

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
1	36488	23	0	0	0	0	General: The structure means that there seems to be some repetition and similar results are scattered across the different sections, for example impacts on wine are scattered in at least 3 different sections. This means it is harder to get an overview for those issues that are more scattered and it also may give them more weight than was intended as the reader is constantly reminded of the same or similar impacts. (Paula Harrison, University of Oxford)	We have tried to avoid duplication but in some areas it may be necessary to have redundancy where an issue is relevant to different sectors. The text on wine has been pulled together in a box.
2	38104	23	0	0	0	0	(general comment) The Chapter is quite clear, thanks also to the Boxes and the intelligible figures. However this chapter needs further improvements. The improvements are the following: 1) it needs to quote more the new EEA Report just published in May 2012: "Urban adaptation to climate change in Europe" (EEA Report No 2/2012) for all issues related to urban areas. 2) after OCTOBER 2012 this chapter needs to quote the new EEA reports to be published in October 2012: a) "Climate change, impacts and vulnerability in Europe, An indicator-based report" b) "Adaptation in Europe" c) "Freshwater assessment report (floods & droughts and water scarcity)" d) "Coastal assessment report" 3) The Box 23-3. Climate Change Impacts in the Mediterranean needs more contents to highlight the status of CLIMATE HOT SPOT. 4) The authors need to plan to insert a table with the status of the national adaptation strategies in Europe just in the last draft before publication. 5) The authors need to plan to insert a paragraph regarding the EU Adaptation Strategy after has been adopted in March 2013. (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	The chapter relies on the primary scientific literature rather than summary reports. EEA reports will only be cited where they include additional relevant material that has been peer reviewed.
3	38110	23	0	0	0	0	Add somewhere in Box Box 23-2. the following sentence: "The White Paper on adaptation (Comm. of the European Union, 2009) encouraged the EU members states to act in view of possible mandatory requirements for developing their own national adaptation strategies (NAS), or, most probably, mandatory reporting on adaptation actions being undertaken or planned. The EU Member states are at different stages of planning, developing and implementing NAS.". Then when the chapter is close to be finalized the authors should add a sentence quoting the number of EU countries having adopted a NAS. (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	The purpose of this chapter is to review the scientific evidence rather than policies on climate change. We have limited space to discuss national or international policies on adaptation.
4	38272	23	0	0	0	0	Looking at figures and tables made for the different chapters, there are similarities (e.g. magnitude of temperature and rainfall changes, impacts on ecosystems...) between chapters because they have they deliver similar information, but for different regions. (Guillaume Simioni, INRA)	We have reviewed tables and figures in chapter 21 and there is no duplication of content.
5	38273	23	0	0	0	0	Having a similar layouts (i.e. same styles and legends, symbols, columns, colors, ...) across the chapters, would help the comparison between regions. Not sure it is important, especially if the readership is different from one chapter to another. It's just a suggestion. (Guillaume Simioni, INRA)	Some visual consistency will be done by TSU in production stage.
6	38713	23	0	0	0	0	This is a well written chapter, my only concern is that general results are presented in tables etc for "regions" of Europe, but some individual countries may differ significantly to others within the same region, and one needs to be aware of this. Eg dependence on agriculture compared to neighbours etc (Patrick Goodman, Dublin Institute of Technology)	We are aware of this concern. Will be addressed where relevant in the text. Tables are used to summarise the sub-regional info and we will make clear that these assume an average impact across the subregion.
7	38844	23	0	0	0	0	If the chapter is using the division as indicated in figure 23-1 (Metzger et al 2005, page 5, line 29), then this should be reflected throughout the chapter. I think this division is valuable as several studies have shown, but it should be used consistently. (Rob Jongman, Wageningen UR)	We have tried to ensure that sub-regional classification is used consistently.
8	39189	23	0	0	0	0	There are several statements that need a reference throughout the report (e.g. page 24 L4-13; page 31 L45-47; P32 L20-22; page 32 L35-39; P34 L19-21) (Christopher Reyer, Potsdam Institute for Climate Impact Research)	This has been addressed in the SOD.
9	39190	23	0	0	0	0	Maybe at some point it would be important to note that climate change impacts in the different systems mirror to some extent the climate change projections used for the analysis (this is a very obvious link but I think it would be good to show that some of the system react in way we expect them to do from theory / our general understanding of the system). (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Does this mean we should discuss where observed impacts are consistent with projections? We have attempted to do this, and also, identify where observed impacts are not consistent with projections.
10	40293	23	0	0	0	0	Overall the chapter relies too heavily on references to SREX. SREX is itself a synthesis. The primary references should be used instead. (John Sweeney, National University of Ireland Maynooth)	SREX is not extensively used. Will add references from the primary literature and only cite SREX where relevant.
11	40294	23	0	0	0	0	There is a good balance overall to the chapter which of necessity covers a lot of material on a broad brush approach. Some more material on the natural controls on climate in Europe would be useful e.g. the role of topography/land-sea/storm track changes etc. which condition particular spatial responses would be useful. (John Sweeney, National University of Ireland Maynooth)	This refers to basic climatology and is not relevant to the chapter.
12	41985	23	0	0	0	0	Tropospheric O3 risks to forest in Europe: what are the trends/predictions, what will happen in combination with warming if there is drought and vice versa under humid conditions? Chronic exposure vs. peaks; trends and possible effects on forests? If afforestation increases forest area in Europe, what does it mean to VOCs and thereby tropospheric O3 trends? Warming effects on boreal trees is inter- and intra-species specific, this should be addressed more thoroughly. Especially winter-time warming might be harmful to boreal trees (if root systems are exposed to frost without snow cover or there is winter-time flooding): are there studies relating to these topics and have these taken into account when assessing the warming effects on boreal forests? Warming might also increase stem height growth more than that of stem diameter and therefore trees could become more sensitive to wind damage (tree tapering). If deciduous forests replace coniferous forests in northern parts of Europe what does it mean to albedo, VOCs, ozone risks to forests and to decomposition and soil processes in general? (Anne Kasurinen, University of Eastern Finland)	The impact of climate change on tropospheric O3 is discussed in section on air quality but there is limited space for detailed discussions. Future emissions of VOC associated with reforestation is not necessarily climate change, but some references on the effect of higher temperature on VOC emissions are included.
13	43331	23	0	0	0	0	The chapter is significantly improved compared to the zero-order draft. (Hans-Martin Füssel, European Environment Agency)	Thanks.
14	43494	23	0	0	0	0	In general, there is a very light treatment of risk processes in the Iberian Peninsula, especially as regards the risk of drought that has many socio-economic impact in Spain and Portugal. An analysis of the causes and consequences of drought sequences in this European region can be read in Olcina (2008). (Olcina Jorge, University of Alicante)	We have included additional information on drought and fires in the Iberian peninsula.

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15	44551	23	0	0	0	0	Section 23.2.2.1: Please update to ensure consistency and cross-referencing with relevant WGI AR5 chapters (in particular, Ch2 and Ch14), and the SREX Chapter 3 in regards to extremes. (Thomas Stocker, IPCC WGI TSU)	We use information from CORDEX/regional climate models which are forced by GCMs. We refer to SREX regarding extremes
16	44552	23	0	0	0	0	Section 23.2.2.2: Please update to ensure consistency and cross-referencing with relevant WGI AR5 chapters and the Annex I: Atlas of global and regional climate projections. SREX Chapter 3 included an assessment on extreme sea level, and this should be referred to here. (Thomas Stocker, IPCC WGI TSU)	OK.
17	44553	23	0	0	0	0	Section 23.2.2.3: Please update to ensure consistency and cross-referencing with relevant WGI AR5 chapters and Atlas, because some assessments may have been updated/ revised for some extremes. SREX Chapter 3 included an assessment on extreme sea level, and this should be referred to here. (Thomas Stocker, IPCC WGI TSU)	We are not happy with the Atlas because it is not very good.
18	44578	23	0	0	0	0	the figures 23.2 23.3 23.4 ... are all based on numerical regional climate models. Due to the European scale most statistical downscaling methods can not be used for this purpose. This might be a shortcoming what should be discussed somewhere. (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	We use dynamic downscaling for regional climate input and not statistical downscaling.
19	44581	23	0	0	0	0	the definition of Northern and Southern without an object is unusual. please use Northern-Europe and Southern-Europe (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	We have tried to describe the sub-regions more consistently.
20	46468	23	0	0	0	0	The first draft provides a good first cut to climate change impacts and adaptation in Europe. But the draft covers impacts far more extensively than adaptation, and in many places the very localised evidence reporting would need antecedent more general statements / judgements which are then substantiated / undepinned by reference to specific evidence. Two issues appear to be under-covered in the text: snow and fires. The latest climate science has established that overall warming and snowier winters may co-exist in Europe, making snow-related extreme weather an adaptation challenge to many European countries and local authorities. Secondly, wild fires whilst not omitted in the report are not covered comprehensively enough - they demand similar attention to heat/health as a matter of preparedness. Finally, health impacts are treated too narrowly, the range of health impacts needs to be treated more comprehensively (see comments below). (Jouni Paavola, University of Leeds)	Snow is included where relevant to policy areas. We have included additional text on wildfires (in forestry section) from a new contributing authors. Some additional health issues have been added.
21	49854	23	0	0	0	0	The chapter is developing very well and the conclusions are starting to emerge into the ES. I think it is time now, with this review phase, to consolidate the more recent literature that is emerging, country by country. In my comments I have emphasised new work from Finland that has appeared (including some shameless self-citation), and new sectoral studies that are about to be published ahead of the IPCC deadline. If Finland is anything to go by, prepare yourselves for a glut of new information, especially on adaptation! This has the potential be a very interesting and comprehensive assessment (updating AR4 and placing the many reports coming out of EEA in a more considered and balanced context). (Timothy Carter, Finnish Environment Institute)	New published literature has been included.
22	49855	23	0	0	0	0	Note that there will be a number of publications for multiple sectors released soon in English from the Finnish Climate Change Adaptation Research Programme (ISTO). A summary report will be published along with a Special Issue of Boreal Environment Research (open access, peer-reviewed journal published in Finland). Currently, there is a Finnish language summary report available: Ruuhela, R. (Ed.) 2012. Miten väistämättömään ilmastonmuutokseen voidaan varautua? Yhteenveto suomalaisesta sopeutumistutkimuksesta eri toimialoilla. (How can we prepare for unavoidable climate change? Summary report of Finnish adaptation research in different sectors.), Publications of Ministry of Agriculture and Forestry 6/2011, Helsinki, 177 pp (in Finnish). In addition, there is a web site worth visiting for summary information on ISTO, including reference to peer reviewed publications at: http://www.finessi.info/ISTO/?lang=fi&page=overview (Timothy Carter, Finnish Environment Institute)	It was not possible to include this reference.
23	49856	23	0	0	0	0	A paper describing trends in frost and snow over Europe and Baltic sea ice was published out of the ENSEMBLES project along with some maps that might be worth reporting: Jylhä, K., Fronzek, S., Tuomenvirta, H., Carter, T.R. and Ruosteenoja, K. 2008. Changes in frost and snow in Europe and Baltic sea ice by the end of the 21st century. Climatic Change 86: 441-462. (Timothy Carter, Finnish Environment Institute)	Arctic and Baltic sea ice are addressed in the Polar chapter
24	51323	23	0	0	0	0	1) Overall -- In preparing the 2nd-order draft, the chapter team should prioritize making each section of the chapter a polished, comprehensive treatment of topics considered. From these sections, the chapter team is then encouraged to maximize the utility of its findings, ensuring that they are robust, compelling, and nuanced. Themes to consider informing in constructing findings include decisionmaking under uncertainty, risks of extreme events and disasters, avoided damages, and limits to adaptation. To these ends, the chapter team has prepared an effective 1st-order draft. In an effort to inform further chapter development, I provide some general and specific comments below. (Katharine Mach, IPCC WGII TSU)	General comments. No response required.
25	51324	23	0	0	0	0	2) Highlighting key findings -- In developing the 2nd-order draft, the chapter team should continue clearly presenting key findings throughout the sections of the chapter, using calibrated uncertainty language to characterize its degree of certainty in these conclusions. In this way, a reader of the chapter can readily understand how the literature reviews and syntheses in chapter sections--the traceable accounts--support the conclusions of the chapter, in particular those presented in the executive summary. (Katharine Mach, IPCC WGII TSU)	Additional text added in each section.
26	51325	23	0	0	0	0	3) Usage conventions for calibrated uncertainty language -- Where used, calibrated uncertainty language, including summary terms for evidence and agreement, levels of confidence, and likelihood terms, should be italicized. In addition to incorporating these terms directly into sentences, the author team may find it effective to present them parenthetically at the end of sentences or clauses, as already done in many cases. Casual usage of the reserved uncertainty terms should be avoided. (Katharine Mach, IPCC WGII TSU)	Agreed. Language has been revised to be consistent with IPCC guidance

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27	51326	23	0	0	0	0	4) Summary terms for evidence and agreement -- The chapter team is encouraged to revisit statements for which a summary term is provided for evidence, but not for agreement--or vice versa, where a summary term is provided for agreement, but not for evidence. In such cases, the author team should consider characterizing its evaluation of both evidence and agreement. Alternatively, there may be statements for which the author team could present only a level of confidence, without summary terms for evidence and/or agreement. The TSU (especially Mike Mastrandrea) is available to discuss the framework for treatment of the uncertainties in this regard, if doing so would be helpful for the author team. (Katharine Mach, IPCC WGII TSU)	Agreed. Language will be carefully revised to be consistent with IPCC guidance
28	51327	23	0	0	0	0	5) Specificity of described observations and projections -- The author team has done a very nice job of ensuring specificity in describing observed and projected impacts, while still presenting information succinctly. I encourage the author team to continue ensuring specificity in this way: indicating relevant time periods, geographic areas, etc. for observations; indicating relevant time frames, scenarios for climate change or socio-economic development, geographic regions, or other assumptions for projections; and characterizing key driving factors where ranges of outcomes are presented. In particular, where the author team provides information on projections, as possible and appropriate, it would be beneficial to further indicate differences across scenarios of climate change, thus providing information on outcomes expected for higher and lower levels of climate change. (Katharine Mach, IPCC WGII TSU)	OK. No response needed.
29	51328	23	0	0	0	0	6) Coordination across the Working Group 2 contribution -- In developing the next draft of the chapter, the author team should consider treatment of topics not only in this chapter, but also across the report as a whole. For each topic, the chapter team should ensure that treatment here is reduced to the essence of what is relevant to the chapter, with cross-references made to other chapters as appropriate, also minimizing overlap in this way. (Katharine Mach, IPCC WGII TSU)	Agreed. We have tried to coordinate with WG1 and WGIII findings.
30	51329	23	0	0	0	0	7) Harmonization with the Working Group 1 contribution to the AR5 -- At this stage of chapter drafting, the author team should carefully consider the working group 1 contribution. Wherever climate, climate change, climate variability, and extreme events are discussed, the chapter team should ensure that their treatment is harmonized with the assessment findings of working group 1. (Katharine Mach, IPCC WGII TSU)	Agreed.
31	52645	23	0	0	0	0	There is limited focus on biology and effects of climate change on biological systems in Europe, this should be expanded such as description of known or predicted biological consequences of the environmental effector from climate change in Europe (e.g. increased flooding and drought episodes etc.), and also relating effects of changes in air, soil, and water quality (p. 29, l. 38 – p. 31, l. 30) to biological effects at all levels (e.g. organism/pop/habitat/ecosystem) (Else Marie Løbersli, Norwegian directorate for nature management)	We feel this issue is well covered. Impacts on ecosystems, biodiversity and ecosystem services are included in the chapter. The chapter is structured around a sectoral framework
32	53465	23	0	0	0	0	When presenting projected impacts, please include the time frame, scenario, and other assumptions. This is done in most instances but is missing in a few. (Kristie L. Ebi, IPCC WGII TSU)	Text has been revised to address this point.
33	53466	23	0	0	0	0	Please check consistency of statements with those in the relevant sectoral chapters, such as food systems, coastal zones, and human health. (Kristie L. Ebi, IPCC WGII TSU)	Text has been revised to address consistency across all the sections/topics
34	53467	23	0	0	0	0	Confidence statements are in italics in some places, but not others. (Kristie L. Ebi, IPCC WGII TSU)	Text has been edited.
35	53468	23	0	0	0	0	Quite a few paragraphs mix observations, projected impacts, and adaptation, but not in a consistent order. To the extent reasonable, having a consistent approach will facilitate communication of results. (Kristie L. Ebi, IPCC WGII TSU)	The evidence is revised by topic/sector rather than by time frame - but we have tried to review observed effects, then projected impacts, then adaptation
36	54490	23	0	0	0	0	GENERAL COMMENTS: I would like to thank the authors for their work on the FOD. When considering the expert review comments received on your chapter and the next round of revisions, I suggest several overall priorities. (1) Keep in mind that the preparation of the SOD is the time to ensure that each section of the chapter presents a comprehensive treatment of relevant literature, and that the Executive Summary presents findings that capture the key insights that arise from the chapter assessment. (2) This is also the time to focus on distilling the chapter text, not just fine-tuning wording but editing with a critical eye to improving quality by making discussions succinct and synthetic, while still being comprehensive. (3) Cross-chapter coordination is also important at this stage, as it should now be possible to identify topics that overlap with other chapters and to coordinate with other chapter teams to minimize that overlap. (4) Cross-Working Group coordination is important as well, and relevant chapter sections should cross-reference chapters from the other Working Groups, particularly in the case of statements about changes in mean or extreme climate conditions that are assessed in the contribution of Working Group I. (5) Continue to look for opportunities for the creation of figures that synthesize across results from the literature. (Michael Mastrandrea, IPCC WGII TSU)	OK.
