Govt. of UK)
1308	19	16	19	16	Two surveys of published estimates (are these estimates net cost or net benefits – not clear) (Govt. of India)
1309	19	16	19	17	Costs from the two surveys are unclear and should be clarified. Additionally, referencing the two surveys would benefit the text. (Govt. of Japan)
1310	19	17	19	18	Policymakers may have difficulty in understanding the meaning of "mean" and "standard deviation" in this section. In particular standard deviation greater than mean is somewhat counter-intuitive. More explanation will be needed. (Govt. of Japan)
1311	19	17	19	17	May replace "US\$ -3" by "- US\$ 3" in line with the pattern given in Table 20.3 on page 17 of chapter 20. (Govt. of Pakistan)
1312	19	18	18	22	It would be helpful to provide some examples and describes the findings of this studies. (Govt. of UK)
1313	19	18	18	22	It would be helpful to indicate in what direction taking account of climate forcing would move these models. Also the point should be made that most models do not take account of higher and therefore riskier temperature rises, as well as not explicitly modelling irreversibilities. (Govt. of UK)
1314	19	18	19	25	The point should be made that the Social Cost of Carbon depends on stabilisation scenarios - so if the world is on BAU, the SCC is \$85/tCO ₂ , and if on a 550ppm goal, the SCC is around \$30/tCO ₂ . (Govt. of UK)
1315	19	18	19	25	It would be helpful to produce estimates in terms of percentage of GDP drawing on Figure 20.3a. (Govt. of UK)
1316	19	22	19	22	It is suggested to include a baseline (1990?) against which the 4 degrees centigrade have to be added. (Govt. of Austria)
1317	19	22		22	Replace “damages” with “costs and benefits”. The presumption that “non-quantifiable impacts” are necessarily “damages”—and hence, negative—needs to be proven rather than asserted. (Govt. of USA)
1318	19	23	19	25	This text sends a confusing message to the reader. The text reads: "No single cost estimate from the published literature is very likely to be correct. Taken as a whole, however, the range of published estimates shows with high confidence that net costs are positive." This sentence could lead some to draw the conclusion that none of the published literature reviewed is of much use. To avoid any gross misunderstanding and/or misinterpretations, re-writing this sentence is suggested. (Govt. of Japan)
1319	19	23		24	We would suggest removing the sentence stating "No single cost estimate from the published literature is very likely to be correct" as the sentence does not provide valuable information (in itself it could be incorrect) and actually can be counterproductive in decreasing the (policy) credibility of the text. (Govt. of Finland)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
1320	19	24		25	Replace sentence starting with “No...” with “Modeling of climate feedbacks on biophysical and socio-economic systems is immature in these assessments, so analysis of adaptation responses is limited.” Add 18.4 to the cites. (Govt. of USA)
1321	19	24		25	If there is a standard deviation of $\pm \$23/\text{ton}$ of CO ₂ , is it appropriate to state with “high confidence” that net costs are positive? Delete sentence. (Govt. of USA)
1322	19	24		25	Again the authors have used a different and less clear construction than that which is provided in the Chapter 20 ES, and they have also adapted the confidence reading, suggest changing the final sentence to "Taken as a whole the range of published estimates shows with very high confidence that climate change will result in net costs into the future, aggregated across the globe and discounted to today and these costs will grow over time". (Govt. of Australia)
1323	19	25	19	25	For clarification, replace "net costs are positive" by "economic costs outweigh benefits". (Govt. of Germany)
1324	19	25	19	25	For clarification, replace "net costs are positive" by "economic costs outweigh benefits". (European Commission)
1325	19	27	19	27	Drop the phrase "It is virtually certain that" because this sentence is tautologically true. (European Commission)
1326	19	28	19	30	The sentence is not clear (net costs vs gobal aggregate costs) (Govt of Switzerland)
1327	19	29	19	29	The sentence "that the net costs will be larger than the global aggregate" needs further clarification. Such clarification might be achieved by the following wording: "that the net costs of impacts of climate change per capita will be larger than the global average". (Govt. of Austria)
1328	19	32	19	52	This is an important and very necessary Section. It shows that the IPCC, as an advisory Panel to the UNFCCC, through SBSTA, and the Convention programmes and projects plays an important role regarding also the implementation of the UNFCCC plans for action. Such is the case regarding its Article 5: Systematic Research and Observation. However, the listing of commitments misses the necessary reference on monitoring the geophysical and biological variables and, in particular, for the sake of decision makers from developing countries, the need to initiate the operation of watching and warning systems enabling the dissemination of early alert warnings regarding climate hazards and risks. This inclusion would demonstrate the IPCC coordination with other UN efforts, like those undertaken by the ISDR. Threfore, it is suggested to add, at the end of the first bullet, in page 19 the necessary complementary action, i.e. monitoring. (Govt. of Argentina)
1329	19	32	19	53	The issue raised on p. 16 (39-52), i.e.. the need for integrated assessments, should be reflected in the list of research needs. I.e.. we suggest adding a new bullet along the lines of “further research to achieve a better understanding of how multiple stresses interact to increase vulnerability to natural and societal systems”. (Govt. of Norway)
1330	19	32	19	52	The authors need to provide an explanation or source from whence these research needs are derived. We question the merits of including this section in the SPM (which already is too long). The needs indicated are very broad. Suggest the research needs issue is covered in the TS and not the SPM.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Australia)