37	54491	23	0	0	0	0	EXECUTIVE SUMMARY: The author team has made a good start on the Executive Summary, including clear attention to providing traceable accounts (see separate comment on this), and calibrated uncertainty language. In the next round of revisions, I suggest considering ways to make the findings more specific. Currently, the findings tend to the general, providing indications of directions of change when more specific/quantitative information is presented in the corresponding chapter text and sometimes providing less information about sub-regional differences. Please consider opportunities to include further detail while still providing clear findings. Some findings also include information about adaptation options along with impacts, but this could be taken further to integrate the information available regarding adaptation. (Michael Mastrandrea, IPCC WGII TSU)	The ES has been extensively revised.

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38	54517	23	0	0	0	0	EXECUTIVE SUMMARY 2: Please also consider the usage of calibrated uncertainty language throughout the Executive Summary. Currently, assignments of confidence are used primarily, sometimes paired with levels of agreement or evidence individually, and sometimes with likelihood language also presented. For those findings where confidence and agreement or evidence are presented together, I recommend revision to present either levels of confidence on their own, or levels of confidence along with agreement and evidence assignments on which the confidence assignments are based (e.g., high confidence based on high agreement, medium evidence). Doing so would allow greater comparability across chapter findings. In addition, please check the usage of likelihood language in the Executive Summary and throughout the chapter. For likelihood assignments, the basis in quantitative evidence should be clear in the corresponding chapter text, to support the probabilistic expression of the author team's degree of certainty in a specific statement. If the information on which the statement is based is qualitative in nature, I recommend assigning a level of confidence instead. We in the TSU are available to discuss any of the technical details related to these issues if that would be of use. (Michael Mastrandrea, IPCC WGII TSU)	The ES has been extensively revised. Uncertainty language has been included.
39	54518	23	0	0	0	0	TRACEABLE ACCOUNTS: The author team has made a very good start to providing traceable accounts for assessment findings and highlighting the location of those traceable accounts in the Executive Summary. Because you have done such a good job, I see several cases where improvements could be made, for which I have included suggestions in comments associated with specific bullets. In general, I would recommend the author team consider ways to more clearly identify support for assessment findings in the chapter text to link with the Executive Summary. In this context, I suggest providing some explanation of the calibrated uncertainty language used in the Executive Summary in the corresponding chapter section(s) where the traceable account appears for each finding, for cases where this is not done already. In particular, in situations where confidence is not high, it would be useful to understand why the author team has made this judgment (e.g., is there a lack of robust evidence?, are there multiple perspectives in the literature?). In situations where confidence is high, what is the evidence that forms the basis for these assignments? Succinct descriptions in the chapter text of this type will both highlight the basis for ES findings and help explain the author team's assessment of the literature. We in the TSU are available to discuss these issues as well if that would be of use. Finally, the standard convention is for line of sight to chapter sections to appear after each Executive Summary paragraph as a whole. You may wish to additionally include reference to specific chapter sections after individual non-bold sentences (e.g., if the finding is synthesizing information in several chapter sections but certain points are from specific sections), as is done in many cases now. But currently, where many but not all sentences are associated with a line of sight reference, the source of the unreferenced sentences can be unclear. (Michael Mastrandrea, IPCC WGII TSU)	We have included section and table references to support the statements in the ES.
40	41535	23	1	1	85	1	It is a very complete report on the impact of climate change in Europe and I would like to congratulate and acknowledge the lead authors and contributing authors for their work. Consequently I will only introduce some comments and references to complete the report, or to clarify some questions mainly related with forest fires, droughts and floods. A last comment: the IPCC does not contemplate a specific chapter devoted to Mountains; in the case of Europe Mountains plays an important role and it would be interesting to add a specific point about it and consider them also in the Key Findings (Maria-Carmen Llasat, University of Barcelona)	Thank you. We have decided not to include a section specifically on mountains but key mountain impacts are discussed in the relevant sector.
41	38028	23	2	2	2	3	Any chance to specify in which sub-regions increase of heat waves, meteorol. drought and heavy precipitation are projected to be most pronounced? (Harald Pauli, Austrian Academy of Sciences)	Figures 23.2-4 show this information and it is discussed in the text.
42	51330	23	2	50	0	0	Executive Summary -- In subsequent work on the executive summary, there are several aspects of development for the author team to consider further: 1st, in terms of formatting, all calibrated uncertainty language (summary terms for evidence and agreement, levels of confidence, and likelihood terms) should be italicized. 2nd, where possible, where key findings characterize expectations for future outcomes, the author team should consider providing further information on the differences in projections made for differing levels of climate change (and for differing climate/socio-economic scenarios). 3rd, where a summary term for evidence OR agreement is provided, the author team is strongly encouraged to consider presenting summary terms for BOTH evidence and agreement. In some cases it may be clearest to present only a level of confidence, without explicit indication of the corresponding summary terms for evidence and agreement that the author team has assigned. (Katharine Mach, IPCC WGII TSU)	The ES has been extensively revised.
43	38383	23	2	50	5	16	The executive summary seems somewhat detached from the main text. It is not really possible to trace statements to the main text. This is particularly the case with respect to the confidence statements. Is it a deliberate decision not to use likelihoods - even where there is high confidence? There are a few cases in the executive summary where 'likely' is used - but it is not evident that this is being used in the context of the uncertainty guidance. (Claire Goodess, University of East Anglia)	The ES has been extensively revised, with added references to the main text and summary tables.
44	43332	23	2	50	5	16	The Executive Summary is not as well written as most parts of the main text, and it does not always fully reproduce the key messages from the main text. Furthermore, the use of the calibrated uncertainty language is confusing at places. (Examples are provided below.) (Hans-Martin Füssel, European Environment Agency)	The ES has been extensively revised.
45	49857	23	2	50	5	16	The use of bold type for key points in the ES is not especially effective, as it highlights only certain issues whilst having the effect of seemingly downplaying others. I think that rather than highlighting specific findings, as is done currently, perhaps some key broader message(s) for that sector could be distilled from the text. I realise that this isn't easy, but currently the highlighted text gives a quite ad hoc impression of impacts/responses in Europe. (Timothy Carter, Finnish Environment Institute)	Bold has been removed.
46	36454	23	2	52	0	0	The first and last sentence of this section are so broad they are virtually meaningless. Couldn't something be added briefly about the direction of change and regional differences. It also implies that changes in temperature are not significant as they are not explicitly mentioned. (Paula Harrison, University of Oxford)	The text has been changed. Temperature has been included, but due to the many regional difference direction and strength of changes are not included in the ES.

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47	54492	23	2	52	2	52	Regarding the traceable account for the bold statement here, section 23.2.2.2 includes a statement that indicates projected increases in Northern Europe and decreases in Southern Europe and that is assigned medium confidence. This seems to be the source of the Executive Summary statement, and the reasons for the difference in confidence level is not clear. If this is the source, it would be worth explaining the difference and considering including the regional detail in the Executive Summary, rather than the more generic statement as it is currently phrased. (Michael Mastrandrea, IPCC WGII TSU)	The confidence level has been changed in the ES. Text has been added.
48	43333	23	2	52	3	3	The bold text refers to rainfall only whereas the rest of the paragraph refers to several climate variables. (Hans-Martin Füssel, European Environment Agency)	Text has been changed accordingly.
49	49858	23	2	52	3	3	This summary of projected climate in the ES needs to be complemented with information on ongoing observed trends, which could perhaps be included in a separate bullet point. The main statement about projected precipitation is too vague - where in Europe are these significant changes projected, and what is the sign of changes? Even if changes are similar to those reported in AR4 (useful information in itself), the similarities need to be reported explicitly here too, as readers may not be familiar with AR4. What average temperature changes or rates of temperature change are projected in different parts of Europe? Ditto for precipitation changes. Perhaps these could be given for northern, central and southern Europe (or even for Giorgi regions N Europe and S Europe/Med. if that is easier). Five sub-regions mentioned here may be too many to summarise in the ES. The conclusions about wind speed extremes seem to downplay projected increases that are reported for parts of northern Europe (e.g. by Donat et al., already cited here) with associated storm damage potential as storm tracks are projected to move northward. Obviously this also implied declines in storminess in some other areas of central and southern Europe. The authors already cross-reference Chapter 21, which is providing an overview of the latest observed and projected climate information for each IPCC region covered in Chapters 22-30, using WG I and their own analyses. Please liaise with that chapter to harmonise the main messages about observed and future climate. (Timothy Carter, Finnish Environment Institute)	Text has been changed accordingly. Details of sub-regions could not be taken into account in the ES.
50	53469	23	2	52	3	3	Please ensure consistency with WG1. (Kristie L. Ebi, IPCC WGII TSU)	We have ensured consistency with WG1
51	54496	23	2	52	3	3	Please provide an indication of the time horizon over which the projected changes in this paragraph are relevant. Further specifics regarding the magnitude and direction of change, as well as sub-regional differences, would also be useful to include in the next draft to the extent they are available. (Michael Mastrandrea, IPCC WGII TSU)	Details for sub-regions and time horizons can not be included in the ES due to space limitation. They are included in the chapter.
52	38384	23	2	53	2	54	The SREX (Table 3.3) assigns lower confidence levels to European changes in droughts (medium confidence) and heavy precipitation (low to high depending on region). (Claire Goodess, University of East Anglia)	The confidence level for droughts has been changed to medium, but for heavy precipitation the level has not been changed after literature review.
53	43334	23	2	53	2	54	Where will the "marked increase in the frequency and intensity of heat waves, droughts, and heavy precipitation" occur? Everywhere in Europe or only in some regions? (Hans-Martin Füssel, European Environment Agency)	We have included discussion of regional differences in the ES. Sub-regional details are in the chapter figures and table and text.
54	51331	23	2	53	2	54	For this sentence, the author team should consider providing further specificity and qualification. More precisely, what is meant by "marked increase"? For the extreme events anticipated to increase in frequency and intensity, are there any brief indications that could be provided indicating the types of changes expected for a specific time horizon, climate/socio-economic scenarios, etc. Such information perhaps could be concisely provided at the end of this paragraph. (Katharine Mach, IPCC WGII TSU)	We agree with the reviewer but cannot add regional details in the ES. Please see the chapter.
55	54494	23	2	53	2	54	Regarding the traceable account for the statement on increasing frequency and intensity of meteorological droughts, section 23.2.3 includes a statement that model simulations project with medium confidence an increase in the duration and intensity of droughts in central and southern Europe and the Mediterranean region. If this is the source for the Executive Summary statement, the difference in confidence level is not clear, as well as the mention of frequency instead of duration in the Executive Summary. It would be worth explaining these differences or revising for consistency. The regional detail may also be useful to include in the Executive Summary. (Michael Mastrandrea, IPCC WGII TSU)	The confidence level has been changed in the ES. Text has been added.
56	54493	23	3	1	3	1	The chapter reference should be 23.2.2.3 here. (Michael Mastrandrea, IPCC WGII TSU)	Agreed. This has been changed.
57	54495	23	3	1	3	2	Regarding the traceable account for the statement on wind speed extremes, it is not clear how the low confidence in small or no changes relates to the statements in 23.2.2.3 that present medium confidence in an increase in Northern Europe in winter and inconsistent changes in other parts of Europe. In addition, the chapter does not seem to discuss the finding related to hail events. Please add support for this statement. (Michael Mastrandrea, IPCC WGII TSU)	The text in the ES has been changed for winds. The literature review did not give conclusive results about projected changes in hail events. Text has been added in the chapter.
58	36455	23	3	5	0	0	Why is only information included on the rural development and water sectors. It would be useful to summarise the progress across all policy sectors (coasts, forestry, biodiversity, etc) (Paula Harrison, University of Oxford)	This has been addressed in the revised ES.
59	43335	23	3	5	3	6	The bold text is not very informative if read by itself. The next sentence, mentioning adaptive capacity explicitly, would be a more useful summary of the whole paragraph. (Hans-Martin Füssel, European Environment Agency)	Bold has been removed.
60	43336	23	3	5	3	9	This paragraph would be more usefully presented further below, towards the end of the Executive Summary (Hans-Martin Füssel, European Environment Agency)	The ES has been revised and paragraphs re-ordered.
61	53474	23	3	6	3	7	Please ensure consistency with chapter 11. (Kristie L. Ebi, IPCC WGII TSU)	We have tried to ensure consistency with chapter 11
62	43337	23	3	8	3	9	This sentence suggests that adaptation is only occurring in the water sector, which is not correct. The chapter mentions adaptation in several other sectors as well (agriculture, forestry, coastal protection, etc.). A statement of (medium) confidence regarding adaptation does not seem adequate. If we do have evidence that (planned) adaptation to climate change is occurring, a confidence statement is not needed. (Hans-Martin Füssel, European Environment Agency)	Paragraph is revised to include other sectors and confidence statements.
63	38389	23	3	9	0	0	I'm not sure what you mean by upstream/downstream links. (Claire Goodess, University of East Anglia)	We do not think this requires further elaboration.
64	36456	23	3	11	0	0	Last sentence doesn't seem to fit with the rest of the paragraph (Paula Harrison, University of Oxford)	Agreed. Text has been revised.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
65	51332	23	3	11	3	11	For this statement, it may be clearest to indicate more specifically what is meant here by "risk." Presumably the author team is referring in particular to occurrence/frequency of floods, rather than to associated risks of impacts for humans and ecosystems, and it may be helpful to clarify this further. Additionally, if "likely" is being used as calibrated uncertainty language, it should be italicized; otherwise the author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Agreed, text has been revised.
66	53470	23	3	11	3	13	Over what time period and under what assumptions? (Kristie L. Ebi, IPCC WGII TSU)	Agreed, is by the end of the century reasonable? Until mid century signal is really mixed. Although on the other attributions studies argue otherwise; see Pal et al. 2012.
67	49208	23	3	14	3	14	"Annual monetary flood damages....." seems to be a little unusual. Is there another expression? (Oyvind Christophersen, Climate and Pollution Agency)	Text revised.
68	51333	23	3	14	3	15	Is the phrasing here ("the contribution of observed climate change is not clear") as clear as it could be? Would it be beneficial to mention more explicitly attribution to climate change? (Katharine Mach, IPCC WGII TSU)	Indeed this is unclear; we should state that in observed record attribution is made to anthropogenic climate change.
69	54501	23	3	14	3	15	Regarding the traceable account for this statement on observed flood damages, it appears the chapter reference should be to 23.3.1.2. Also, please consider whether the statement in the Executive Summary should include more explicitly the contribution of increasing exposure that is discussed in the chapter text. (Michael Mastrandrea, IPCC WGII TSU)	Agreed, text revised and reference added.
70	43338	23	3	17	3	18	I do not believe the combination of likelihood and confidence statements in one sentence is in line with the IPCC uncertainty guidance. (The same problem occurs at various other places as well.) (Hans-Martin Füssel, European Environment Agency)	Text revised.
71	49859	23	3	17	3	18	What does overheating in domestic housing have to do with coastal and river flood risk? I also wonder if the statement that adaptation can prevent most of the damages projected is really accurate in the case of coastal flooding and erosion. There are many stretches of coastline that simply are too expensive to protect against erosion exacerbated by SLR. Please check the literature on this, but some European countries (e.g. UK, Denmark) are already abandoning "lower value" coastlines and coastal communities to their inevitable fate. (Timothy Carter, Finnish Environment Institute)	Overheating of buildings is discussed in the housing section.
72	53471	23	3	17	3	18	You might want to explain why overheating could be a problem. (Kristie L. Ebi, IPCC WGII TSU)	This has been done.
73	54502	23	3	17	3	18	It is unclear whether "likely" is used here in its formal sense, or more casually. If intended as a probabilistic statement, it would be useful to explain the basis for it in the corresponding chapter text, particularly given the pairing with an assignment of medium confidence. This would aid in interpretation of the finding. In addition, the placement in this paragraph on coastal and river flood risk seems somewhat odd, and it would be useful to consider other options for presenting this finding. (Michael Mastrandrea, IPCC WGII TSU)	Text has been revised.
74	51334	23	3	17	3	23	"likely" on lines 17 and 23 -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. In place of casual usage, a word such as "expected" may be appropriate. (Katharine Mach, IPCC WGII TSU)	Text has been revised.
75	49860	23	3	20	3	21	This is not necessarily the case in northern Europe, where Arctic locations (Lapland) with a guaranteed (albeit slightly shortening) snow season could well benefit in terms of winter recreation (a broader term) and tourism from lack of snow further south. Thus there is a latitudinal as well as altitudinal factor at play here, and operates at least to mid-century and probably well beyond, even under high-end scenarios. For more on winter recreation in Finland, see: Landauer, M., Sievänen, T. and Neuvonen, M. 2009. Adaptation of Finnish cross-country skiers to climate change. Fennia 187(2): 99-113; Pouta, E., Neuvonen, M. and Sievänen, T. 2009. Participation in cross-country skiing in Finland under climate change: Application of multiple hierarchy stratification perspective. Journal of Leisure Research 41(1): 91-108. For perceptions of the tourism industry to climate change in Finland, see: Saarinen, J. and Tervo, K. 2006. Perceptions and adaptation strategies of the tourism industry to climate change: the case of Finnish nature-based tourism entrepreneurs. Int. J. Innovation and Sustainable Development, 1 (3), 214-228. (Timothy Carter, Finnish Environment Institute)	Arctic regions are not included in our chapter.
76	54504	23	3	20	3	23	The relevant section for this finding is 23.3.6. In addition, this is an example where the section provides quite a bit of more specific and quantitative information regarding projected changes. It would be worth considering ways to increase the detail of the Executive Summary finding to communicate what is known. (Michael Mastrandrea, IPCC WGII TSU)	We have revised the ES to include important findings.
77	38385	23	3	21	0	0	Is the statement that there will be no significant impacts before 2050 true of all European regions? In general, I think that the text implies more importance/confidence with respect to tourism impacts. (Claire Goodess, University of East Anglia)	The text has been revised and shortened.
78	49861	23	3	25	3	30	Frozen ground and frozen sea is used for transporting heavy equipment (e.g. forest machinery) and for accessing islands (e.g. in the Baltic archipelago areas). These seasonal transport routes will be severely affected by warming, with the shifting timing of transition seasons posing the greatest problems (e.g. dangerous thin ice and/or floating ice periods prohibiting access). A recent paper covering European Arctic regions is: Stephenson, S.R., L.C. Smith, and J.A. Agnew, 2011: Divergent long-term trajectories of human access to the arctic. Nature Climate Change, 1, 156-160. (Timothy Carter, Finnish Environment Institute)	Arctic regions are not included in our chapter.
79	43339	23	3	26	3	27	The qualifiers to be used for "evidence" are "limited", "medium", and "robust". "Low evidence" is not foreseen in the IPCC uncertainty guidance. Furthermore, "evidence" is to be combined with "agreement" to possibly result in a "confidence" statement; "evidence" cannot be combined with "confidence". Hence, "medium confidence, low agreement" is not permitted. "Medium confidence" would be permitted as well as "High agreement, limited evidence". (The same problem occurs at other places, e.g., p. 3, l. 43 & l. 54) (Hans-Martin Füssel, European Environment Agency)	The language has been revised.
80	51335	23	3	28	3	29	In this statement, it would be helpful to more explicitly indicate the mechanism or means through which climate change would affect inland water transport (low water levels?). (Katharine Mach, IPCC WGII TSU)	We do not have space to include this in the ES.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
81	38796	23	3	32	0	33 In all subregions but Sacandinavia (... change by:in all sub-regions but not in Scandinavia. (Ricardo Anadon, University of Oviedo)	Text has been revised.
82	41462	23	3	32	3	33	"...in all sub regions but Scandinavia." Replace "but Scandinavia" with "except Scandinavia." (SERHAT SENSOY, TURKISH STATE METEOROLOGICAL SERVICE)	Text has been revised.
83	53472	23	3	32	3	40	Please ensure consistency with chapter 10. (Kristie L. Ebi, IPCC WGII TSU)	We have tried to ensure consistency with chapter 10
84	51336	23	3	34	3	36	For this statement, it would be helpful to more explicitly indicate the mechanism or means through which climate change would affect thermal power production. (Katharine Mach, IPCC WGII TSU)	We do not have space to include this in the ES.
85	54505	23	3	36	3	37	The basis for this likelihood statement is unclear from the discussion in the corresponding chapter text--further clarity would be useful. (Michael Mastrandrea, IPCC WGII TSU)	We have revised the ES to include important findings and links to the main text.
86	51337	23	3	37	3	37	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. If the usage is casual, a word such as "expected" could be used instead. (Katharine Mach, IPCC WGII TSU)	Text has been revised.
87	54506	23	3	37	3	39	Regarding the traceable account for this statement, the section does discuss the changes in cooling demand under the combined effect of climate and non-climate factors such as income growth, but without discussing the relative contribution of different factors as is implied here. (Michael Mastrandrea, IPCC WGII TSU)	Text has been revised.
88	41463	23	3	38	3	38	after "...will increase" please insert "due to increased cooling demand " (SERHAT SENSOY, TURKISH STATE METEOROLOGICAL SERVICE)	Text has been revised.
89	51338	23	3	42	3	42	For this finding, the author team should consider providing further specificity and qualification, possibly with an example of projections in a subsequent sentence. For example, changes of what magnitude are expected, on what timescales, for what climate/socio-economic scenarios? (Katharine Mach, IPCC WGII TSU)	Text has been revised.
90	54507	23	3	45	3	46	I would suggest rephrasing to avoid the use of "may" here, as currently the pairing of "may" and "medium confidence" is somewhat hard to interpret. I would suggest either revising to read that the author team has medium confidence that climate change "will" change the distribution and seasonal activity, or "high confidence" that climate change may change the distribution and seasonal activity. (Michael Mastrandrea, IPCC WGII TSU)	Text has been revised.
91	36457	23	3	48	0	0	The last sentence in this paragraph seems to fit better in the following paragraph starting on page 3, line 53. (Paula Harrison, University of Oxford)	Text has been revised and re-ordered.
92	43340	23	3	48	3	49	The link between the first and second part of the sentence (before/after "although") is not clear. (Hans-Martin Füssel, European Environment Agency)	Text has been revised and re-ordered.
93	53473	23	3	48	4	6	Please ensure consistency with chapter 7. (Kristie L. Ebi, IPCC WGII TSU)	We have tried to ensure consistency with chapter 7.
94	43341	23	3	50	3	51	Use of the word "will" is adequate if future impacts depend on natural processes only; it is not appropriate if future impacts depends critically on human behaviour, as in this sentence where "improved drought tolerance" apparently refers to future successes in plant breeding. (Hans-Martin Füssel, European Environment Agency)	Statements are qualified with confidence statements.
95	51339	23	3	50	3	51	For this statement, the author team may wish to specify the timeframe and climate/socio-economic scenarios for which it holds. (Katharine Mach, IPCC WGII TSU)	text has been revised
96	38386	23	3	53	0	0	This is the first mention of observed trends and attribution. Is attribution not possible for other sectors etc? (Claire Goodess, University of East Anglia)	Text has been revised to include discussion of detection and attribution for each sector.
97	38388	23	3	53	4	11	This is quite a bit more detailed than other paragraphs. (Claire Goodess, University of East Anglia)	Text has been revised.
98	54509	23	3	53	4	11	The pairing of the bold statement in this paragraph on observed impacts on crop yields with the rest of the paragraph on various projected impacts is somewhat odd. In general, it would be preferable for the nonbold sentences to provide additional context for the finding presented in bold, rather than a series of additional relevant points that are not directly related to the bold statement. (Michael Mastrandrea, IPCC WGII TSU)	Bold has been removed.
99	38387	23	3	54	0	0	And this is the first mention of AR4. Are other changes all consistent/no new evidence? (Claire Goodess, University of East Anglia)	Text has been revised.
100	43342	23	3	54	4	4	The three separate statements on future impacts in Northern Europe are confusing and appear partly contradictory. Please present a summary statement that indicates what is known and what is not known for this region. (Hans-Martin Füssel, European Environment Agency)	Text has been revised.
101	51340	23	4	1	4	9	For these statements as appropriate, the author team should consider providing further specifics regarding the projections--what magnitudes are expected for described effects, on what timescales, for what climate/socio-economic scenarios? (Katharine Mach, IPCC WGII TSU)	Text has been revised to provide more detail.
102	43343	23	4	7	4	11	This sentence compiles various statements in a confusing way. It needs to make clear what the assumptions regarding adaptation are for the various individual statements. Furthermore, the use of "will" appears inappropriate if adaption is a central factor determining the impacts on livelihoods. (Hans-Martin Füssel, European Environment Agency)	Text has been revised.
103	43344	23	4	13	4	16	Where will these effects occur? Everywhere in Europe or only in some regions? (Hans-Martin Füssel, European Environment Agency)	Text has been revised
104	54510	23	4	13	4	17	The traceable account for the statement on damage from heatwaves is not clear, as this does not seem to be discussed directly in the referenced chapter sections. (Michael Mastrandrea, IPCC WGII TSU)	Text has been revised to illustrate impacts of heat waves on all sectors.
105	38390	23	4	14	4	15	Is this statement about irrigation applicable to all European regions? (Claire Goodess, University of East Anglia)	Yes.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
106	51341	23	4	14	4	15	For this statement, the author team should consider specifying the relevant climate/socio-economic scenarios. (Katharine Mach, IPCC WGII TSU)	Text has been revised.
107	38391	23	4	16	0	0	Should this also be integrated management? (Claire Goodess, University of East Anglia)	Text as been revised.
108	38797	23	4	19	0	0	In this sentence a negative impacts in fisheries is signaled with high confidence. In my opinion in the chapter devoted to oceans the emphasis was done on a not clear influence in fisheries. I suggest to coordinate the messages about this topics between chapters (Ricardo Anadon, University of Oviedo)	Information on fisheries by region has been included. We have coordinated with the relevant chapter.
109	43345	23	4	19	4	19	Where will climate change have negative impacts on fisheries? Everywhere in Europe or only in some regions? (Hans-Martin Füssel, European Environment Agency)	Information on fisheries by region has been included.
110	53475	23	4	19	4	25	Please ensure consistency with chapters 6 and 7. (Kristie L. Ebi, IPCC WGII TSU)	We have tried to ensure consistency with chapters 6 and 7.
111	51342	23	4	19	4	27	On lines 19 and 27, it would be beneficial to indicate more specifically what is meant by "negative impacts." Additionally, on line 19, as a minor point, "species of marine fishes" might be closer to wording commonly used, as opposed to "sea fish." (Katharine Mach, IPCC WGII TSU)	Paragraph on fisheries has been revised.
112	38392	23	4	21	0	0	I wonder if it is appropriate to include a statement based on a single study in the executive summary? (Claire Goodess, University of East Anglia)	Paragraph on fisheries has been revised.
113	54512	23	4	22	4	23	The traceable account for this statement on relocation of fishing fleets is unclear, as what appears to be the relevant statement in the chapter text states that fishing fleets in the Baltic will likely have to relocate or switch to other species. If this is the relevant source, consider revisions to harmonize. (Michael Mastrandrea, IPCC WGII TSU)	Paragraph on fisheries has been revised.
114	51343	23	4	22	4	24	"unlikely"/"likely" – On lines 22 and 24, these terms should be italicized if being used per the uncertainties guidance for authors (reflecting a probabilistic basis for their assignment). The author team should avoid casual usage of these reserved likelihood terms. If the usage is casual, a word such as "expected" could be used instead. (Katharine Mach, IPCC WGII TSU)	Paragraph on fisheries has been revised.
115	54511	23	4	23	4	24	The traceable account for this statement on salmon production is not clear, as this does not seem to be discussed directly in the referenced chapter section. (Michael Mastrandrea, IPCC WGII TSU)	Statement is linked to discussion on main text.
116	43346	23	4	27	4	27	Where will climate change have negative impacts on forestry? Everywhere in Europe or only in some regions? (Hans-Martin Füssel, European Environment Agency)	Northern Europe.
117	51344	23	4	27	4	31	As can be supported by the chapter's assessment, the author team should consider whether further information can be provided regarding projected outcomes across climate/socio-economic scenarios. Are differences in outcomes expected for lower versus higher levels of climate c (Katharine Mach, IPCC WGII TSU)	Noted.
118	53476	23	4	27	4	31	Please ensure consistency with chapter 4. (Kristie L. Ebi, IPCC WGII TSU)	We have tried to ensure consistency with chapter 4
119	51345	23	4	33	4	33	It would be preferable to indicate more specifically what is meant by "environmental quality" here. (Katharine Mach, IPCC WGII TSU)	n/a text removed.
120	54513	23	4	33	4	34	Please clarify that this statement refers to air quality. (Michael Mastrandrea, IPCC WGII TSU)	n/a text removed.
121	53477	23	4	33	4	37	Please ensure consistency with chapters 1 and 3. (Kristie L. Ebi, IPCC WGII TSU)	We have tried to ensure consistency with chapter 1 and 3
122	54514	23	4	35	4	35	Here is an example where further specificity is needed. How will climate change affect air quality in the future? In addition, the assignment of low confidence suggests that the use of "likely" here is casual, and given that "likely" has a specific meaning in the calibrated lexicon, a different word should be used here. (Michael Mastrandrea, IPCC WGII TSU)	Paragraph on air quality has been revised.
123	51346	23	4	35	4	36	For these statements, it would be preferable to provide an indication of mechanism or means if possible--is the effect of climate change on air quality described here due to ozone, and through what mechanism is climate change expected to decrease surface water quality? Additionally, if the word "likely" is being used per the uncertainties guidance for authors, it should be italicized; casual usage of this reserved likelihood term should be avoided. (Katharine Mach, IPCC WGII TSU)	Insufficient space to discuss mechanisms.
124	54515	23	4	35	4	36	As in the previous sentence, further detail is needed here. How will climate change decrease surface water quality? Also, section 23.6.3 should be referenced. (Michael Mastrandrea, IPCC WGII TSU)	Insufficient space to discuss mechanisms.
125	54516	23	4	36	4	37	Section 23.6.2 should be referenced, and please ensure the statement here is consistent with the discussion in that section. (Michael Mastrandrea, IPCC WGII TSU)	This has been addressed
126	36458	23	4	39	0	0	The 2nd sentence is unclear. Is this only comparing biodiversity in Natura 2000 to other protected areas or to the wider countryside? If the former then it needs to be more specific or it makes no sense as to why this might be the case. It should also be clarified how this compares to the wider countryside where other pressures are often less than in PAs. (Paula Harrison, University of Oxford)	Sentence has been reworded
127	37042	23	4	39	4	40	Please avoid the use of a Europe-proprietary conservation area network name in this summary ("Natura 2000") as this is likely not known to the broad readership. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	We disagree. It is well known policy in Europe.
128	53478	23	4	39	4	51	Please ensure consistency with chapter 4. (Kristie L. Ebi, IPCC WGII TSU)	We have tried to ensure consistency with chapter 4.
129	54519	23	4	39	4	51	Here is another example where the chapter text includes more specific and quantitative information from which to construct findings. Please consider ways to synthesize this information for the Executive Summary that communicates that detail. (Michael Mastrandrea, IPCC WGII TSU)	Text has been revised, where information available.
130	51347	23	4	40	4	51	For these statements as appropriate, the author team should consider providing further specifics regarding the projections--what differences in outcomes are expected for differing climate/socio-economic scenarios, over what timescales? (Katharine Mach, IPCC WGII TSU)	Insufficient space to discuss projections.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
131	54520	23	4	53	5	2	Please reference section 23.5.4 with this finding. (Michael Mastrandrea, IPCC WGII TSU)	Done
132	49862	23	5	4	5	5	This doesn't read well. Does it refer to the distribution of per capita wealth across the continent? (Timothy Carter, Finnish Environment Institute)	This paragraph has been revised.
133	51348	23	5	4	5	7	For these statements as appropriate, the author team should consider providing further specifics regarding the projections--what differences in outcomes are expected for differing climate/socio-economic scenarios, over what timescales? (Katharine Mach, IPCC WGII TSU)	Insufficient space to discuss projections.
134	51349	23	5	7	5	7	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. If the usage is casual, a word such as "expected" could be used instead. (Katharine Mach, IPCC WGII TSU)	Text has been revised.
135	54521	23	5	11	5	16	Please provide line of sight for this finding. (Michael Mastrandrea, IPCC WGII TSU)	Text has been revised to include refs to main text.
136	40587	23	5	14	5	14	. Are energy and water intensive. (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	Agreed.
137	43347	23	5	21	5	22	I do not believe it is possible to review the scientific evidence on observed impacts of *anthropogenic* climate change only. We observe the impacts from total climate change (and changes in other factors), and it is the task of WG 1 to assess which fraction of the observed change in several climate variables in a particular region can be attributed to anthropogenic causes (GHG emissions, land-use change, etc.,) (Hans-Martin Füssel, European Environment Agency)	Agreed. Will clarify the text.
138	36460	23	5	29	0	0	Are these sub-regions supposed to be used consistently throughout the chapter or in addition to political boundaries as page 3, line 33 refers to Scandinavia? (Paula Harrison, University of Oxford)	Yes, sub-regions used throughout chapter. Political boundaries only used in sense of reporting specific studies.
139	44573	23	5	29	0	0	comma between Southern Northern missing (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	OK
140	42276	23	5	29	5	29	northern, southern (Luhui Yan, Tanzuji)	Text on sub-regions has been more consistent.
141	38393	23	5	29	5	31	I'm not sure that these sub-regions are particularly widely used, so perhaps need a bit more comment on their suitability. Particularly in the context of Section 21.2 discussion on defining regions. Perhaps some caveats are needed - e.g., with respect to averaging climate change projections over the disparate Alpine regions (as is done for Table 23-1 for example). (Claire Goodness, University of East Anglia)	We do not feel we need to use text to justify the use of the sub-regions, as any division would have some problems.
142	53994	23	5	29	5	31	An accompanying table that describes characteristics of climate zones for each sub-region may be useful. (Yuka Estrada, IPCC WGII TSU)	We do not have space to include this
143	53479	23	5	31	5	31	And the sub-regions do not represent socioeconomic vulnerability. (Kristie L. Ebi, IPCC WGII TSU)	Agreed. The regions are defined by climate factors only.
144	36461	23	5	39	0	0	The choice for this division of key policy areas is not obvious. Is it based on a European policy framework? It might have been more useful to base the structure on the policy areas listed in the EC White Paper on "Adapting to Climate Change: Towards a European Framework for Action". Production systems and physical infrastructure and health and social policies overlap, but the others are less consistent, particularly where coasts fit within this division. Or to use those policy sector divisions on Climate-Adapt (the EU platform on climate change adaptation). I realise this gives weight to the EC part of Europe, but it would make the results easier for the Commission to use and incorporate/associate with Climate-Adapt (Paula Harrison, University of Oxford)	Disagree. The sections were agreed in discussions with the chapter team.