1331	19	32	19	52	Refer to which section of the main text? (Govt. of Thailand)
1332	19	32	19	52	In Sector E. More researches are needed to predict CC impacts in a region in order to link such impacts to adaptive capacity needs focusing on early warning system needs. (Govt. of Thailand)
1333	19	32	19	52	In Sector E. In many region, especially in Asia had fewer published researches than North America and European countries, then it should be better, if we can promote the CC researching in these counties. (Govt. of Thailand)
1334	19	32		52	The U.S. Government recommends deletion of Section E. It seems odd that the SPM should have a “research needs” section. Neither the WG I 4AR SPM nor the second-order WG II SPM draft had one. The WG II chapters include lessons on enhancing the better communication and usability of information and the incorporation of adaptation strategies into practice. This provides appropriate detail on needs while not unnecessarily elevating the topic to the SPM and choosing to highlight a small subset of possibilities. (Govt. of USA)
1335	19	32			Section E is very much appreciated. It would be very much appreciated if linkages to the Technical Summary or the main report would also be provided for this section. (Govt. of Austria)
1336	19	34	18	39	The point should be made that there are some impacts for which there are no adaptation responses. (Govt. of UK)
1337	19	34	19	52	Research directions suggested focused on adaptation and observation. Not enough emphasis was put on understanding the relationship between climate change and the systems of concern. So, please add: "Continue the basic research to improve the understanding of the impact of climate change on the processes that govern the ecophysiological and biogeochemical cycles in terrestrial ecosystems. This is necessary to confirm or dismiss existing as well as new hypotheses ". (Govt. of Canada)
1338	19	34	19	52	In particular, there seems to be a need to consider the 2011-2040 time window, in addition to the usual 2071-2100, given the policy relevance of that period for the on-going international process of climate policies making. (European Commission)
1339	19	36	19	37	It is suggested to also include "financial effort". (Govt. of Austria)
1340	19	37	19	38	It is very much welcome to mention climate change risk management and the information necessary to implement such policy approach. (Govt. of Austria)
1341	19	39	19	52	Can IPCC provide a summary table by region or by particular physical, biological and human systems of research needs? In addition, can these research needs be prioritized? (Govt. of Thailand)
1342	19	42			Drop this. Systems respond to changes in climate it is impossible to distinguish between the natural and human component via observations. Modelling

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					can be used but in then the energy can better be used to improve models for complex systems in multi-stress situations. Once this can be done with some confidence we can play with different temperature ranges and perhaps indicate the attribution of anthropogenic component. (Govt. of The Netherlands)
1343	19	44	19	45	Suggest to add "especially in developing countries, where research capacity is limited" at the end of the bullet. (Govt. of Mexico)
1344	19	44	19	44	It is suggested to insert "in particular" after "human systems". (Govt. of Austria)
1345	19	44			It is proposed to add a bullet here saying: "More development and easier availability of downscaled data on climate change and its impacts at regional and local levels" (Govt. of France)
1346	19	47	19	47	It is suggested to substitute "emissions reduction" by "emission reductions". (Govt. of Austria)
1347	19	47	19	47	Change " and of options for adapting to" to " and of costs and benefits of options for adapting to", because the options include costs and benefits. (Govt. of China)
1348	19	49	19	49	In section E, experience gained and knowledge accumulated in adapting to climate variability and extreme events should be analysed to benefit action to adapt to climate change. Therefore we propose to add after "climate": "variability and extreme events and". (UNISDR)
1349	19	50	16	51	It would be helpful to provide some examples to support this sentence. For example: 'There are indirect climate change impacts manifested through, for example, changing patterns of nutrient runoff, as well as direct effects such as loss of species, like coral, due to rising water temperatures.' (Govt. of UK)
1350	19	50	19	50	It is suggested to add the following wording: "and identification of barriers to adaptation." (Govt. of Austria)
1351	19	52	19	52	We propose to add after "practical experience": "in particular that accumulated in coping with today's climate-related risks." (UNISDR)
1352	20	2			In "Endbox 1" it is proposed to add a definition of the term "adaptation". (Govt. of Chile)
1353	20	3		21	End Box 1 should be placed in the introduction. Before readers get into the text they should be provided the definitions so that they know what the various terms mean, as opposed to surmising – perhaps erroneously – what they might mean. This is especially important because, as noted, the UNFCCC defines "climate change" differently, and the U.S. Government suspects that many, if not most, policymakers are likely to have greater familiarity with the UNFCCC definition. Moreover, much of the public, which may also read this SPM, quite often equate "climate change" with non-natural or anthropogenic climate change. (Govt. of USA)
1354	20	11	20	13	Endbox 1: The definition provided here for "Adaptive capacity" differs to that provided in Chapter 17. For consistency, suggest reversion to Chapter 17 definition (e.g. "Adaptive capacity" is the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behaviour and in resources and technologies.")

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
					(Govt. of Australia)
1355	20	20	20	21	Endbox 1: It is suggested to delete the text in italics in the final version. (Govt. of Austria)
1356	20	24		36	Insert Box TS-2 (changing the text from “Technical Summary” to “Summary for Policymakers” where appropriate), instead of the existing End Box 2, into the text of the SPM just after the introduction. Box TS-2 contains a better description of the two ways to describe certainty of knowledge than the current text. The definition of climate change is important for the reader to note (it’s distinction from anthropogenic climate change alone). (Govt. of USA)
1357	20	25	20	35	Please explain why there's a difference between the likelihood of an outcome or a result, and the level of confidence in a statement. It is not clear to the layman why there are some statements with discussed in terms of levels of confidence, while others are discussed in the terms of certainty/unlikelihood. If there is no significant difference between the two types of statements, choose the "virtually certain/very likely/likely" lines of reasoning, as opposed to confidence. Note that the SPM for WG1 makes only sparing use of levels of confidence, and stays with the terms of likelihood for most of the document. Greater consistence makes the SPMs easier for policymakers to understand. (Govt. of Canada)
1358	20	25	20	36	Endbox 2: It is suggested to explain the difference between the likelihood of an outcome or a result and the confidence in a statement. (e.g.: likelihood: chance (probability) of something happening; confidence: trust of faith in a thing). (Govt. of Austria)
1359	20	25	20	35	Endbox 2: It is noted that statements in the SPM are only qualified with very high, high and medium confidence but not with low and very low confidence. There is the question whether we need a definition of low and very low confidence. (Govt. of Austria)
1360	20	27	20	27	The colon (:) after the word "indicate" may be deleted. (Govt. of Pakistan)
1361	20	27	20	27	Endbox 2: It is suggested to delete ":" after "indicate". (Govt. of Austria)
1362	21	24	21	24	It is suggested to substitute "toward" by "towards". (Govt. of Austria)
1363	21	36	21	36	Seven years after adoption of the SRES it might not be appropriate to claim that all emission scenarios should be considered equally sound. It is proposed to delete this sentence. (Govt. of Austria)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Late Comments from the Sultanate of Oman

Comment number	From Page	From Line	To Page	To line	Comments
LATE -1	7	42	7	48	The ground level Ozone is generated as a result of photochemical reaction between nitrogen oxides and hydrocarbons in the presence of sun light which is a local site specific o country specific. The increased frequency of cardio-respiratory diseases due to higher concentrations of ground level ozone can not be attributed to the projected climate change or greenhouse impacts
LATE -2	8	21	8	32	Natural climate variability forcing also plays an important role in the climate change scenario, therefore, anthropogenic climate forcing may not be the only case for greater risk of increased flooding from rivers and the sea in the regions of South East Asia. Natural climate forcing factors need to be considered in such a scenario

Late Comments from the Government of Belgium

Comment number	From Page	From Line	To Page	To line	Comments
LATE -1	1	0			It would be nice to have a layout similar to the WG1 SPM layout: yellow boxes at the beginning of sections; footnotes instead of endboxes when possible.
LATE -2	2	6	2	14	Line 6-7 say announces "impact on natural, managed and human systems, while the title line 13-14 only includes "natural and managed". The section under this title also contains impact on humans. One solution could be to end the title with "...impacts in natural, managed, and human systems. (see page 3 line 40 for usage of "managed and human systems")
LATE -3	2	26	3	9	The part on the impact on physical systems (line 26-37) contains one biological effect related to cryosphere changes (line 31-32), which seems out of place there since all other biological effects are grouped in the part from line 39 onward. One might argue that lines 26-32 group all cryosphere effects, including secondary effects on biology, but then why does page 3 line 2 (in the part on biological systems) refer to changes in marine and freshwater biota that are related to ice cover? We think the division in physical and biological systems is a good one, but should (i) be consistent, (ii) mention that impact of climate change on biological systems can be either direct (such as effects or temperature or rainfall changes), or indirect, i.e. mediated by impact of climate change on physical systems (such as in the example on changes in Arctic and Antarctic flora and fauna resulting from cryosphere changes)
LATE -4	3	9	3	9	Change sentence to "The impact of anthropogenic CO2 on the pH of the oceans that will affect the process of calcification for some marine organisms is perhaps equally important to global climate change, in terms of modifying the biology of the oceans, but effects of this are as yet undocumented" (in order to properly reflect the assertion in Chap.1, p. 24, lines 9 to 12). A second-best option would be to change word order to: «Effects of observed recent ocean acidification.... » (logic: effects that are observed are also documented. The acidification itself has been measured quite precisely, but not its biological effects)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
LATE-5	3	11	5	11	Page 3,4,5: Arrangement of related information: The separation of box SPM-1 from the text on page 3 and from figure SPM-1 is inefficient, requiring the reader to check in three places for related information about the same analysis, and also leads to some duplication. The diagram page 4 Line 6 – 19 is clumsy and does not add value to the text below it. This diagram could be deleted, and replaced by the three upper plots of Box TS-4, which we found convincing. The remaining text page 4 Lines 23-30 could be blended with the text after page 3 line 19. This would clear space to address pattern analysis, including some of the text of page 3 lines 20-26, the text of page 4 lines 35-44, and figure SPM1 with its caption (removing duplication and white space).
LATE-6	3	15	3	26	The cells and temperature ranges described in Box SPM1 page 4 35-40 are the same as in fig SPM1, so it seems there are not really three separate sets of evidence (page 3 line 15) – as bullets 2 and 3 (page 3 lines 20 and 23) refer to different ways of analysing the same huge dataset.
LATE-7	3	17	3	19	Better mention here explicitly that models with natural + anthropogenic forcings simulate observed trends significantly better than models with natural forcings only. In the current phrasing this is only implicit, and one has to read box SPM-1 to get to this crucial element of the report
LATE-8	3	17	3	38	At least some of the long and complicated sentences here could be revised. Examples: page 3 line 17-19, 23-26 and 35-38.
LATE-9	3	28	3	30	«few analyses... limited in number» : This doesn't seem to correspond with the the text just above referring to 29,000 datasets, combined with «shows a discernible human influence» in page 4 line 46-48. To explain the difference, page 4 line 46-48 should move above page 3 line 28, and the word «full» in line 28 should be elaborated.
LATE-10	4				Box SPM 1: The terminology used here for the various types of evidence (Using climate models, Using spatial pattern analysis) is not the same as the terminology used on page 3 lines 17-26. For example, the term "spatial pattern analysis" is not mentioned on page 3. Moreover, Box SPM-1 contains two bullets, while page 3 lines 17-26 has three. Better correspondence between text and box would strengthen this part.