145	53480	23	5	51	5	51	These could be listed in supplementary material. (Kristie L. Ebi, IPCC WGII TSU)	Agreed. Lists of countries in regional formulation is intended to be added as supplementary material.
146	51350	23	6	6	0	0	Section 23.1.2. As appropriate, the author team should consider providing background citations as references for the statements in this section. (Katharine Mach, IPCC WGII TSU)	Agreed. Will include some references but this paragraph cannot be comprehensive.
147	53481	23	6	8	6	14	References are needed. (Kristie L. Ebi, IPCC WGII TSU)	Agreed. Will include some references but this paragraph cannot be comprehensive.
148	51351	23	6	13	6	13	"unlikely" -- If this term is being used per the uncertainties guidance for authors, it should be italicized. Casual usage of this reserved likelihood term should be avoided. (Katharine Mach, IPCC WGII TSU)	Agreed.
149	36462	23	6	19	6	20	Update as the platform is now known as Climate-Adapt (http://climate-adapt.eea.europa.eu/) (Paula Harrison, University of Oxford)	This is now mentioned.
150	43348	23	6	19	6	20	Please replace by the following sentence "The European Union has launched the European Climate Adaptation Platform (Climate-ADAPT, http://climate-adapt.eea.europa.eu/), which presents information relevant for the development of adaptation strategies, including links to research and knowledge projects and to already implemented adaptation measures across Europe. (Hans-Martin Füssel, European Environment Agency)	Climate-Adapt is now mentioned.
151	53482	23	6	21	6	22	Please check this is covered in chapter 15. (Kristie L. Ebi, IPCC WGII TSU)	Chapter 15 is about institutions and governance for adaptation.
152	51352	23	6	25	0	0	Section 23.1.3. It would be clearest to include "IPCC" in the title for this section to indicate the scope of previous assessments considered here. Additionally, calibrated uncertainty language cited from previous reports (such as the levels of confidence on lines 29, 31, 32) should be italicized. (Katharine Mach, IPCC WGII TSU)	This will be done in next draft.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
153	36465	23	7	3	0	0	Section 23.2.1: This section does not clearly differentiate between trend projections and scenario studies. For example the statement on line 35-36 makes the reader assume that all scenarios have shown that forest areas expand in Europe, but the reference is only from one study. The consideration of the many other socio-economic scenario studies in Europe is only covered by a single sentence on line 52 and needs to be expanded as the uncertainty from projections of different socio-economic variables are as important, and in many impacts, more important than climate changes (it seems biased to only present scenarios from a single study and not represent the variability/uncertainty between different studies). An FP7 project known as CLIMSAVE has created new socio-economic scenarios for Europe using a participatory approach with European stakeholders. This work has not been published in a journal yet, but the scenarios are described in an online report (see http://www.climsave.eu/climsave/doc/Report_on_the_second_European_workshop.pdf). It might be clearer to sub-divide this section into "Observed" and "Projected" sub-sections as has been done for climate. (Paula Harrison, University of Oxford)	It was not possible to split the non-climate trends section into 'observed trends' and 'future projections/scenarios'. Reference will be given to the Climsave scenarios as grey literature. The statement about forest area changes comes from 2 studies, and the second study will be referenced (Spangenberg).
154	51353	23	7	5	7	12	It would be preferable to provide citations supporting statements made in this paragraph. (Katharine Mach, IPCC WGII TSU)	References have been added
155	53483	23	7	5	7	12	References are needed. (Kristie L. Ebi, IPCC WGII TSU)	References have been added
156	36463	23	7	9	7	12	Really! I find it hard to believe that economic projections for countries such as Greece, Portugal, Italy and Spain haven't changed since the financial crisis and AR4. Can this be justified with a citation or is it just because the datasets have not been updated very recently? (Paula Harrison, University of Oxford)	There is no published material in support of this. We refer to the economic projections used for emissions and climate impact modelling.
157	45316	23	7	13	7	15	The two datasets listed (HadCRUT3 and CRUTEM3) are monthly in resolution and therefore do not represent the daily timescales required to examine changes in hot days and other extremes indices, which is what the sentence refers to. (John Caesar, Met Office Hadley Centre)	This point refers to page 8 and not page 7
158	43837	23	7	14	7	36	There are many more recent references on projected changes in land use in Europe e.g. Verburg, P., D. van Berkel, et al. (2010). "Trajectories of land use change in Europe: a model-based exploration of rural futures." <i>Landscape Ecology</i> 25(2): 217-232. Letourneau, A., P. H. Verburg, et al. (2012). "A land-use systems approach to represent land-use dynamics at continental and global scales." <i>Environmental Modelling & Software</i> 33(0): 61-79. Haines-Young, R., M. Potschin, et al. (2012). "Indicators of ecosystem service potential at European scales: Mapping marginal changes and trade-offs." <i>Ecological Indicators</i> 21(0): 39-53. (Pam Berry, Oxford)	The section will be updated with these references
159	36464	23	7	15	7	18	This sentence can be supported by the reference: Harrison et al. (2010) Identifying and prioritising services in terrestrial and freshwater ecosystems. <i>Biodiversity and Conservation</i> , 19: 2791-2821 (see pages 2805-2806). (Paula Harrison, University of Oxford)	This section has been revised.
160	40281	23	7	16	7	18	Add "reduction in biodiversity" to the list (John Sweeney, National University of Ireland Maynooth)	We include reference to scenarios of changes in biodiversity.
161	51354	23	7	22	7	22	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Text has been revised.
162	41536	23	7	31	7	31	Please, include the abandonment of agriculture as one of the causes of the forests growing. For instance, this is the case of some parts of Mediterranean Region (Maria-Carmen Llasat, University of Barcelona)	Text has been revised.
163	51355	23	7	32	7	32	"very likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Text has been revised.
164	35837	23	7	35	7	36	scenarios may suggest expansion of forests, but it is already happening, at least in mountains (see 'Europe's ecological backbone: recognising the true value of our mountains': see http://www.eea.europa.eu/publications/europes-ecological-backbone (Martin Price, University of the Highlands and Islands)	A comment forest expansion has been added to the current trends section.
165	53484	23	7	35	7	36	What role do biofuels have in this projection? The emission scenarios underlying the RCPs, published in 2011, have projections on land use change that could be referenced. (Kristie L. Ebi, IPCC WGII TSU)	We did not include discussion of bioenergy trends and projections in this section, but the issue is addressed later in the text.
166	41537	23	7	39	7	39	Due to the improvement of forest fires prevention and management there are no agreement on the increase of forest fires in Europe. Then, if you prefer to maintain this statement, it would be better to indicate to which region you refer. Please, read my comments to page 23 lines 7-13. (Maria-Carmen Llasat, University of Barcelona)	The text on wild fires has been extensively revised-
167	35838	23	7	42	0	0	what does 'Europe has relatively moderate urban sprawl levels' mean? What criteria? (Martin Price, University of the Highlands and Islands)	We dont think this needs qualification.
168	41538	23	7	42	7	45	It would be interesting to add a comment about the important role that urban development plays in natural risks and disasters, particularly in the case of floods, coastal floods and flash floods (Llasat, 2009) (Lumbroso and Vinet, 2011). This problem is particularly important in European Mediterranean Region, where the population has moved to the coast (there are some regions where more than 70% of population lives in the coast), where the specific geographic and climate features made flash floods and wind storms more frequent than inland. Llasat, M.C., 2009. Chapter 18: Storms and floods. In <i>The Physical Geography of the Mediterranean basin</i> . Edited by Jamie Woodward. Published by Oxford University Press, ISBN: 978-0-19-926803-0, pp. 504-531 Lumbroso, D.M. and F. Vinet, 2011. A comparison of the causes, effects and aftermaths of the coastal flooding of England in 1953 and France in 2010. <i>Nat. Hazards Earth Syst. Sci.</i> , 11, 2321-2333. doi:10.5194/nhess-11-2321-2011 (Maria-Carmen Llasat, University of Barcelona)	There is limited literature on this as a determinant of future flood risk.
169	51356	23	7	45	7	45	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Sentence has been reworded

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
170	41539	23	7	49	7	49	Other important environmental trend includes declines in water quantity to have enough resources to supply new urban and peri-urban areas (where water consumption are usually greater). (Maria-Carmen Llasat, University of Barcelona)	Agriculture consumes more water than domestic consumption.
171	36466	23	7	51	0	0	It should be noted that the SSPs are global and rely on expert opinions rather than on a broad stakeholder involvement. In particular, they will need to be refined and enriched for the European region with stakeholders. (Paula Harrison, University of Oxford)	This is no scope to critique the various scenarios discussed in the chapter.
172	36279	23	8	1	10	20	I was surprised to see nothing on past and future storm surges and waves, since, later on in this chapter, coast flooding is discussed. Thus I would recommend to add some elements on that. As starting references, I suggest : Charles et al (2012a,b) and Wang et al (2008), but there should be other references much more worth to cite. Reference : Charles E., Idier D., Thiébot J., Le Cozannet G., Pedreros R., Arduin F., Planton S. (2012a) Wave climate variability and trends in the Bay of Biscay from 1958 to 2001, Journal of Climate, 25, 2020-2035. Charles E., Idier D., Delecluse P., Déqué M., Le Cozannet G. (2012b) Climate change impact on waves in the Bay of Biscay, France. Ocean Dynamics, DOI 10.1007/s10236-012-0534-8. Wang S., McGrath R., Hanafin J., Lynch P., Semmler T. and Nolan P. (2008) The impact of climate change on storm surges over Irish waters. Ocean Modelling 25: 83–94. (Déborah Idier, BRGM)	Text on storm surge has been added in SOD
173	53485	23	8	3	10	20	Please ensure consistency with WGI. (Kristie L. Ebi, IPCC WGII TSU)	done.
174	39370	23	8	7	8	8	10 years of temperature trends over Europe not useful index, it is far too short a period. What is its significance compared to internal variability? What was global temperatures doing at the same time? (Gareth S Jones, Met Office)	these lines will be rewritten in SOD
175	44575	23	8	13	0	0	even being not on a climate time scale, we had a couple of cold episodes in northern Europe (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	Cold extremes will be mentioned in the SOD
176	41464	23	8	14	8	14	New reference which shows climate indices result in Turkey could be added here. (Sensoy et al, 2008) Sensoy, S., Demircan, M., Alan, I., 2008, Trends in Turkey climate extreme indices from 1971 to 2004, BALWOIS Conference on Water Observation and Information System. Url: http://balwois.com/balwois/administration/full_paper/ffp-1000.pdf (SERHAT SENSOY, TURKISH STATE METEOROLOGICAL SERVICE)	Yes, but due to the space only the main features can be described
177	45315	23	8	14	8	15	"..based on Climate Research Unit (CRU) gridded datasets HadCrut3 (land and ocean) and CruTemp3 (land only)". The land-only dataset is called CRUTEM3. HadCRUT3 is a collaboration between CRU and the Met Office Hadley Centre. (John Caesar, Met Office Hadley Centre)	Will be corrected in the SOD
178	35839	23	8	17	8	18	meaning? (Martin Price, University of the Highlands and Islands)	It is an illustration of the scale of the phenomenon
179	40284	23	8	19	8	19	Some comment on cold extremes would also be appropriate, perhaps combined with attribution for the recent cold European winters using Peterson, Thomas C., Peter A. Stott, Stephanie Herring, 2012: Explaining Extreme Events of 2011 from a Climate Perspective. Bull. Amer. Meteor. Soc., 93, 1041–1067. (John Sweeney, National University of Ireland Maynooth)	Cold extremes are mentioned in the SOD
180	41540	23	8	20	8	21	Although there is not a common agreement on precipitation trends in European Mediterranean Region, negative winter trends in precipitation have been found in Central Mediterranean meanwhile for the Western Mediterranean, the most significant negative trends are concentrated on spring (Altava-Ortiz et al, 2010). Altava-Ortiz, V., M.C. Llasat, E. Ferrari, A. Atencia and B. Sirangelo, 2010. Int. J. Climatol., Published online in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/joc.2204 (Maria-Carmen Llasat, University of Barcelona)	This is coherent with what is written in the FOD, references not added because of insufficient space
181	40679	23	8	20	8	26	During the second part of the 20th century, the latitudinal boundary of trend sign in annual precipitation crosses France, with an increase in the North of the country and a decrease in the South (Vidal et al., 2010). Vidal, J.-P., Martin, E., Franchistéguy, L., Baillon, M. & Soubeyrou, J.-M. (2010) A 50-year high-resolution atmospheric reanalysis over France with the Safran system. International Journal of Climatology, 30(11), 1627-1644. doi : 10.1002/joc.2003 (Jean-Philippe Vidal, Irstea)	This is coherent with what is written in the FOD, references not added because of insufficient space
182	40233	23	8	21	8	21	Please add Cohen et al. (submitted) studying the evolution of rainfall in Andalusia during the 1955-2009 period, show a rupture in 1979, with a 18% diminution afterwards. Cohen, M., Ronchail, J., Alonso-Roldan M., Morcel, C., Angles, S. and Labat, D.: Adaptability of Mediterranean agro systems to climate change. The example of the Sierra Mágina olive growing region (Andalusia, Spain) Past and present. Submitted to Weather, Climate and Society, 2012. (Josyane Ronchail, LOCEAN - Laboratory of Oceanography and Climate)	This is coherent with what is written in the FOD, references not added because of insufficient space
183	40282	23	8	26	8	26	Consider adding: "and quasi cyclical changes in windspeeds associated with the North Atlantic Oscillation". (John Sweeney, National	"and high climate variability will be added
184	39248	23	8	28	8	32	suggest to complement the average rate of SLR in 20th century by the enhanced rate as measured by satellites (WGI-13; 13.3.2) (Thomas Voigt, Umweltbundesamt / Federal Environment Agency)	trends from 1993 will be added (satellite ERA)
185	53486	23	8	31	8	31	Some readers may not be familiar with the term isostasy. (Kristie L. Ebi, IPCC WGII TSU)	reference to isostasy will be suppressed and "part of Scandinavia" will be added in SOD
186	35840	23	8	31	8	32	not entirely clear: isostasy is not only in Scandinavia; the point is that the land is rising. (Martin Price, University of the Highlands and Islands)	reference to isostasy will be suppressed and "part of Scandinavia" will be added in SOD
187	41465	23	8	32	8	32	Could be added here "However, how much sea level decreasing in Scandinavia caused by tectonic is uncertain." (SERHAT SENSOY, TURKISH STATE METEOROLOGICAL SERVICE)	reference to isostasy will be suppressed and "part of Scandinavia" will be added in SOD
188	49209	23	8	32	8	32	Sea level is decreasing only in a part of Scandinavia, mostly in the northern Baltic sea. Suggest therefor to add "in a part of Scandinavia" (Oyvind Christophersen, Climate and Pollution Agency)	reference to isostasy will be suppressed and "part of Scandinavia" will be added in SOD

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
189	44580	23	8	35	10	20	projected climate change ... even with the material from the CORDEX-experiment missing this part is needs improvement. Currently only one scenario is used. Please include at least 3 rcp-scenarios. What about specific problems for modelling the European region – subregions? Will the CORDEX-experiment be different from an ensemble of local opportunities (European GCMs downscaled with European RCMs) ? Where do the models differ more, where less? (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	This part of the chapter includes state-of-the art information about projected climate change. It does not refer to a single scenario, but takes into account what is published. The figures 23.2-4 and the table use 2 scenarios SRES A1B and RCP4.5, as the best information available.
190	44582	23	8	35	10	20	as written in chapter 21 page 4 line 22 to 26 most regional studies are still based on SRES scenarios. A comparison of the SRES and RCP based scenario run results is urgently needed! (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	Agreed, but this intercomparison is not be possible due to the lack of regionalised RCPs.
191	35842	23	8	37	9	17	Key point in section 23.2.2.2 is the change from snow to rain, critical particularly in mountain and northern (sub/arctic) regions, with many impacts (tourism – not only snow for skiing but also 'black Christmas in the (sub)arctic, more rapid runoff (and possibly increased flooding) as water in precipitation is not stored. (Martin Price, University of the Highlands and Islands)	Change from snow to rain has been made.
192	49863	23	8	42	8	43	It might be worth pointing out some of the more popular datasets used in IAV assessments in Europe, which frequently differ from the most recent projections (e.g. from CMIP5 or even ENSEMBLES). For example, numerous studies of species distributions have used the observed and scenario gridded datasets compiled for the FP5 ATEAM project, and later applied in modified form in the FP6 ALARM project. This was published by the Tyndall Centre as: Mitchell, T.D., Carter, T.R., Jones, P.D., Hulme, M. and New, M. 2004. A comprehensive set of high-resolution grids of monthly climate for Europe and the globe: the observed record (1901-2000) and 16 scenarios (2001-2100). Tyndall Centre Working Paper 55, Tyndall Centre for Climate Change Research, University of East Anglia, Norwich, UK, 30 pp. and is heavily cited. More recently, the ALARM climate scenarios have been made available online and published as: Fronzek, S., Carter, T.R. and Jylhä, K. 2012. Representing two centuries of past and future climate for assessing risks to biodiversity in Europe. Global Ecology and Biogeography 21: 19-35. There is a special issue devoted to these and other related scenarios, including an editorial: Settele, J., Carter, T.R., Kühn, I., Spangenberg, J.H. and Sykes, M.T. 2012. Editorial: Scenarios as a tool for large-scale ecological research: experiences and legacy of the ALARM project. Global Ecology and Biogeography 21: 1-4, a detailed paper on scenarios: Spangenberg, J.H., Bondeau, A., Carter, T.R., Fronzek, S., Jaeger, J., Jylhä, K., Kühn, I., Omann, I., Paul, A., Reginster, I., Rounsevell, M., Schweiger, O., Stocker, A., Sykes, M.T. and Settele, J. 2012. Scenarios for investigating risks to biodiversity. Global Ecology and Biogeography 21: 5-18. as well as some applications of the scenarios in various papers referenced in Settele et al. (e.g. Schweiger, O., Heikkinen, R.K., Harpe, A., Hickler, T., Klotz, S., Kudrna, O., Kühn, I., Pöyry, J. & Settele, J. 2012. Increasing range mismatching of interacting species under global change is related to their ecological characteristics. Global Ecology and Biogeography, 21, 88–99; Hickler, T., Vohland, K., Feehan, J., Miller, P.A., Smith, B., Costa, L., Giesecke, T., Fronzek, S., Carter, T.R., Cramer, W., Kühn, I. and Sykes, M.T. 2012. Projecting the future distribution of European potential natural vegetation zones with a generalized, tree species-based dynamic vegetation model, Global Ecology and Biogeography 21: 50-63.) (Timothy Carter, Finnish Environment Institute)	Text has been changed accordingly. References added.