LATE-11	5	1			Figure SPM-1: Use of Circles: The green bullets over Europe mask most of the coloured background. This must be improved. Suggestion : no colour inside circles (transparent) + could use a different sign, e.g. a polygon, to distinguish between physical and biological systems. In addition, it is difficult to distinguish between the sizes of current symbols on the map. What does each dot (outside Europe) represent ? The location of ONE observed change ? This should be made more clear (it is also unclear in caption of fig 1.8, but expressed differently : "Dots represent ~75 studies"). Although the legend shows 5 circle sizes, only three appear on the map.
LATE-12	5	1			Figure SPM1: Add the same coloring to the square boxes (physical blue, biological green). (suggestion to adapt depending on how the Figure itself is amended)
LATE-13	5	7	5	8	Figure SPM1 Caption: reorder: «Boxes show the significant of changes in physical and biological systems (i) in continental... (ii) at a global scale... (GLO).» .

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
LATE-14	6	6	6	8	Suggest rewrite as «Whilst the global temperature change serves as a common indicator, the impacts frequently stem from projected changes in sea-level, regional precipitation, and other climate variables»
LATE-15	6	14	6	23	Section Water: Line 15: maybe add something about seasonal changes in S Asia (in a monsoon climate, seasonal changes may be large, even if the annual average is not). Line 23: does this also include himalayan glaciers, in which case 'the dry season' would be more appropriate than 'summer and autumn' (but in this case, maybe it's more than 1/6 of the population – check)? It would be useful to include a Figure similar to TS 5 regarding runoff, but adapting the boxes to incorporate more info from Figures 3.2, 3.4 and 3.5.
LATE-16	6	14	6	16	Does it exist enough evidence in the chapter to qualify decrease over __much__ of mid-latitudes as "very likely" ? Informations for mid-latitudes seems only available in figures, and it seems hard to make strong conclusions for mid-latitudes (a possibility would be to use something like "part of the mid-latitudes")
LATE-17	6	27	6	27	We think that giving the appropriate definition of "resilience", at least as a footnote, would be useful to policy makers. It is defined in the summary of Ch 4 (p3) as "the ability to adapt naturally"
LATE-18	6	28	6	28	"other global change drivers" would be made more clear by adding "(especially land use change and overexploitation)", as it is done in the summary of Ch 4, p 3.
LATE-19	6	34	6	35	This sentence is not completely clear, especially for a summary. What happens above this temperature range ? Is the number of species loss limited to about 20-30%, i.e. also valid for +5°C from pre-industrial ? Table 4.1 does not suggests so. We suggest to add: "This percentage is likely to be even higher for higher temperature increases.
LATE-20	6	34	6	34	These are global estimates for the currently assessed species (note: we cannot count all species, most of which are insects, microorganisms etc. - presumably that is not what is meant?). The statement may express that lower or larger losses are possible in specific ecosystems (1-80% in the TS).
LATE-21	6	39	6	39	Please add some examples of changing geographic range - as shown on figure 4.3. Earlier draft of SPM mentioned several times the northwards shift of boreal forests. This would provide continuity with previous IPCC assessments.
LATE-22	6	40	6	40	«goods and services» - please elaborate a bit, what does this mean in this context?
LATE-23	6	42			Section Food: Could be useful to add Figure 5.2 or Figure TS7 into the SPM (with a reference here), this summarises 69 studies, and clearly distinguishes temperate and tropical, and the different response of different crops.
LATE-24	6	44	7	8	Out of the four bullets in this section, only the first - about food production at higher latitudes - stipulates that CO2 effects are included. The following three are not clear on this: are the CO2 effects at lower latitudes unknown and is this responsible for the limited confidence? This would imply that the evolution of food production and hunger could well be less unfavourable than indicated by these statements, given that elevated CO2 would rather enhance than reduce crop productivity. Statements on food production and hunger in the world are going to be key issues in this report, so clarification is needed.
LATE-25	6	45	6	45	position of bracket «(allowing...)» suggests it only applies to the decrease, which is not the case.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
LATE-26	6	1	15	41	Section C: It is inconsistent to have sentences including "xxx is _likely_ to happen" qualified by different levels of confidence, i.e. * or ** (both for a sentence including likely) ? Such cases seems confusing. It seems that almost any combination of on the one hand likely/very likely/extremely likely and on the other hand medium/high/very high confidence are possible, which is confusing to the reader. For example, in line 16, "very likely" (90%) is combined with ** (high confidence, 8/10). In line 18, "likely" is combined with **. In line 34, "likely" is combined with *. On page 7, line 12, "very likely" is combined with ***. On page 7, line 15, "likely" is combined with ***. Endbox 2 suggests that likelihood and confidence are two different things, since they are separately defined. However, looking at these definitions, we wonder if there is a difference between the "likelihood" of an outcome or result, and the "confidence" in the statement that describes that result? Both are expressed as a probability. We are afraid that policy makers who have less experience with probability than scientists, might be even more confused. Could Endbox 2 provide a clear additional explanation on how to interpret likelihood vs. confidence?