193	38798	23	8	48	0	50	In my knowledge a opposite behaviour in warmings will occurs between northern and suthern europe (Ensemble model). The warming was mor intense in winther in northern areas, whereas was more intense in summer in summer and secundarely in spring. I suggest to revise these statements (Ricardo Anadon, University of Oviedo)	Text has been revised
194	49210	23	8	48	8	48	The statement about strongest warming in southern europe is In conflict with table 23.1 showing strongest warming in northern europe. (Oyvind Christophersen, Climate and Pollution Agency)	Text has been revised
195	35841	23	8	52	0	0	not clear (Martin Price, University of the Highlands and Islands)	Text has been revised
196	41541	23	8	52	8	54	The most recent and complete ensembles of global and regional climate simulations generally agree on a future drying precipitation in the southern Europe (Giorgi and Lionello, 2008). Giorgi, F., and P. Lionello (2008), Climate change projections for the Mediterranean region, Global Planet. Change, 63(2–3), 90–104, doi:10.1016/ j.gloplacha.2007.09.005. (Maria-Carmen Llasat, University of Barcelona)	The remark is coherent with the current text, reference added
197	40283	23	9	4	9	4	Spatial uncertainty is huge in this area and the definition of "trends" is itself fraught. It would be safer to say "mean wind speed trends are uncertain due to ..." (John Sweeney, National University of Ireland Maynooth)	Text on wind has been revised.
198	51357	23	9	12	9	13	"very likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Text has been made consistent re italics.
199	48133	23	9	12	9	17	The SLR estimates need to be presented in the context of AR5 WGI: please add a comparison of the global SLR estimates from Katsman 2011 to the AR5 estimates, in a way that clarifies were there are differences (between AR5 and that specific study, and/or between regional and global scales). (Philippe Marbaix, Université catholique de Louvain)	The SLR text will refer to WG1
200	35843	23	9	22	0	0	Not all of Europe is mid-latitude (Martin Price, University of the Highlands and Islands)	reference to mid latitude removed.
201	38394	23	9	22	10	20	Ideally, it would be preferable to use the same number of model runs for all indices (rather than 9 and 20) - particularly as the number of models showing agreement is indicated. (Claire Goodess, University of East Anglia)	This part has been revised SOD - There are only 9 models which have data of Tmax therefore the different number of models. New figures now include RCP scenario.
202	38395	23	9	22	10	20	I think it might be preferable to use a percentile-based warm spell/heat wave definition rather than a fixed threshold above the mean. As used preferentially in SREX Chapter 3. I think the choice of index is one reason why there is apparently no change over most of the UK or other parts of Northern Europe in Fig 23.2. Where more than 66% of models agree, could consider using likelihood language. Once CMIP5 CORDEX data are available, it would be informative to check for consistency (or not) with SREX European assessment (Table 3.3). (Claire Goodess, University of East Anglia)	Our index is related to WMO index and e.g. used in Orlowsky et al 2011. We will compare th pattern of different index definitions again. It will be checked with SREX European assessment Table 3.3 .

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
203	40285	23	9	38	9	38	Recent European extremes could also be mentioned here in the attribution sentence. (John Sweeney, National University of Ireland Maynooth)	Recent European extremes added as a similar study on D&A has been done
204	35844	23	9	41	0	0	'without summer' = except for summer? (Martin Price, University of the Highlands and Islands)	corrected
205	44576	23	9	41	0	0	'...Northern ...' northern of what? (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	Northern Europe (it comes from the definition of the regions)
206	44577	23	9	48	0	0	what is the '... the normal daily maximum temperature...'? (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	Text revised.
207	40286	23	10	11	3	0	Watwer resource management is also important here and receives little mention relative to extremes. It is important to confirm that studies show mean levels change in sympathy with precipitation changes, though hydrological model uncertainty also requires to be taken into consideration e.g. Bastola et al (2011) Advances in Water Resources 34, 562–576. (John Sweeney, National University of Ireland Maynooth)	The comment appears misplaced
208	35846	23	10	16	10	20	P11, line 22 and p10 lines 16-20 do not appear consistent. (Martin Price, University of the Highlands and Islands)	consistency has been checked
209	54498	23	10	16	10	20	Is there an explanation that can be provided for the difference in projections of changes in storm surge for the North Sea mentioned here? (Michael Mastrandrea, IPCC WGII TSU)	revised.
210	36467	23	10	23	0	0	Section 23.2.3: Impacts on hydrology of river basins and river flows doesn't seem to fit well here. It should be integrated into Section 23.4.3. Drought could be integrated into the previous section 23.2.2.3? (Paula Harrison, University of Oxford)	Disagree. This section refers to hydrological modelling only and does not belong in another section.
211	35271	23	10	23	10	23	Section heading - is this a description of river flow, floods and meteorological, soil moisture and hydrological droughts (groundwater and river flow droughts)? - Make section heading coherent with section text and also important to make sure that the text here is consistent with what is described in chapter 3 (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	Section heading will be changed to: Observed and Projected Trends in the Riverflow and Drought
212	53487	23	10	23	11	3	Please ensure consistency with WGI and with chapter 3. (Kristie L. Ebi, IPCC WGII TSU)	consistency checked
213	40680	23	10	25	8	31	The observed trends in river flows are highly dependent on the quality of measurements and on the period considered. Based on a benchmark network of French stations, Giuntoli et al. (2011) found statistically significant upward trends in low flow indices over the 1948-1988 period and downward trends over the 1968-2008 period. Meanwhile, relationships between low flow indices and large scale climate indices (NAO, AMO, weather types) remain stable over different periods. Giuntoli, I., Renard, B., Vidal, J.-P., Bard, A. (2012) Low flows in France and their relationships with large scale climate indices. Journal of Hydrology, submitted. (Jean-Philippe Vidal, Irstea)	This reference is now included; the increase in low flows probably also reflects reservoir development.
214	35272	23	10	25	10	31	The content needs to be consistent with what is described in Chapter 3. First describe changes in annual and seasonal discharge, then in peak flows and then in droughts. It is suggested to replace the first sentence with a description of the findings in a more recent study by Stahl et al. (2010) Ref. see chapter 3 Suggested new formulation: Observed trends in seasonal river discharge in Europe show regional differences (Stahl et al. 2010). (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	This reference is now included, with observed regional observed changes from Stahl et al. 2010
215	38843	23	10	25	10	39	The section until line 31 is rather inconsistent, just indicating examples. The section starting at line 32 starts with the proposed division in Northern, continental, atlantic and southern, but then returns to case studies. It is very important to identify regional trends (Atlantic or southern/Mediterranean) as might be expected (see maps) that there are differences or if data are lacking to indicate these, it should be mentioned. This is too aphaard. There should be a link with the remarks on page 8, line 20-25 and page 7 line 20-22 on agricultural water use. (Rob Jongman, Wageningen UR)	The text is improved to make distinction between studies on observed impacts (until line 31), and projections (after line 31)
216	35845	23	10	25	11	3	again the issue of snow-rain phase change not mentioned; also changes in runoff as glaciers melt. (Martin Price, University of the Highlands and Islands)	Changes in runoff from changing glacier mass-balances is now mentioned in first sentence, and reference is made to AR5 WG2 Chapter 3 on general processes.
217	35273	23	10	33	10	33	Reference should probably be to AR5 WG2 Chapter 3 rather than Chapter 4 (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	Agreed, this should be Chapter 3
218	35274	23	10	33	10	39	(1) Make clear what studies that describe observed changes (and state that the observed changes are influenced by the time period studied) and projected changes. (2) Projected changes in the occurrence of floods is very much influenced by the dominating flood generating processes, i.e. rain floods or snowmelt floods. See comment and reference Chapter 3, page 23, line 10 (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	This section has been revised.
219	40684	23	10	33	10	39	Based on the probabilistic UKCP09 climate projections, Christerson et al. (2012) found a decrease in mean annual flow over most of the UK between 1961-1990 and the 2020s, with negative median values of all monthly changes except in winter over the western and northern mountainous areas. Furthermore the results indicate a high likelihood of a significant decline in summer flows. Christerson, B. v., Vidal, J.-P. & Wade, S. D. (2012) Using UKCP09 probabilistic climate information for UK water resource planning. Journal of Hydrology, 424-425, 48-67. doi: 10.1016/j.jhydrol.2011.12.020 (Jean-Philippe Vidal, Irstea)	This publication is now included.
220	41542	23	10	33	10	39	I would add a sentence doing reference to the fact that changes in uses of soil will also affect the occurrence of extreme discharges, being difficult to separate the climate factors from those other non-climate factors (Maria-Carmen Llasat, University of Barcelona)	This is a principle problem of attribution of observed changes, and belongs in AR5 WG2 Chapter 3.
221	44134	23	10	33	10	39	More information for the major river basin Rhine would be interesting: Extreme events are also projected to increase in a hydrological simulation of the Rhine basin driven by a regional climate model with a high spatial resolution under the scenarios B1, A1B and A2 at the gauge Lobith until the mid and end of this century (Hurkmans et al. 2010). An event of the magnitude of the flooding in 1926 would then occur every 10-20 years under these scenarios in this century. Hurkmans, R.,W. Terink,R. Uijlenhoet,P. Torfs,D. Jacob & P. A. Troch (2010). "Changes in Streamflow Dynamics in the Rhine Basin under Three High-Resolution Regional Climate Scenarios." Journal of Climate 23(3): 679-699. (Anne Holsten, Potsdam Institute for Climate Impact Research)	Reference added.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
222	44579	23	10	33	10	39	are there no results from the German KLIWAS-project available? (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	We have checked but there are no refereed publications from Kliwas.
223	44135	23	10	35	10	35	The cited work of Dankers and Feyen (2008) involved major uncertainties, which should be stated, when referring to the results: Larger deviations of model simulations from observed annual maximal discharges were found for catchments dominated by snowmelt regime. When driven with different regional climate models, global climate models and emission scenarios, the hydrological model has shown rather high mean relative errors of the mean annual maximum discharge between 12-59%. Further, only few gaging data for validation were applied for the validation of the modeling results, which were concentrated in the central part of Europe. Especially in Eastern Europe, the uncertainty of the model is high. (Anne Holsten, Potsdam Institute for Climate Impact Research)	Of course the Europe wide approach by JRC has uncertainties, but we want to refer to this. We now also include the improved study by Rojas et al., (2012), that calibrate and validate their simulations for a much wider number of gauging stations. Rojas, R., Feyen, L., Bianchi, A., Dosio, A. (2012). Assessment of future flood hazard in Europe using a large ensemble of bias corrected regional climate simulations. Journal of Geophysical Research 117, D17109.
224	40287	23	10	37	10	37	(More recent work than Wang, Steele-Dunne Bastola, S. et al (2011), J. The sensitivity of fluvial flood risk in Irish catchments to the range of IPCC AR4 climate change scenarios. Science of the Total Environment, 409, 5403-5415. (John Sweeney, National University of Ireland Maynooth)	Ref added.
225	35275	23	10	41	10	48	Make clear what type of drought that is discussed - meteorological, soil moisture or hydrological droughts. (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	Agreed. Clarified.
226	40681	23	10	41	10	48	Drought trends are highly dependent on the drought indices considered. WMO recommended using the Standardized Precipitation Index (SPI, McKee et al., 1993) for assessing meteorological droughts (Hayes et al., 2011). Using the SPI at different time scales from an ensemble of GCM projections under the A2 emissions scenario, Vidal and Wade (2009) found a dramatic increase in the frequency of short-term extreme drought class for most of the UK. A decrease of long-term droughts is expected in Scotland, due to the projected increase in winter precipitation. The analysis for two catchment case studies also showed that changes under the B2 scenario are generally consistent with those of the A2 scenario, with a reduced magnitude in changes. Using various standardized indices at different time scales based on precipitation (SPI), soil moisture (Standardized Soil Wetness Index) and river flows (Standardized Flow Index), Vidal et al. (2010) and Soubeyroux et al. (2010) found upward trends in soil moisture droughts in France over the 1958-2008 without statistically significant trends in precipitation deficits. McKee, T., Doesken, N. & Kleist, J. (1993) The relationship of drought frequency and duration to time scales Preprints of the 8th Conference on Applied Climatology, 179-184 Hayes, M., Svoboda, M., Wall, N. & Widhalm, M. (2011) The Lincoln declaration on drought indices: Universal meteorological drought index recommended. Bulletin of the American Meteorological Society, 92(4), 485-488. doi : 10.1175/2010BAMS3103.1 Soubeyroux, J.-M., Vidal, J.-P., Baillon, M., Blanchard, M., Céron, J.-P., Franchistéguy, L., Régimbeau, F., Martin, E. & Vincendon, J.-C. (2010) Characterizing and forecasting droughts and low-flows in France with the Safran-Isba-Modcou hydrometeorological suite, Houille Blanche-Revue Internationale De L'Eau, (5), 30-39. doi: 10.1051/lhb/2010051 Vidal, J.-P. & Wade, S. D. (2009) A multimodel assessment of future climatological droughts in the United Kingdom. International Journal of Climatology, 29(14), 2056-2071. doi: 10.1002/joc.1843 Vidal, J.-P., Martin, E., Franchistéguy, L., Habets, F., Soubeyroux, J.-M., Blanchard, M. & Baillon, M. (2010) Multilevel and multiscale drought reanalysis over France with the Safran-Isba-Modcou hydrometeorological suite. Hydrology and Earth System Sciences, 14(3), 459-478. doi: 10.5194/hess-14-459-2010 (Jean-Philippe Vidal, Irstea)	SREX used CDD and SPI for meteorological droughts. This is discussed in the text.
227	40682	23	10	41	10	48	Vidal et al. (2012) found highly significant increases in various spatio-temporal characteristics (duration, area, magnitude) of meteorological and agricultural droughts over France throughout the 21st century. Results were consistent across an ensemble of experiments with varying emissions scenarios, GCMs and downscaling methods. Vidal, J.-P., Martin, E., Kitova, N., Najac, J. & Soubeyroux, J.-M. (2012) Evolution of spatio-temporal drought characteristics: validation, projections and effect of adaptation scenarios. Hydrology and Earth System Sciences, accepted. (Jean-Philippe Vidal, Irstea)	Ref not added, as meteorologically focussed paper.
228	41544	23	10	41	10	48	(Turco et al, 2011) shows an increase of around 2–3 days/decade in the length of dry spells, for the period 1951-2003, that affects the NE of Spain. It is the only ETCCDI index that shows a spatial coherent pattern of trend (significance of 95%) for an extended area. A recent study (Turco 2012) applying statistical downscaling over the ENSEMBLES regional simulations, suggests a high agreement in the increase in the dry spells (CDD index) in Spain, especially for the period 2071-2100, with most of the area agree on more than 25% of change. Turco, M. y M. C. Llasat, 2011. Trends in indices of daily precipitation extremes in Catalonia (NE Spain), 1951–2003. Nat. Hazards Earth Syst. Sci., 11, 3213–3226, doi:10.5194/nhess-11-3213-2011. Turco, M., 2012. "Climate change in a Mediterranean environment (Catalonia): precipitation extremes, regional scenarios, impacts on forest fires." 214 pp. PhD presented 25 July 2012. University of Barcelona, Spain (Maria-Carmen Llasat, University of Barcelona)	Ref not added, as meteorologically focussed paper.
229	51358	23	10	44	10	45	The phrase "medium confidence" as calibrated uncertainty language should be italicized. (Katharine Mach, IPCC WGII TSU)	Yes, revised
230	41543	23	10	46	10	46	About the uncertainty in drought estimation of future scenarios, a study (Vasiliades et al, 2009) in Central Thessaly, Greece, shows that the uncertainty introduced is quite large and is increasing as SPI timescale increases. Larger timescales of SPI, which, are used to monitor hydrological and water resources droughts, are more sensitive to climate change than smaller timescales, which, are used to monitor meteorological and agricultural droughts. Vasiliades, L., A. Loukas, and G. Patsonas, 2009. Evaluation of a statistical ownscaling procedure for the estimation of climate change impacts on droughts. Nat. Hazards Earth Syst. Sci., 9, 879-894. www.nat-hazards-earth-syst-sci.net/9/879/2009/ (Maria-Carmen Llasat, University of Barcelona)	We have limited space to discuss studies of drought outcomes per se.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
231	35276	23	10	48	10	48	See also comment and reference to Chapter 3, page 24, line 23. It is suggested to add the following: However, in a study by Wong et al. (2011) it is shown that even in regions where summer precipitation is expected to increase, soil moisture and hydrological droughts may become more severe due to increasing evapotranspiration. (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	We have limited space to discuss studies of drought outcomes per se.