LATE-27	7	4	7	5	Very important: The 3°C upper limit for positive impacts is too high, particularly as it is from 1990 and without adaptation, as indicated at the beginning of this section. Chapter 5 often uses local temperature increases, which should be larger than the average due to larger warming on the continents (see for example WG1 table S8.1). In addition, adaptation is often considered in chapter 5, yet in spite of that, temperatures at or below 3°C are frequently given. So it is hard to see how this statement about 3°C, which is not in the summary of chapter 5, can be consistent with the two statements just above it (lines 6-34 to 6-40), and how it derives from the text in chapter 5 section 6. From the diverse literature studies quoted in chapter 5 our general impression is that net negative production would commence at a much lower *global* temperature change from 1990, probably not higher than 2°C. A quick calculation from fig TS7, giving equal weight to both crops and both regions, suggests that the average yield drops after a local temperature rise of 2.6°C, implying a global temperature rise of less than 2°C. (Note, it is unfortunately not clear from TS7 or Figure 5.2 whether temperature is relative to 1990 or preindustrial, in the latter case the warming relative to 1990 is even less). Please make sure throughout the whole report that the reference date is clearly given. You might want a box at the beginning of the report highlighting the default configuration, and the manner to translate numbers from one scale to the other (using the WG1 AR4). We may speculate that the origin of this statement might instead be from economic integrated assessment models (as discussed in chapters 18 and 19), in which climate-agriculture links were generally derived from earlier literature, due to the inevitable delay in updating parametrizations (for example, some well known IA studies such as that of Tol et al 2002 derived such a 3C figure, but assumed a very high effect of carbon fertilisation). Please make sure that this statement reflects the balance of new evidence from chapter 5, not that from older IA models (or from the TAR). If such a statement is retained, the word « potential » should also be clarified (i.e. does this assume substantial conversion of high latitude forest to agricultural land?). The method of aggregation across crops and regions should also be clarified (e.g. is it based on market prices?). The reference (eg to chapter 5.6) should also make it clearer how this number was derived. If this statement is found to be misleading, it should also be changed in the box in TS page 30.
LATE-28	7	16	7	16	add «and acidification (caused by rising atmospheric CO2)» after « temperatures ».
LATE-29	7	22	7	22	it's not only Asia: the Nile delta is also particularly vulnerable due to high population density. Figure 6.6 suggests that three most vulnerable deltas are Nile, Ganges and Mekong.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
LATE-30	7	47	7	48	Altered burden of water-related diseases: greater or smaller? Or geographic shift between affected areas? Altered spatial distribution: just a shift, or also range expansion? "Altered" is not informative to the reader.
LATE-31	7	51	7	52	For improved clarity, change the sentence to : "Climate change is likely to have some mixed effects, such as geographic expansions of the areas suitable for stable Plasmodium falciparum malaria in some regions (PLEASE SPECIFY IF POSSIBLE) and with contractions in other regions (SAME) (based on Chap.8, lines 6-8)
LATE-32	8	8	8	8	page 8 line 8: please specify the « numbers », as example in ch9 summary pg 3: « A 3°C temperature increase could lead to 0.4 – 1.8 billion more people at risk of water stress ». Likelihood estimates need to be added.
LATE-33	8	13	8	13	too brief – add specific examples / regions. Or use sentence in Chapter 9 summary: The cost of adaptation to sea level rise could amount to at least 5-10% of GDP (PLUS SPECIFY TIME PERIOD FOR THIS COST).
LATE-34	8	23	8	33	Asia Section: This section is too brief, especially for such an important region with more than half of the global population. It deserves more space with more specific examples. Confidence should not be decreased just because the region is too diverse to make general statements – elaborate more about subregions instead. Another way to improve this section could be to include a variant of figure 10.4 (hotspots of future climate impacts and vulnerabilities in Asia), preferably with use of color and possibly some trends (in small boxes overlaid as in fig 14.1) Additional suggestions for Asia: What about morbidity and mortality due to drought, heat waves, diarrhoeal disease and cholera, especially in southern Asia? What about effects on wetlands, corals, and mangroves and aquaculture (see strong paragraph in chapter 10 page 3) What about Central Asia and Middle East– any significant impacts here? What about increased wildfires in north-asian forests, and effect of melting permafrost on infrastructure (partly duplicates polar, but included within Asia in TS).
LATE-35	8	24	8	24	« disruption of water resources » – this is very important, please elaborate more. Note chapter 10 summary pg3: Freshwater availability in central, south, east and Southeast Asia particularly in large river basins such as Changjiang is likely to decrease due to climate change, along with population growth and rising standard of living that could adversely affect more than a billion people in Asia by the 2050s (high confidence) [10.4.2]
LATE-36	8	26	8	27	« likely » is too weak here, since we are rather certain that there will be some sea level rise. Could specify number of people affected (as for some other regions).
LATE-37	8	30	8	30	page 8 line 30 « is likely to affect development » - that's trivially vague and too weak, please elaborate more.
LATE-38	8		10		These geographic sections focus a lot on water (availability, drought, floods, sea level, etc.). This is justified but it makes the region's section quite repetitive. There is too little attention for biodiversity.
LATE-39	9	3	9	14	In order to make the picture complete for Europe, add the key impact on biodiversity (in an additional paragraphs) : "A large percentage of the European flora could become vulnerable, endangered, critically endangered or extinct by the end of the 21st century under a range of SRES scenarios. *** N [12.4.6]" (based on TS, p,51, lines 49-50)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

Comment number	From Page	From Line	To Page	To line	Comments
LATE-40	9	7	9	7	Heat waves also reach northern europe (See figure 12.4).- does Paris (where thousands of people died from the 2003 heatwave) count as south or north? Belgium alone had more than 1200 additional deaths during the 2003 heat wave.
LATE-41	9	7	9	7	It is misleading to suggest there are only benefits in the north (please also clarify where you consider the limit between "North" and "South" to be in Europe). Could write « likely to bring mixed benefits... » - specific suggestions can be found in following Belgian comments.
LATE-42	9	7	9	8	Mention that tourism, especially winter sports may be negatively affected by reduced snow cover
LATE-43	9	8	9	8	"increased crop yields" in northern Europe: This sweeping affirmation cannot be true fro any temperature increase. Please qualify with, e.g., the temperature range. "increased Atlantic waters productivity" may be missleading. A more clear and balanced view is given in chapter 12, section 12.4.7.2 : "temperature increase has a major effect on fisheries production in the North Atlantic, causing changes in species distribution, increased recruitment and production in northern waters and a marked decrease at the southern edge of current ranges". 12.4.7.2 also mentions increased « trophic mismatches » in the North sea, «toxic algal blooms » and decreased dissolved oxygen, etc. At least, a statement about increased productivity should be qualified with «in northern waters », as the chapter does not provide support to the conclusion that Atlantic water productivity as a whole will increase (even near Europe). The key issue is change in species distribution, and that should be reflected in the SPM.
LATE-44	9	10	9	10	Suggested addition: [Europe's] biodiversity will be substantially affected by climate change (very high confidence) (extracted from ch 12, p 3 (summary) which also says: « The great majority of organisms and ecosystems are likely to have difficulty in adapting to climate change (high confidence) ... Alpine communities face up to a 60% loss of species under high emission scenarios [12.4.3]. A large percentage of the European flora is likely to become vulnerable, endangered, or committed to extinction by the end of this century [12.4.6]. »)
LATE-45	9	14	9	14	This number is based on Nicholls (2004). However, it includes 0.9 millions for SOUTH mediterannean. This should probably not be included in Europe. In addition, it would be useful to remind that the number does assume that even currently planned adaptation will not take place. It might be more useful to mention the long-term challenge of a several metres SLR in the course of this millennium.
LATE-46	9	18	9	20	What is the likelihood for the first sentence, and how large a fraction of the forest is affected (an estimate could be derived from figure 4.3? The last sentence is meaningless, there are always some extinctions – how much will they increase?
LATE-47	9	52	9	52	Page 9 line 52: « changes in the extent of sea ice and permafrost »: please specify what kind of changes (eg see maps TS-11, TS-16 ...)
LATE-48	10	1	10	2	« negative and positive impacts ... changing cryospheric components ... transport » - is this really the clearest choice of words for policymakers? – more useful to be specific and refer to sea-passages opening up while land transport infrastructure sink into melting tundra.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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LATE-49	10	1	10	2	In order to better reflect the climate risks for Arctic human communities, complete the sentence "For Arctic human communities, it is virtually certain that there will be both negative and positive impacts, particularly through changing cryospheric components, on infrastructure and transport" by (additional paragraph) : "Climate change is likely going to drive changes in communities by challenging individuals' and community's relationship with their local environment which has been the basis of Arctic peoples' identity, culture, social and physical well-being ** D [15.4]" (based on Chapter 15, p.33, lines 1-3)
LATE-50	10	23			Altogether the layout of the SPM does not support its structure very well. For example, this section, as well as the following ones, does not belong to the regions but it has the same caption style.
LATE-51	10	28	10	29	"changes in climate associated with amount of change in global average temperature": should this not be the reverse? A temperature change is associated with climate change, not the other way around.
LATE-52	10	39	10	39	after « other judgements » could add « such as the relative weight of different regions, sectors, generations, and risk-levels, ». Overall, this short paragraph does little justice to the detailed discussion in chapter 19. One or two additional sentences inspired from Chapter 19 would be welcome.
LATE-53	11	5			Page 11 table SPM-1, upper part: Outer tick marks for SRES scenarios are barely distinguishable from arrow-heads, and the gap (i.e. location of arrow-heads) is inconsistent. A small diagram explaining the ticks, as in Figure TS-4, could be clearer than the caption.
LATE-54	11	5			Table SPM-1 - upper part : The global mean warming range indicated in brackets should be the same as in WG1, i.e. 90% confidence, and not 1 standard deviation (as it might be here ?). If this cannot be done in WG2 SPM for internal consistency, it should be clearly indicated that the brackets relates to 1 standard deviation, and that it does not follow WG1 practice.
LATE-55	11	24			Table SPM-1, lower part, and table SPM-2 : These tables effectively replace the well-known « burning embers » figure of TAR, which was often used in presentations. Adding a similar coloured background – for example a different shade for each sector in table SPM-1 (water blue, ecosystem green...), getting darker/'warmer' towards the right, could help to show the connection to the « burning embers » and help presenters, who could speak about, for example « the blue region at top left », « the orange region at lower right », etc.
LATE-56	11	29	11	29	Table SPM-1 - lower part - Ecosystems: The meaning of "inc. high risk of extinction" is not clear. Does it mean (1) "the risk will be increasingly high" OR (2) "an extra 20-30% species are at high risk" (in the temperature range) ? We think that the correct message is (2), but it is not clear with the current words. In addition, "species" should be replaced by "studied species" or a similar wording indicating that only a sample of species is considered. (In addition, "inc." might be understood as "including")
LATE-57	11	48	11	49	Table SPM-1 Amend text to read «... a few locations, such as high-latitude coastal areas ...» (and likewise pg 15 line 40-41)

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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LATE-58	11	52	12	31	Table SPM-1, lower part, and Table SPM-2: Sea-level rise spots: Don't need to be duplicated in both tables. Even disregarding uncertainty, the relationship between temperature and sea level rise is very scenario dependent due to their different inertia, so it must at least say « Sea Level Rise by 2100 (for SRES) » - otherwise it looks rather inconsistent with the « long term commitment to several m SLR » (page 11 line 46-7). Different numbers would apply for the stabilisation scenarios in the longer term.
LATE-59	11				Table SPM-1. Please explain in the legend what WAIS and MOC are. Are the numbers for FOOD correct: -10 to +10 million people at risk for medium warming while less warming already yields -10 to +30? Are these numbers really underpinned by the chapter ?