232	51359	23	11	10	11	13	For these statements, the author team should consider providing cross-reference to other relevant sections in the chapter and providing supporting citations. Additionally, if the usage of "likely" on lines 12 or 15 is per the uncertainties guidance for authors, if the term should be italicized; casual usage of this reserved likelihood term should be avoided. (Katharine Mach, IPCC WGII TSU)	This is an introductory paragraph, the likelihood statements will be discarded
233	38845	23	11	10	11	17	reference? (Rob Jongman, Wageningen UR)	This is an introductory paragraph, the likelihood statements will be discarded
234	53488	23	11	10	11	17	References are needed. (Kristie L. Ebi, IPCC WGII TSU)	This is an introductory paragraph, the likelihood statements will be discarded
235	54497	23	11	11	11	13	It would be useful to specify the studies that support this statement here, or reference where these studies are assessed (even if it is in the subsequent sections, this will make the traceability more explicit). Please also ensure a clear communication of the basis for the likelihood assignment here (quantitative evidence on which to base a probabilistic statement). (Michael Mastrandrea, IPCC WGII TSU)	This is an introductory paragraph, the likelihood statements will be discarded
236	38396	23	11	12	0	0	Is this formal likelihood language? (Claire Goodess, University of East Anglia)	This is an introductory paragraph, the likelihood statements will be discarded
237	53489	23	11	12	11	12	Is this a confidence statement? (Kristie L. Ebi, IPCC WGII TSU)	This is an introductory paragraph, the likelihood statements will be discarded
238	41545	23	11	17	11	17	Besides all these factors, the reliability of estimates of relative changes in the development of potential flood damage depends also of the uncertainties stemming from flood damage modelling approaches (Bubeck et al, 2011) Bubeck, P., de Moel, H., Bouwer, L.M. and Aerts, J. C. J. H, 2011. How reliable are projections of future flood damage? Nat. Hazards Earth Syst. Sci., 11, 3293–3306. www.nat-hazards-earth-syst-sci.net/11/3293/2011/ doi:10.5194/nhess-11-3293-2011 (Maria-Carmen Llasat, University of Barcelona)	Agreed, ref added.
239	51360	23	11	22	11	22	The author team should consider indicating more specifically what is meant here by "risk"--presumably frequency of occurrence of flood events is intended, rather than risks associated with impacts for humans or ecosystems? (Katharine Mach, IPCC WGII TSU)	Agreed, probabilities are meant, text revised.
240	44172	23	11	24	11	25	The statment that climate change will increase the the frequency of severe storm surges should be complemented wit a qualitative statment of the possible magnitude. The reference "Debernard and Ryed" pointed that significant wave height increase in the North Sea to be of only 6 to 8 percent. Debernard, J.B. and L.P. Ryed, 2008: Future wind, wave and storm surge climate in the northern seas: A revisit. Tellus A, 60(3), 427-438 (Anne Holsten, Potsdam Institute for Climate Impact Research)	This ref was already included in section 23.2.2
241	45818	23	11	25	0	0	The contribution of Bosello et al. (2012) dealing with coastal impacts in Europe, using the DIVA model, could be considered. Bosello F, Nicholls RJ, Richards J, Roson R. and RSJ Tol (2012): Economic impacts of climate change in Europe: sea-level rise. Climatic Change (2012) 112:63–81 (Juan-Carlos Ciscar, European Commission)	ref added.
242	38105	23	11	25	11	25	add the following frase after "particularly": "for cities along north-western European, northern Italian and Romanian coasts (EEA, 2012)". (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	EEA not appropriate reference, and Italy and Romania are not mentioned as specifically vulnerable; rather northwest Europe
243	38106	23	11	25	11	25	add the following sentence: "North Sea storm surges will likely increase wave height predominantly affecting those coastal urban areas in north-western Europe, where major cities and economic centres are located (EEA et al., 2008)." (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	EEA not appropriate reference, and section 23.2.2 already covers primary studies extensively; will check section on regional specific information
244	51361	23	11	25	11	30	For these statements, the author team should consider specifying as appropriate relevant climate/socio-economic scenarios. Additionally, if being used as calibrated uncertainty language, "likely" on line 30 should be italicized; casual usage of this reserved likelihood term should be avoided. (Katharine Mach, IPCC WGII TSU)	Agreed, will insert the range of SRES scenarios used; will replace "likely" by "projected"
245	38107	23	11	28	11	28	Cancel the phrase "According to the same study" and add the correct citation: "(Ciscar et al., 2011)" (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	Disagree, Hinkel et al. is the primary source for the study underlying Ciscar et al. 2011
246	38846	23	11	29	11	32	In the paper of Hinkel et al the UK plays an important role. They have disappeared here. (Rob Jongman, Wageningen UR)	UK not mentioned.
247	39249	23	11	31	0	0	please delete one of the terms 'highest', because it is double used (Thomas Voigt, Umweltbundesamt / Federal Environment Agency)	Agreed, revised.
248	38108	23	11	32	11	32	add the following phrase: "However, implemented adaptation measures (dikes and beach replenishment) can reduce significantly the number of people potentially exposed to floods." (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	No, this effect of adaptation by improving coastal defence is already included on lines 27-28
249	38847	23	11	34	11	42	I miss important impacts in the Mediteranean (see for instance Lionello 2012, Di Sipi 2011) and the Danube delta (Rob Jongman, Wageningen UR)	Lionello et al. 2012 was already included in section 23.2.2; Di Sipi 2011 (Hydrogeology Journal) is not relevant here.
250	38848	23	11	45	12	10	I regionalisation is lacking, especially the need for data on continental and Mediterranean trend, especially where these are linked with mountain regions, where flash floods can occur (relation alpine-continental and alpine-mediterranean. Maybe this is a research agenda setting issue. (Rob Jongman, Wageningen UR)	Agreed, studies rather than data for Med region are often lacking; flash floods are covered in paragraph on page 12, lines 6-11.
251	35277	23	11	47	11	48	Make clear that flood risk is a product of the probability of flooding and flood damages. With this in mind there is no coherent observed trend in flood events in Europe even if it is correct that flood damages have increased. The word events should therefore be deleted. That will make the text in line 47 consistent with the text in line 48 (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	Will introduce risk concept at start of section; and change into "damaging flood events"; and make this in line with section 23.2.2

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
252	54499	23	11	47	11	49	The mention of flood events in this sentence is somewhat ambiguous, given that the increase is attributed to increasing exposure. The term flood events seems to imply changes in the physical events, which does not seem consistent here. (Michael Mastrandrea, IPCC WGII TSU)	Will change into "damaging flood events"
253	54500	23	11	49	11	51	Given the previous sentence, please clarify the mechanism by which climate change is projected to affect economic losses from river flooding (e.g., changes in extreme precipitation). (Michael Mastrandrea, IPCC WGII TSU)	Agreed, will include a line on precipitation
254	51362	23	11	49	11	54	For these statements, the author team may wish to provide further indication of the relevant drivers for the projected changes. (Katharine Mach, IPCC WGII TSU)	Agreed, will include a line on precipitation
255	36468	23	12	1	12	4	This sentence is unclear. The studies quantify the populations and property value at risk of flooding due to what if not climate change as implied by the second half of the sentence. (Paula Harrison, University of Oxford)	Will change to "changes in populations..."
256	41546	23	12	6	12	6	Besides Hoes, 2006 I would add the reference from (Lenderik and Van Meijgaard, 2008) Lenderink, G. and Van Meijgaard, E., 2008. Increase in hourly precipitation extremes beyond expectations from temperature changes. Nature Geoscience, 1, 511-514. www.nature.com/naturegeoscience (Maria-Carmen Llasat, University of Barcelona)	Thanks, will add this reference in Section 23.2.2 though, as related to meteo
257	38397	23	12	6	12	10	The focus of this paragraph is not very clear. Is it impacts of increased intense rainfall in general? Or specifically flash flooding? (Claire Goodess, University of East Anglia)	Both. Will adjust paragraph to make distinction
258	41547	23	12	6	12	11	I would substitute the expression "increasing exposure from..." by "increasing vulnerability and exposure from....". It would be interesting adding a specific reference to the important role played by flash floods in Mediterranean region. A sentence like the following could be added: "Mediterranean Europe is frequently affected by flash floods (Gaume et al, 2009), mainly in summer and early autumn; besides the factors previously considered, changes in land uses and inter-annual and intra-annual changes in population density are affecting considerably flash floods production and impact (Llasat et al, 2010a). Although no common and significant trend has been found for this region, damages have been increased considerably (Llasat et al, 2010b)." Gaume E., Bain, V., Bernardaza, P., Newinger, O., Barbuc, M., Bateman, A., Blaskovicova, L., Blöschl, G., Borga, M., Dumitrescu, A., Daliakopoulos, I., Garcia, J., Irimescu, A., Kohnova, S., Koutroulis, A., Marchi, L., Matreata, S., Medina, V., Preciso, E., Sempere-Torres, D., Stancalie, G., Szolgay, J., Tsanis, J., Velasco, D., and Viglione, A., 2009: A compilation of data on European flash floods, J. Hydrol., 367, 70–78. Llasat, M.C., Llasat-Botija, M., Rodríguez, A., Lindbergh, S., 2010a: Flash floods in Catalonia: a recurrent situation. Advances in Geosciences, 26, 105-111. Llasat, M.C., M. Llasat-Botija, M.A. Prat, F. Porcú, C Price, A. Mugnai, K. Lagouvardos, V.Kotroni, D. Katsanos, S. Michaelides, Y. Yair, K. Savvidou, K. Nicolaidis, 2010b. High-impact floods and flash floods in mediterranean countries: the flash preliminary database. Advances in Geosciences, 23, 1-9, 2010, (Ed. Copernicus GmbH, European Geosciences Union. Print: ISSN 1680-7340, Online: ISSN 1680-7359. (Maria-Carmen Llasat, University of Barcelona)	Refs not included.
259	35653	23	12	14	0	0	Suggest to add "avalanches" in the title. Various types of slope processes, mainly landslides and avalanches (snow, rock, clay and debris) pose together with floods the main geohazards in Europe. (Ketil Isaksen, Norwegian Meteorological Institute)	not needed. Avalanches are a type of mass movement.
260	35654	23	12	14	0	0	Consider to also refer to one or two major studies on trends in the frequency of snow avalanches, e.g. Eckert, N., Parent, E., Kies, R., and Baya, H.: A spatiotemporal 'modelling framework for assessing the fluctuations of avalanche occurrence resulting from climate change: application to 60 years of data in the northern French Alps, Climatic Change, 101(3–4), 515–553, 2010. (Ketil Isaksen, Norwegian Meteorological Institute)	Added.
261	35655	23	12	14	0	0	The number of large slope failures in some high-mountain regions such as the European Alps has increased during the past two to three decades. There is concern that recent climate change is driving this increase in slope failures, thus possibly further exacerbating the hazard in the future. See: Huggel C, Salzmann N, Allen S, Caplan-Auerbach J, Fischer L, Haeblerli W, Larsen C, Schneider D, Wessels R. 2010. Recent and future warm extreme events and high-mountain slope stability. Philosophical Transactions of the Royal Society A368: 2435–2459. (Ketil Isaksen, Norwegian Meteorological Institute)	added.
262	35656	23	12	14	0	0	An excellent state of the art on landslides and climate change is given by Huggel et al. 2012. Is climate change responsible for changing landslide activity in high mountains? Earth Surf. Process. Landforms 37, 77–91 (2012) (Ketil Isaksen, Norwegian Meteorological Institute)	Added.
263	39250	23	12	22	0	0	please delete one of the terms 'that', because it is double used (Thomas Voigt, Umweltbundesamt / Federal Environment Agency)	agreed
264	39251	23	12	22	0	0	please explain the meaning of the term 'temperature' as it is used here (Thomas Voigt, Umweltbundesamt / Federal Environment Agency)	Revised.
265	51363	23	12	22	12	22	The phrase "medium confidence" as calibrated uncertainty language should be italicized. (Katharine Mach, IPCC WGII TSU)	phrase removed.
266	35847	23	12	22	12	26	need to include references from other regions, eg from the Alps (Martin Price, University of the Highlands and Islands)	We have added a series of references, see also earlier review comments
267	53490	23	12	29	13	9	Please ensure consistency with chapter 9. (Kristie L. Ebi, IPCC WGII TSU)	Agreed.
268	35848	23	12	35	12	36	not all climates will be drier and hotter. (Martin Price, University of the Highlands and Islands)	Agreed. Will revise.
269	38849	23	12	37	12	40	Is this climate change indication or a property indication, changing from a former Yugoslavia country to a higher income EU country? (Rob Jongman, Wageningen UR)	Unclear comment.
270	51364	23	12	45	12	45	Given the description of evidence here, the author team may wish to consider presenting summary terms for evidence and agreement. (Katharine Mach, IPCC WGII TSU)	Agreed.
271	38850	23	12	48	12	52	I would expect here remarks on impacts on Scandinavian and Northern Russian housing as well as here soil subsidence would be more important (subsoil peat, permafrost). (Rob Jongman, Wageningen UR)	Agreed. But difficult to find references from Eastern Europe/Russia.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
272	44264	23	12	48	12	52	This paragraph does not really seem to fit here as it deals with soil subsidence. (Dominik Reusser, Potsdam Institute for Climate Impact Research)	Agreed. Have separate paragraph on subsidence.
273	51365	23	12	49	12	49	It would be helpful to further indicate the metric relevant to the described "level of damage." Additionally, if "likely" is being used as calibrated uncertainty language, it should be italicized; casual usage of this reserved likelihood term should be avoided. (Katharine Mach, IPCC WGII TSU)	Agreed. Revised
274	38398	23	12	50	12	51	What about effect of precipitation changes on subsidence? E.g., wetting/drying cycles and clay shrinkage. (Claire Goodess, University of East Anglia)	Agreed. Will include if supporting references are found.
275	35849	23	12	52	0	0	meaning not clear (Martin Price, University of the Highlands and Islands)	OK.
276	38399	23	12	52	0	0	Is the statement about lack of adaptation really necessary? Presumably this could said of many impacts. (Claire Goodess, University of East Anglia)	Agreed. Revised
277	51366	23	13	1	13	1	The phrase "limited evidence" as calibrated uncertainty language should be italicized. (Katharine Mach, IPCC WGII TSU)	Agreed. Revised
278	53491	23	13	12	18	8	Please ensure consistency with chapter 10. (Kristie L. Ebi, IPCC WGII TSU)	No major inconsistencies have been identified so far. A new check on this will be performed during the review of SOD.
279	35850	23	13	21	13	28	text should make clear that the first findings relate to a small part of the UK, and Larsen et al is from Alaska, not Europe. (Martin Price, University of the Highlands and Islands)	The first findings mentioned in FOD indeed refer to West Midlands (one of the largest conurbations in UK). In order to give a broader overview, the text has been revised accordingly (i.e. making a distinction between severe and total accidents) and simplified, and the references have been also enhanced in order to cover other regions as well. As for the sentence on the climate change impacts on road infrastructure, it was deleted since no peer-reviewed references on Europe have been found.
280	38400	23	13	25	0	0	The previous sentence related to a UK study. Now there is a mention of permafrost thawing - so what is the geographical focus now? Include a reference? (Claire Goodess, University of East Anglia)	Look at reply to comment No. 279.
281	38401	23	13	26	13	28	This final sentence is hard to follow and should be rephrased. (Claire Goodess, University of East Anglia)	Look at reply to comment No. 279.
282	51367	23	13	26	13	28	For this statement, the author team should consider indicating the relevant scenarios of climate/socio-economics, as well as the key drivers for the projected outcome. (Katharine Mach, IPCC WGII TSU)	Look at reply to comment No. 279.
283	51368	23	13	30	13	30	For this statement, the author team may wish to consider assigning calibrated uncertainty language to characterize further the state of knowledge. (Katharine Mach, IPCC WGII TSU)	Such a language is in fact being used in the Executive Summary (in the part which refers to rail - page 3, line 30).
284	38402	23	13	39	0	0	Clarify W5B-029/TR - or omit this detail. (Claire Goodess, University of East Anglia)	The whole sentence has been deleted as no peer-reviewed references or EU reports etc. were found on the impact of flooding on railways in Europe.
285	38851	23	13	41	13	14	The selection of navigable rivers is not very representative as there are many more navigable rivers as well as canals. Important are the British, French and German canal systems, and rivers such as Seine, Rhone, Garonne, Po, Tagus, Vistula, Oder Humber and Thames. The size of the rivers and canals and their position in climate zone should be the approach to calculate/describe impact. (Rob Jongman, Wageningen UR)	In order to take the comment into account, the first sentence of the paragraph has been revised in order to make no specific reference to the Rhine river. However, apart from Rhine, no other peer-reviewed references from 2007 to date were found and thus the next sentence remained practically unchanged. We would greatly appreciate the suggestion by the reviewer of any references (after 2006) on CC impacts on other important (in terms of freight/ passenger transport) European rivers.
286	51369	23	13	42	13	44	For this statement, the author team should consider specifying the relevant climate/socio-economic scenario. (Katharine Mach, IPCC WGII TSU)	The text has been revised in order to clarify the climate scenario examined (i.e. temperature increase by 1-2 oC by 2050)
287	35851	23	13	44	13	45	meaning not clear. (Martin Price, University of the Highlands and Islands)	The sentence has been deleted.
288	51370	23	13	46	13	46	It would be helpful to indicate more specifically the ways in which the summer of 2003 is a good proxy for future summers-- additionally, does this characterization also include consideration of socioeconomic factors? (Katharine Mach, IPCC WGII TSU)	According to Beniston (2004), the summer of 2003 resembled to the most extreme climate scenario. However, in order to simplify and shorten the text, this part of the sentence has been deleted.