LATE-60	12	0			Table SPM-1 The rate of warming, which is important factor, is not considered here, and this limitation should be mentioned in the caption.
LATE-61	12	14	12	16	Table SPM-2: We do not think that the selection of examples for Europe is representative. All impacts are positive for "N. Europe", and since Europe is only "divided" in North/South, it may suggest that "half" of Europe should expect positive impacts from climate warming, while this is not true. There will be some positive impacts in the northern parts of Europe, but negative impacts will be dominant on the continent. The selection of examples should reflect this. Examples: more people at risks of flooding; - more heat related deaths.
LATE-62	12	36			“Table SPM-1 (cont.)” This caption refers to both Tables SPM1 and SPM2 – confusing
LATE-63	12	38	12	39	Table SPM1-caption: add « (upper scale) » after « 1990 » and « (lower scale) » after « and 1861-1890 »:
LATE-64	12	46	12	46	Table SPM-1 - caption : Does it mean that the position of arrows (value) does not have any meaning ? Why are some arows placed above the last tick while others are not ?
LATE-65	12	0			Table SPM-2. Says that in South Europe wheat yields on average increase with increasing warming (although the span becomes greater and ranges from negative to positive). However, the region section says on page 9 line 4 that crop production is endangered in Southern Europe. Then wheat does not look like a good example to illustrate this. Upon closer inspection of the figures, some of the values given in table SPM-2 for wheat production do not correspond with the last version (November 2006) of chapter 12 that I have seen. In 12.4.7.1 of that version I found: "Climate-related increases in crop yields are mainly expected in N. Europe (e.g. wheat 2020: +2 to +9% by 2020, +8 to +25% by 2050, +10 to +30% by 2080) (Olesen et al., 2006; Audsley et al., 2006; Alexandrov et al., 2002; Ewert et al., 2005)". For South Europe I found in 12.4.7.1: "The impacts on autumn-sown crops are more geographically variable; yield is expected to strongly decrease in most southern areas, and increase in northern or cooler areas (e.g. wheat 2020: +3 to +4% by 2020, -8 to +22% by 2050, -15 to +32% by 2080) (Santos et al., 2002; Olesen et al., 2006; Audsley et al., 2006; Giannokopoulos et al., 2005)." If this text has not been changed since November 2006, there seems to be a problem of correspondence between SPM and chapter 12. Furthermore there seems to be a misinterpretation: from 12.4.7.1 (the second cited phrase above), we derive that in the range -15 to +32% by 2080, -15 is for South and +32 for North. Table SPM-2, however, gives the impression that -15 to +32% is the range for South (since -15 to +32% is on the line that starts with 3-4% increase for South, and is connected with arrows to that 3-4% value). A general comment: throughout the SPM, if changes in agricultural production are given, it is in our view necessary to ALWAYS indicate whether elevated CO2 is included. This can make huge differences, and can quickly lead to false

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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					interpretation by policy makers if left unspecified.
LATE-66	13	5	13	6	Table SPM1-caption: « Note that these are estimated climate-induced changes to the estimated number for a future without climate change. »: very hard to read! Simpler to say « These numbers show the increase specifically due to climate change (above that due to other factors)».
LATE-67	13	9	13	10	Table SPM1-caption: Sea Level Rise: WG1 SPM has several caveats about dynamic ice melting and other processes that are poorly included in the models – some note or cross-reference to this effect should be added.
LATE-68	13	12	13	22	Table SPM1-caption: Not easy to find the right numbers in this long list of sources, could instead put them in a narrow column at the right hand side of the table.
LATE-69	14	9			Table SPM-3. Not consistent that this table has no source references at the end, while SPM-2 has.
LATE-70	14	9			Table SPM3: row days/nights + column water: add increased evapotranspiration row heat-waves + column health: « especially for elderly and very young » instead of in settlement column. In last column append « coincident with peak in demand ». row cyclones + column agriculture: windthrow = « uprooting »? row sea-level + column settlement: a few cities may not be protectable against extreme high SL even with costs, and could have to be abandoned
LATE-71	15	14			English not correct.
LATE-72	15	15	15	16	Delete "because of climate change": all impacts are due to this. Or specify.
LATE-73	15	19	15	19	Fig 6.6 suggests that three most vulnerable deltas are Ganges, Nile, and Mekong, so why is the ZhuJiang so important here in the SPM?
LATE-74	15	23			"and also some areas": this needs rephrasing, the sentence already started with "In some areas".

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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LATE-75	15	29			We think it would be useful to refer here to the uncertainties from dynamic mass loss. Different, apparently contradictory elements of information are given about the ice sheets. Here it is as if part of W. Antarctic is melting, while on other places it is said in the TS p18 line 5 that there is no clear evidence of ice sheet change; TS p 6 line 9 refers to the thickening of the Antarctic Ice sheet. From the TS and from the SPM of WG1 it is clear, but not from this SPM.
LATE-76	15	32	15	32	« causing sea-level rise of 4-6 m »: Not quite consistent with WG1 SPM (page 14) which says: « Current models suggest that a global average warming (relative to pre-industrial values) of 1.9 to 4.6°C would lead to virtually complete elimination of the Greenland ice sheet and a resulting sea level rise of about 7 m, if sustained for millennia. 125,000 years ago, when paleoclimatic information suggests 4 to 6 m of sea level rise. »
LATE-77	15	40	15	41	Amend text to read «... a few locations, such as high-latitude coastal areas ...» (and likewise in table SPM-1)
LATE-78	16	16	16	18	add « further » before 0.6, to avoid any ambiguity.
LATE-79	16	24	16	24	replace « cope with » by « reduce »
LATE-80	16	45	16	51	Hard to read, condense to : « exposure, sensitivity and adaptive capacity, including ... », and invert two halves of sentence line 50.