289	51371	23	13	52	13	53	The author team may wish to consider if it would be preferable to use slightly more qualified wording as compared to "not an option." (Katharine Mach, IPCC WGII TSU)	The text has been revised in order to take this comment into account.
290	38403	23	14	6	0	0	Indirectly due to higher temperatures - actually due to ice melt. (Claire Goodess, University of East Anglia)	In order to simplify and shorten the text on long range ocean transport, this part of the sentence has been deleted.
291	38404	23	14	7	0	0	Can you give an example of the kind of non-climatic factors? (Claire Goodess, University of East Anglia)	In order to respond to this comment, examples of non-climatic factors (i.e. passage fees, bunker prices and cost of alternative sea routes) have been added to the text.
292	38405	23	14	11	0	0	It is a bit inconsistent throughout the chapter as to whether or not details of scenarios/models etc are given. (Claire Goodess, University of East Anglia)	The details of scenarios/models were included as a response to comments made during the review of ZOD. In order to make this part more consistent with the rest of the chapter regarding this point, details have been kept only in a very limited number of cases (e.g. when only one scenario was examined).

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
293	38406	23	14	16	0	0	Perhaps worth commenting that projections of thunderstorms and fog are not available. (Claire Goodess, University of East Anglia)	Although the comment is valid, unfortunately the addition suggested was not possible due to limitations regarding the overall size of the text.
294	38407	23	14	20	0	0	Section doesn't really consider distribution issues - e.g., power line transmission is less efficient at higher temperatures - also concerns about wind damage for overground cables - and permafrost melt for underground cables. (Claire Goodess, University of East Anglia)	The comment made is valid; however, no peer-reviewed references on the impacts of climate change on energy transmission were found during the elaboration of FOD. Since then, a quantitative peer-reviewed study on the impacts of climate change on electricity transmission faults in UK was published (i.e. McColl et al., 2012) and thus the text has been revised in order to include these findings. Due to restrictions regarding the overall size of the text, it has not been possible to add also the findings of Inderberg and Lochen (2012) on adaptation practices followed by grid companies in Norway and Sweden (e.g. extensive cable undergrounding, manuse of more robust materials, increased inspection and maintenance, safety switces, etc.).
295	40683	23	14	22	14	50	For the Ariège catchment in the French Pyrenees, Paiva et al. (2010) found a 20% decrease of hydropower production together with an increase in internnual variability between 1973-2004 and 2015-2045, based on projections from 11 GCMs under the A1B emissions scenario. Paiva, R. C. D., Collischonn, W., Schettini, E. B. C., Vidal, J.-P., Hendrickx, F. and Lopez, A. (2010) The Case Studies, in Modelling the Impact of Climate Change on Water Resources (eds F. Fung, A. Lopez and M. New), John Wiley & Sons, Ltd, Chichester, UK. doi: 10.1002/9781444324921.ch6 (Jean-Philippe Vidal, Irstea)	The reference suggested by the reviewer has been added to the text.
296	44266	23	14	24	14	24	To be added: (Barstad et al., 2012) found a weak reduction of 2 to 6% in wind power production over norther Europe in the period 2020-2049 compared to 1972-2001 but emphasize that the spread between model runs is quite large. Regional pockets of increased potential appear in vicinity to high terrain but these results are regarded as uncertain as a little shift in storm tracks will lead to very different mountain shadow effects and alter the picture completely. SOURCE: Barstad I., A. Sorteberg, and M. dos-Santos Mesquita, 2012: Present and future offshore wind power potential in northern Europe based on downscaled global climate runs with adjusted SST and sea ice cover. Renewable Energy (xxx), doi:10.1016/j.renene.2012.02.008. (Dominik Reusser, Potsdam Institute for Climate Impact Research)	The reference suggested by the reviewer has been added to the text.
297	44269	23	14	27	14	27	To be added as a REFERENCE: Nolan P., P. Lynch, R. McGrath, T. Semmler, and S. Wang, 2011: Simulating climate change and its effects on the wind energy resource of Ireland. WIND ENERGY. (Dominik Reusser, Potsdam Institute for Climate Impact Research)	The reference suggested by the reviewer has been added to the text.
298	51372	23	14	31	14	34	As possible, it may be helpful to specify broadly the range of climate/socio-economic scenarios for which this statement holds. (Katharine Mach, IPCC WGII TSU)	Since different scenarios (A2, B2, A1B, B1, B2) were examined by the authors mentioned, and in order not to further extend its length, those details have not been added to the text.
299	35278	23	14	36	14	36	Make new paragraph where the text about hydropower starts (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	A new paragraph has been made.
300	35279	23	14	36	14	50	See comment Chapter 3 p 25 47 - p 26 15. It is suggested to add the findings from Golombek et al. (2012) and Thorsteinsson and Björnsson (2011). The reference Thorsteinsson, T and Björnsson, H. (2011) should replace Bergström et al. (2007) or be added as the studies referred to in the latter were updated in the project (CES - Climate and Energy Systems - Risks, Potential and Adaptation) reported in Thorsteinsson and Björnsson (2011). Also note that the CES project cover climate change effects on renewables including wind and bio. One aspect worth mentioning related to hydro is that a lot of the expected increase in production potential caused by expected increases in precipitation will be lost because of increased flood overflow unless changes are made in the operation of the reservoirs. Also, the inflow to the reservoirs is expected to become more evenly distributed over the year, decreasing the need for reservoir storage. (Hege Hisdal, Norwegian Water Resources and Energy Directorate)	The 2 references suggested by the reviewer have been added to the text. As for the impacts mentioned in the second part of the comment, we would appreciate the suggestion by the reviewer of peer-reviewed references (from 2007 to date) on these issues. Changes needed in the operation of reservoirs fall under 'water management' which was already mentioned in the text regarding adaptation in hydropower.
301	35852	23	14	41	14	50	need to mention increased trend towards pump storage, at least in the Alps to my knowledge. (Martin Price, University of the Highlands and Islands)	The text has been revised in order to mention pump storage as suggested by the reviewer.
302	38852	23	14	47	14	50	This is incomplete, there are no references to the Portuguese and Spanish hydropower situation. Here droughts and reservoir problems are serious and should be included on the analysis of the Mediterranean. Comparing the regions (Mediterranean, Alpine, Continental, Atlantic and Boreal) could help understand where the problems will be most severe. (Rob Jongman, Wageningen UR)	A recent peer-reviewed reference (published after the elaboration of FOD) on the impacts of climate change on hydropower in Southern Europe has been added to the text in order to take into account this comment.
303	44268	23	15	6	15	6	To be added: (Van Vliet et al., 2012) found a summer average decrease in capacity of power plants of 6.3–19% in Europe depending on cooling system type and climate scenario for 2031–2060 compared to 1971–2000 which is mainly due to the combined impacts of lower summer river flows and higher river water temperatures. Probabilities of extreme (>90%) reductions in thermoelectric power production will on average increase by a factor of three. SOURCE: van Vliet, M.T.H., J.R. Yearsley, F. Ludwig, S. Vögele, D. P. Lettenmaier, and P. Kabat, 2012: Vulnerability of US and European electricity supply to climate change. NATURE CLIMATE CHANGE, ADVANCE ONLINE PUBLICATION. (Dominik Reusser, Potsdam Institute for Climate Impact Research)	The findings of he reference suggested by the reviwier have been added to the text.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
304	38408	23	15	10	0	0	Flooding is not only of concern to nuclear plants - but also for other energy related infrastructure. (Claire Goodess, University of East Anglia)	The comment made is correct, but this particular sentence was not meant to refer to nuclear plants only. Although the particular sentence has been deleted in order to shorten the text, the point made may be valid for other sentences of the paragraph. Thus, the first sentence of the paragraph has been revised and now refers to thermal power in general (and not only to nuclear power plants).
305	49211	23	15	14	15	14	Replace "positive" with "decrease" if the sentence means to say that energy use will decrease. This to avoid misunderstanding (Oyvind Christophersen, Climate and Pollution Agency)	The term has been changed as suggested by the reviewer.
306	43349	23	15	14	15	15	It is not clear whether the term "positive ... effect" refers to an "increase" in energy demand or to a beneficial impact, which would presumably be a decrease in energy demand. I suggest using the terms increase/decrease and/or beneficial/adverse rather than the ambivalent terms positive/negative. (The same comment applies to Table 23-4.) (Hans-Martin Füssel, European Environment Agency)	Look at reply to comment No. 305.
307	38853	23	15	14	15	38	Eskeland and Mideska have a good continent covering analysis, but in the further elaboration I miss a balanced analysis of the Mediterranean as references to Italy and the Iberian Peninsula are missing. Only Greece and Cyprus are mentioned, which makes this part anecdotic. (Rob Jongman, Wageningen UR)	In order to take this comment into account, the text has been revised in order to include the finding of a recent (i.e. after the elaboration of FOD) study on the impacts of climate change on the electricity generation cost of Spain, as well as of Finland and Germany (Pilli-Sihlova et al., 2012). We would appreciate the suggestion by the reviewer of any similar references (after 2006) on Italy and Portugal.
308	44271	23	15	19	15	19	To be added: (Hekkenberg et al., 2009) point out that although electricity demand in countries with moderate summer temperatures such as the Netherlands generally peaks in winter months and shows a minimum in summer months, historical trends for the period 1970 to 2007 show significant increases in temperature dependence of electricity demand in May, June, September, October and during the summer holidays which could be an indication for the development of an additional electricity peak in summer. SOURCE: Hekkenberg, M., R.M.J.Benders, H.C.Moll, and A.J.M.Schoot Uiterkamp, 2009: Indications for a changing electricity demand pattern: The temperature dependence of electricity demand in the Netherlands. Energy Policy, 37, 1542–1551. (Dominik Reusser, Potsdam Institute for Climate Impact Research)	The text has been revised in order to include the findings of the reference suggested by the reviewer.
309	44267	23	15	22	15	22	To be added: In the first analysis of the combined effect of climate change, future changes of the building stock, renovation measures and heating and cooling systems, (Olonscheck et al., 2011) studied the future energy demand for room conditioning of residential buildings and resulting greenhouse gas emissions in Germany until 2060. They show that the heating energy demand decrease of 57% - 81% compared to 2010 mainly depends on the number of renovated buildings and climate change scenarios and only slightly on demographic changes. The future cooling energy demand will remain low in the future unless the amount of air conditioners strongly increases. SOURCE: Olonscheck, M., A. Holsten, and J.P. Kropp, 2011: Heating and cooling energy demand and related emissions of the German residential building stock under climate change. Energy Policy, 39, 4795–4806. (Dominik Reusser, Potsdam Institute for Climate Impact Research)	The text has been revised in order to include the findings of the reference suggested by the reviewer.
310	35853	23	15	26	0	0	4000%? (Martin Price, University of the Highlands and Islands)	The expected total increase of cooling energy demand during 2000-2050 is indeed that large (4211%) for Russia, but one has to consider that Russia starts from a very low absolute number in 2000 (due to the combined effect of low income and penetration in 2000) and then faces a very rapid increase of these during the 1st half of the century. However, its total absolute number still remains low in 2050 compared to other regions (e.g. India, USA, rest of Asia). The text has been revised in order to clarify that there are very high percentage increases in 2000-2050 due to low initial penetration of cooling devices.
311	44265	23	15	27	15	27	To be added: Considering the effect of a 3.9°C temperature increase given in the SRES climate scenario A1FI (Collins et al., 2010) found that CO2 emissions from heating energy demand of the UK housing stock will still outweigh the cooling energy demand by the middle of the century, although the former will strongly decrease while the latter is likely to increase. Even with a most pessimistic assumption of cooling system uptake of 50%, total CO2 emissions of the UK residential building stock will decrease by 10% between 2050 and 1996 but this benefit likely vanishes little by little in the subsequent decades. SOURCE: Collins, L., S. Natarajan, and G. Levermore, 2010: Climate change and future energy consumption in UK housing stock. Building Serv. Eng. Res. Technol., 31(1), 75–90. (Dominik Reusser, Potsdam Institute for Climate Impact Research)	The study mentioned by the reviewer refers only to 4 cities in UK and not on the country as a whole, whereas all the other refs included in the text cover broad European regions or whole countries. Thus, its results are not really comparable with the rest refs and for this reason the reference suggested has not been added to the text.
312	35854	23	15	27	15	28	meaning not clear (Martin Price, University of the Highlands and Islands)	The text has been revised in order to clarify this point.
313	43350	23	15	27	15	28	It is not clear to which of the regions mentioned above this statement refers to, i.e. To which values the 74-118% range should be compared. (Hans-Martin Füssel, European Environment Agency)	Look at reply to comment No. 312.
314	51373	23	15	29	15	30	It would be preferable to specify the relevant climate/socioeconomic scenarios for which this projection was made. (Katharine Mach, IPCC WGII TSU)	The text has been revised in order to clarify this point.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
315	44270	23	15	35	15	35	To be added: While the cost of electricity use will increase in Spain due to an increase in the cooling energy demand that overcomes the decreased need for heating, costs will decrease in Central and North Europe (Finland, France, Germany) due to declines in the heating energy demand between 2008 and 2050 under the SRES emission scenarios A2,A1B,and B1 (Pilli-Sihvola et al., 2010). SOURCE: Pilli-Sihvola, K, P. Aatola, M. Ollikainen, and H. Tuomenvirta, 2010: Climate change and electricity consumption — Witnessing increasing or decreasing use and costs? Energy Policy, 38, 2409–2419. (Dominik Reusser, Potsdam Institute for Climate Impact Research)	The text has been revised in order to take this comment into account. The reference suggested has also been added to the text.
316	44733	23	15	53	0	0	Suggest to include the following sentence: "Moiseyev et al. (2011) apply a detailed global partial equilibrium model of forestry and forest industries to study the joint impacts on forestry, forest industries and wood bioenergy production of the IPCC climate change scenarios A1 and B2, under varying energy wood prices reflecting different carbon mitigation efforts and including trade. The study found that in a 20 years perspective there is very little difference between A1 and B2 regarding total harvest in the EU, whereas the EU use of wood biomass for bioenergy depends on the wood energy price and the wood import possibilities to the EU. " (The ref. is: Moiseyev, A.; Solberg, B.; Kallio, A. M. I.; Lindner, M. 2011: An economic analysis of the potential contribution of forest biomass to the EU RES target and its implications for the EU forest industries. Journal of Forest Economics;Volum 17(2):197-213.) (Birger Solberg, Norwegian University of Life Sciences)	The impacts of climate change on forestry and wood production are mentioned in section 23.4 and not in 23.3.
317	38409	23	16	3	0	0	How might quality and safety be affected? Can you give an example? (Claire Goodess, University of East Anglia)	The text has been revised in order to clarify this point (i.e. by favouring/ accelerating the growth of foodborne pathogens).
318	41768	23	16	7	17	7	section 23.3.6 - This entire section does not meet the review criteria of being comprehensive. The scope of this section is too narrow (only covering two themes - neither adequately or critically in some areas - while issues such as sea level rise and coastal tourism, environmental change in mountain/glaciers, forests, coasts are not discussed at all), is poorly structured, and what is provided could be rewritten much more concisely (including removing irrelevant material). Given that this region is a leading contributor to the literature for this sector and has much expertise, this draft is remarkably weak. Much more detailed comments could be provided, but overall the entire section needs to be redone by author(s) that know the literature. (Daniel Scott, University of Waterloo)	The comment, in the way it is expressed, is unproductive as it contains just general statements and is almost without any specific suggestions for modifications to be made. Especially the second part of the last sentence falls completely outside the scope of commenting within the IPCC review process. Regarding the (indirect) suggestion on including text on the environmental change in mountain/glaciers, forests and coasts, the section on tourism is not the right place for discussing these issues. As for sea level rise and coastal recreation, some text has not been added due to limitations regarding the overall size of the section.
319	41769	23	16	9	0	10	This sentence on 'new approaches' needs to be removed for multiple reasons. First, it does not provide any meaningful insight into the theme of this section. Second, there are many new approaches that have emerged, yet we are provided with a long list of publications from the same two authors. A blatant case of self citation?. (Daniel Scott, University of Waterloo)	The last sentence of this comment falls completely outside the scope of commenting within the IPCC review process. As for the rest part of the comment, the term 'new approaches' was not used in a general way, but referred specifically to the combination of meteorological and tourism related components as a tool to analyze the climatic tourism potential (the methodology introduced by Matzarakis and Endler does such a combination). Nevertheless, in order to reduce the overall size of the section, lines 9-14 have been deleted and some of the references included there have been moved to other relevant parts of the section.
320	41772	23	16	9	0	29	Beach and urban (sort of) tourism are specifically discussed in this section, however empirical work that documents the impact of higher temperatures on visitation to mountain resorts in Switzerland is not discussed. Why? See WIRE-Climate Change paper above for reference to this work as well. (Daniel Scott, University of Waterloo)	The section, as it was, did not discuss "a sort of urban tourism", but general tourist activities including urban tourism. The text has been revised in order to clarify this. Regarding the impact of higher temperatures on visitation to mountain resorts in Switzerland, the reference mentioned by the reviewer in the WIRE paper (probably the Behringer et al., 2000) is too old to include it in AR5. In the WIRE paper there is also another, more recent ref on this issue (namely (Unbenhaun et al., 2008)), but concerns a survey of 540 skiers only from Vienna and thus its results may not be representative for other tourists and regions. Finally, the potential opportunities that may arise for summer tourism in mountainous areas under the future climate were already mentioned (page 17 lines 4-7 of FOD).