LATE-81	16	45	16	45	add « and acidification due to CO2 » after « water temperature ».
LATE-82	17	8	17	11	See our comment about replacing SRES box with a much more useful figure showing such trends.
LATE-83	17	23			Figure SPM2: Would be clearer to group each set of bars for the three time periods closer together. Alternatively, use a line plot and show all on one time axis.
LATE-84	17	20			Figure SPM-2. This figure suggests that, apart from under the A2 scenario, socio-economic development will more than compensate the increasing risk from SLR because the blue bars drastically go down over time. In other words, despite SLR, the situation regarding flooding risk later this century will become a lot better than today (again, apart from under A2). This seems to contradict the message earlier in the SPM: six out of eight regions (pages 8-10) list flood risk as key impact. Scientifically there is no contradiction, since these previously stated impacts on pages 8-10 are for climate change alone, and do not take into account development pathway and adaptation. However, we are concerned that in this way the SPM is sending different messages: until page 17 SLR seems to be a major problem, which subsequently disappears in figure SPM-2. Moreover: (1) how reliable is a single study? (2) this study seems to contradict page 7 line 19 where it is stated that hundreds of millions of people are vulnerable to sea level rise, since the red bars in SPM-2 are much smaller.

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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LATE-85	18	20	18	21	«do not take full account of ... for example, the sensitivity of climate models to forcing »: this is misleading / out of date. Many stabilisation studies used a wide range of climate sensitivities derived from both GCMs and historical constraints, and in some cases even model the cascade of uncertainty using a probabilistic approach (see WG 1 section 10.5 and 10.7.3). Remove the « for example », or provide some better examples.
LATE-86	18	24	18	26	The first sentence suggests we are about to discuss the ***rate*** rather than just the level of warming, which is indeed an important factor, unfortunately the second sentence doesn't do this, and nor does table SPM-1, a limitation which could be mentioned there. Actually, what this paragraph is really saying is that the WG1 GCM analysis didn't, very unfortunately, include stabilisation scenarios, so instead we have to interpolate between results for SRES scenarios using simple models (or table SPM1) – it could be clearer to the policymaker to admit this.
LATE-87	18	31	18	45	Adaptation and Mitigation: Could be a very useful to insert here Figure 20.7 (four maps of vulnerability under BAU, Adaption, Mitigation, Both A+M), since it clearly shows both the differences and complementarity of adaptation and mitigation for each region. Figure TS 19 is similar, however the mitigation scenario (550ppm) is not ambitious enough to compare with SRES over such a short (50 year) time horizon, so Fig 20.7 (to 2100) is preferred. If included, also make a second reference to this figure in page 20 line 8 (end).
LATE-88	19	17	19	18	"a standard deviation of US\$23" suggests that low values where as likely as high values, while it is not the case. Another way of expressing this, according to the concerned study, is that 10% of the (peer reviewed) literature shows costs of carbon exceeding about 34 US\$ per tonne of CO2.
LATE-89	19	21	19	21	Add a sentence after « variation »: « Many of these estimates derive from a relatively small group of economic models, whose parameterizations of climate impacts and representations of the physical climate system are inevitably highly simplified and derived from older literature than that assessed elsewhere in this report. » (Note for justification – figure 20.4 and section 20.6)
LATE-90	19	24	19	25	This statement should follow Ch 20 p 3, which is much more clear: "Climate change will result in net costs into the future, aggregated across the globe and discounted to today; these costs will grow over time (very high confidence)."
LATE-91	19	42	19	52	Section Research Needs: Line 43: add at end, « and application of this to improve projection of marginal impacts of future forcings ». Line 44: invert order, to « research into the risks of irreversible change due to climate and other stresses, and strategies for managing physical, biological and human systems to reduce such risks, noting key vulnerabilities and avoiding critical thresholds» Line 47: add « and rates » after « levels ». Line 51: to make last bullet follow from « among these needs are: » replace by « study of the importance of learning-by-doing for both adaptation and mitigation, where the base ... experience »

IPCC WGII AR4 SPM Final Draft - Government Review Comments

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LATE-92	19	42	19	52	Section Research Needs: Could add an additional need (related to current discussion on new scenarios for AR5): « for WG1 GCMs to run low stabilisation scenarios as well as BAU, in order to identify the nonlinearities (or critical thresholds) in the patterns and trends of impacts, as these nonlinearities dominate the conclusions of marginal risk analyses made by integrated assessment models which scale such patterns and trends. »
LATE-93	20	34			The definition of a statement having "Medium confidence" might create confusion: about a 5 out of 10 chance implies that the chance of the statement being true is about the same as the chance of the statement not being true. The reader might wonder: why then give the statement? We would advise to stress in the text (in the section on confidence levels) that it is nevertheless important to describe such forecasts with medium confidence, because they can indicate possibilities with serious consequences. E.g. partial deglaciation of Greenland and West Antarctic ice sheets above 1-2°C temperature increase, causing many metres of sea level rise over centuries, is such a forecast with medium confidence that deserves to be mentioned. The reader might also wonder: if there is a category "low confidence" meaning about a 2 out of 10 chance of the statement being true, why not systematically give the opposite statement with "high confidence" (8 out of 10 chance)?
LATE-94	21	0			SRES EndBox 3: This should not be a priority if space is limited, as it has already been shown many times in the TAR, and in AR4 WG1 SPM. More useful could be a figure showing trends for each scenario, both socioeconomic data such as population and GDP (incl the ratio industrialised/developing countries), and emissions of key gases and aerosols (possibly with uncertainty as WG1 Fig 10.26). Another compact alternative could be figure TS2.