321	44136	23	16	9	16	11	Are all these references by Endler and Matzarakis (chapter co-author) necessary for such a general sentence? Most of the work is repetitive and focuses on the black forest. The studies also focus only on the bioclimatic description of the conditions. It is unclear in this work how specific touristic components are integrated. (Anne Holsten, Potsdam Institute for Climate Impact Research)	See reply to comment No. 319. Black Forest is a vulnerable region, at the border between maritime and continental climate in Europe and at proximity to the European Alps. Nevertheless, the sentence has been made more general in order to highlight the increased vulnerability of low-altitude ski resorts.
322	38411	23	16	9	16	29	Although quite a few references are cited - to what extent are there really a number of independent studies? Has implications for confidence levels. (Claire Goodess, University of East Anglia)	Although the majority of studies are independent, the section has been enriched with some more refs in order to clarify more the agreements and disagreements between findings.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
323	41770	23	16	12	0	29	The discussion about TCI (and other such indices, as there are several in this sector) and validation is not needed for this section. The discussion needs to focus on what these varied indices or other approaches to rate the quality of climatic resources for tourism have found with respect to changes resulting from climate change (magnitude and timing) and the potential implications for tourism patterns. There are multiple index based papers relevant to Europe, only some are cited (e.g. Whittlesea and Amelung is not) and some are from AR4 and should not be included in AR5. The next major problem with this discussion is that it does not discuss the outcomes of climate and tourism demand models. Some are identified in the last sentence (line 29) but their findings not discussed at all. Furthermore, there are several other studies (e.g., by Bigano et al, Berrittella et al, Lyons et al, and Eugenio-Martin et al) that are not discussed. There are multiple contributing papers to this discussion (see the review paper in WIRE-Climate Change by Scott et al 2012 for a section on this theme: Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232 (Daniel Scott, University of Waterloo)	Lines 12-14 of FOD, where TCI was mentioned, did not discuss TCI but only said that some studies (mentioned in lines 13-14 of FOD) tried to explore the tourists' preferences in order to assess the importance of different climatic parameters used as input data in index-based studies. The rest of the text in lines 14-24 presented findings of studies and did not make a critique on methodologies applied (this is something to be done in Chapter 10). In any case, as said also in the reply to comment No.319, lines 9-14 have been deleted in order to reduce the overall size of the text. Regarding the point on some references being too old, there was only one before 2007 (Amelung and Viner, 2006), which has been deleted. On the completeness of the index-based studies mentioned, the section cannot provide an exhaustive list of references on index-papers relevant to Europe due to space restrictions (more can be found in Chapter 10). Regarding the study of Whittlesea and Amelung (2010), it is not a peer-reviewed one and refers to the south-west of England (being covered by other refs). As for the results of climate and tourism demand models, again due to space restrictions it is not possible to include a full presentation of these in the text. Finally, some of the references suggested by the reviewer have been added in the text.
324	44137	23	16	12	16	12	A short explanation of the TCI would be helpful (Anne Holsten, Potsdam Institute for Climate Impact Research)	The initial sentence on methodologies applied for climate change impact assessment in tourism (lines 9-14) has been deleted and thus there is no need for an explanation of TCI.
325	38410	23	16	16	0	0	I would avoid using subjective/emotional words like 'remarkably'. (Claire Goodess, University of East Anglia)	The text has been rephrased in order to take this comment into account.
326	41771	23	16	16	0	17	Denstadli et al 2011 specifically criticise the TCI-based work of Amelung and Viner 2006 for not adequately representing the climate of northern Scandinavia with this index approach, yet here we are told their work is 'in line' with AR4 findings by these authors. (Daniel Scott, University of Waterloo)	The comment made by the reviewer is incorrect, as he has not paid attention in which specific part of the text the reference on Denstadli et al. was mentioned. In fact, this was not done in lines 16-17 of FOD (as the reviewer says) -which referred to the conformity with AR4- but in line 14 referring to the fact that Denstadli and other authors used empirical techniques (Denstadli et al. used questionnaires) in order to explore tourists' perceptions of weather. Nevertheless, as was said in the reply to comment No. 319, lines 9-14 of FOD have been deleted in order to reduce the overall size of the text.
327	43495	23	16	17	0	0	The effects of climate change on tourism in the Spanish Mediterranean coast, particularly as concerning the possible implications on water resources and water demands for this activity in one of the greatest demand area for tourism in Europe, have been analyzed in detail by Sauri et al. (2011). It is interesting to highlight the importance of developing urban tourism models high housing density compared to low density residential models, since in the low density urban models increases the per capita water consumption (150 to 400 liters. / person / day) and consumed more land in the transformation of land use planning (from non-urban to urban) planning. This has implications on water planning in the context of climate change which shows a reduction in the volume of water available in the next decades. (Rico et al., 2009). (Olcina Jorge, University of Alicante)	The text has been revised in order to take this comment into account. The reference of Rico-Amoros et al. (2009) has also been added. The other reference suggested by the reviewer (Sauri et al., 2011) has not been included as it is not a peer-reviewed one.
328	38414	23	16	23	0	0	This study showing 'no evidence' seems to contradict some of the findings reported earlier in the paragraph. Can you comment on/explain why this might be the case? (Claire Goodess, University of East Anglia)	The empirical studies mentioned showed that, up to a certain level, high temperatures during summer do not seem to prohibit beach tourism since many tourists (especially those interested in beach tourism) do not mind moderately high temperatures. The text has been revised in order to clarify this.
329	38412	23	16	24	0	0	I would delete 'interestingly' (Claire Goodess, University of East Anglia)	The word has been deleted as suggested by the reviewer.
330	38413	23	16	25	0	0	Isn't precipitation included in the TCI? (Claire Goodess, University of East Anglia)	Yes, on a monthly basis (as a sum). Nevertheless, the text has been revised in a way that there is no need to make this clarification.
331	35855	23	16	31	16	54	much recent research in the Alps, particularly within Alpine Space projects; on line 50 mention increase in energy(as well as water) consumption. (Martin Price, University of the Highlands and Islands)	The text has been revised in order to include energy consumption as suggested by the reviewer. As to the point made on more recent references on the Alps, we would greatly appreciate the suggestion by the reviewer of any relevant additional references published after 2007.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
332	41773	23	16	31	17	2	The section on the vulnerability of ski tourism is also poorly done. There is much discussion of reports and papers that the literature has concluded are methodologically flawed or do not represent the risk of climate change because they do not account for current climate adaptation technologies (specifically snowmaking), let alone the level of adaptation the ski industry expects to have 20-40 years from now (also as evidence by surveys and other work with ski stakeholders). Moreover, state of the art modeling work by Steiger (2010 and 2011) that does account for snowmaking is never discussed. Why? Similarly, the detailed analysis of the record warm winter (analogue approach by Steiger) and its findings that low and small size operators were much more vulnerable are not discussed. Why? Finally, the multiple papers that have examined ski industry stakeholder views of climate change risk and adaptation (e.g., Wolfsegger et al. 2008) are not discussed to contextualize adaptation in this sector. Why? Again the WIRE-Climate Change paper listed above provide a critical discussion of these issues and cites many of the relevant papers (though some very new ones have also been published recently). (Daniel Scott, University of Waterloo)	This review comment is rather unproductive, as the reviewer does not make concrete suggestions on changes and additions. Nevertheless, regarding the point on 'methodologically flawed reports', the initial text clearly stated in line 24 of FOD that the percentages mentioned referred to naturally snow reliable areas (i.e. without snowmaking), as it was also done in line 40 referring to the future evolution of these percentages. In any case, the text has been revised in order to further clarify that the impacts of climate change on the ski season's length (as it is the case of OECD, 2007) refer mainly to cases with limited or absent artificial snowmaking. Regarding the work of Steiger, this was already mentioned in lines 37-38 and 50 and an additional study of this author has also been added. Regarding the comment on the vulnerability of low and small size operators, this was already mentioned in line 42, and lines 48-49 of FOD. As for the analysis of the ski industry stakeholder views of climate change risk and adaptation, this has not been added space limitations.
333	40288	23	16	31	17	7	There is too much emphasis on winter tourism here - more balance is required re summer tourism and changes in tourist attractions such as landscapes/ecosystems. (John Sweeney, National University of Ireland Maynooth)	Winter tourism is particularly important for several national/ regional economies in Europe (much more than summer tourism, at least under the present climate). Nevertheless, the text has been revised in order to achieve more balance between the two sections. As for landscapes/ ecosystems, the existing literature to our knowledge is limited, while the restrictions on the overall size of the section do not allow a presentation of this tourism segment.
334	44138	23	16	32	16	32	Is the reference from the year 1996 really appropriate to underline the economically based requirement of a 100-day operation length of ski resorts for the current time? (Anne Holsten, Potsdam Institute for Climate Impact Research)	The reference (added following a reviewer request during the ZOD review) has been deleted in order to reduce the overall size of the text.
335	51374	23	16	42	16	43	As possible, it would be preferable to specify the relevant climate/socioeconomic scenarios for this projection. (Katharine Mach, IPCC WGII TSU)	(Uhlmann et al., 2009) used also the A2 scenario, while Endler and Matzarakis(2011) considered the A1B and B1 scenario. Thus, as there are three scenarios examined and in order also to not increase further the length of the text, the inclusion of detail on this point has not been considered necessary.
336	41774	23	16	43	0	0	What does 'snow days' mean and is it meaningful to ski operations? Snow cover (2.5 cm or 1 inch) is often recorded by is not relevant indicator, so such terms must be specific if they are to be used. This is another criticism of the extant literature. (Daniel Scott, University of Waterloo)	The term 'snow days' used here did not refer to snow cover but to days with an equivalent snow depth greater than 22 cm. Nevertheless, in order to reduce the overall length of the text, the second part of the sentence in line 43 has been deleted and thus there is no need for this clarification.
337	41775	23	16	53	0	54	What does this sentence mean? Clarify. (Daniel Scott, University of Waterloo)	The sentence meant that, based on the findings of (Landauer et al., 2012; Unbehau et al., 2008), the adaptive capacity depends also on the existing variety of tourist activities offered and the willingness-to-pay of tourists for adaptation. Nevertheless, in order to reduce the overall length of the text, lines 52-55 of page 16 and lines 1-2 of page 17 have been deleted
338	38415	23	16	53	16	54	I don't really understand the last part of this sentence - it needs some rephrasing. (Claire Goodess, University of East Anglia)	Look at the reply to comment No. 337.
339	41776	23	17	1	0	2	See previous point on larger literature related to ski operators views on climate risk which should be consulted for this discussion and not a paper on the Influence of the cooling circulation water on the efficiency of a thermonuclear plant, which I assume is a formatting error. (Daniel Scott, University of Waterloo)	This was of course an editing error (the correct ref being (Hoffmann et al., 2009).). Look also at the reply to comment No. 337.
340	38799	23	17	2	0	0	The reference of Gañan et al, 2005 refers to coling in thermonuclear plants, not to adaptation due to ski adaptation (Ricardo Anadon, University of Oviedo)	Look at the reply to comment No. 339.
341	41777	23	17	4	0	7	The discussion of changes in snow pack in the Alps needs to cite proper physical modeling of snow in this region, not two tourism focused papers that do not in any way provide insights into this question! Many such studies are in the literature and other sections in this chapter should be cross-referenced (perhaps 23.2) as well as relevant WG 1 sections. (Daniel Scott, University of Waterloo)	These lines did not aim to make an analysis of changes in snow pack in the Alps, and thus they do not need to mention physical modelling of snow in this region. The only purpose of this paragraph is to show that although some mountainous areas may face unfavourable climatic conditions during winter as a result of climate change, on the other hand they may profit from improved climatic conditions during summer and enlarge their operational period by developing new tourist activities.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
342	38416	23	17	4	17	7	This material could be incorporated in the previous paragraph. (Claire Goodess, University of East Anglia)	Although this could be done, it has been preferred to keep this paragraph separate as it refers to the opportunities that may arise for mountainous tourism (apart from skiing).
343	38417	23	17	6	0	0	I'm not sure what you mean by infrastructure capacity. (Claire Goodess, University of East Anglia)	This sentence has been deleted from here as there was also a sentence on this issue in page 16, line 28 of FOD. This sentence has been revised in order to clarify this point.
344	41778	23	17	6	0	7	infrastructure capacity' -How so? This is an important question and its discussed in the literature. (Daniel Scott, University of Waterloo)	Look at the reply to comment No. 343. In addition, due to space restrictions, a thorough analysis of the capacity issue cannot be made here (perhaps this could be done in Chapter 10).
345	35856	23	17	29	0	0	more recent studies? It is a hot topic! (Martin Price, University of the Highlands and Islands)	Agreed. Refs have been updated.
346	41548	23	17	38	17	38	Barredo et al (2012) also shows that the economic impacts from floods have been increasing over recent decades due to the increase in the number and value of insured assets. Barredo, J.I., D. Saurí, and M. C. Llasat, 2012. Assessing trends in insured losses from floods in Spain 1971–2008. Nat. Hazards Earth Syst. Sci., 12, 1723–1729, 2012. www.nat-hazards-earth-syst-sci.net/12/1723/2012/ doi:10.5194/nhess-12-1723-2012. (Maria-Carmen Llasat, University of Barcelona)	ref included.
347	38418	23	17	42	0	0	Another mention of hail. Perhaps somewhere need to comment on the lack of information about past and future changes in hail occurrence. (Claire Goodess, University of East Anglia)	The text on hail has been revised in agreement with climate expert.
348	44734	23	18	11	0	0	Comment: Probably better if the present Chapter 23.4 comes before the present chapter 23.3? (Birger Solberg, Norwegian University of Life Sciences)	No. We have an agreed and approved structure.
349	53492	23	18	13	25	30	Please ensure consistency with chapters 4 and 7. (Kristie L. Ebi, IPCC WGII TSU)	Done
350	38419	23	18	32	0	0	The implication of the remark about potential yield is not really clear. Perhaps this needs separating out as a more general point. (Claire Goodess, University of East Anglia)	Text revised, in order to explain that potential yield is a yield limited by climate conditions. Only one reference is available, so we cannot create a distinct paragraph.
351	51375	23	19	4	19	4	It would be preferable to indicate here more specifically what is meant by "climate change impacts"--with respect to yields? (Katharine Mach, IPCC WGII TSU)	Revised to mention impacts on agricultural production
352	38420	23	19	4	19	21	This paragraph suddenly starts using what appears to be calibrated uncertainty/likelihood language (in italics). The whole chapter needs to be more consistent in its use. (Claire Goodess, University of East Anglia)	Agreed. Text revised.
353	38800	23	19	7	0	0	In the same sense that previous comment the reference of Ruiz-Ramos et al 2011 refers to a sea urchin not to water shortage for rainfed crops (Ricardo Anadon, University of Oviedo)	The correct reference needs to be added in the reference list (the confusion came from two papers with same first author name in the same year): Impacts of projected maximum temperature extremes for C21 by an ensemble of regional climate models on cereal cropping systems in the Iberian Peninsula Author(s): Ruiz-Ramos, M (Ruiz-Ramos, M.)1; Sanchez, E (Sanchez, E.)2; Gallardo, C (Gallardo, C.)3; Minguez, MI (Minguez, M. I.)1 Source: NATURAL HAZARDS AND EARTH SYSTEM SCIENCES Volume: 11 Issue: 12 Pages: 3275-3291 DOI: 10.5194/nhess-11-3275-2011 Published: 2011
354	51376	23	19	8	19	13	For the statements on these lines, the author team may wish to consider providing greater specificity. For example, what is the timeframe relevant to the statement on lines 8 and 9? Then, what are the relevant climate/socio-economic scenarios for the examples on lines 9-13? (Katharine Mach, IPCC WGII TSU)	text refined, keeping in mind space limitations.
355	40231	23	19	9	19	10	Please add Under A1B scenario and using 17 RCMs from the Ensembles project, Ronchail et al. (submitted) find a 8% (4%) yield decrease in rain fed (irrigated) olive yield in the upper Guadalquivir valley (Andalusia), on the 2030-2050 horizon. Ronchail, J., Cohen, M., Alonso-Roldan M., Garcin, H., Angles, S. and Sultan, B.: Adaptability of Mediterranean agro systems to climate change. The example of the Sierra Mágina olive growing region (Andalusia, Spain) II The future. Submitted to Weather, Climate and Society, 2012. (Josyane Ronchail, LOCEAN - Laboratory of Oceanography and Climate)	Thank you for providing this reference- but ref not published yet.
356	48540	23	19	12	19	13	However, in central and western Europe a trend for an earlier flowering and vintage was observed and projected for the future (Kersebaum, K.C, J. Eitzinger and K. Bauer, 2009. Viticulture [Weinbau]. In: Agriculture under climate change [Landwirtschaft im Klimawandel]. J. Eitzinger, K.C. Kersebaum, H. Formayer. Agrimedia, Clenze, Germany). Early ripeness during warmer and humid periods of the year might increase pressure of fungal diseases (e.g. Botrytis sp., Penicillium sp.) with negative impact on grape quality (Petgen, M., 2007. Response of vine to climate change [Reaktion der Reben auf den Klimawandel]. Schweiz. Z. Obst-Weinbau 9/2007, 6-9.). (Kurt Christian Kersebaum, Leibniz Centre for Agricultural Landscape Research)	Thank you for providing these references.
357	38421	23	19	14	0	0	It would be better to say diverging evidence rather than diverging views. (Claire Goodess, University of East Anglia)	Agreed, corrected
358	36470	23	19	16	19	18	Why? (Paula Harrison, University of Oxford)	We logically imply here that crop production is equal to area of production times crop yield per unit area. We will consider how to phrase this more explicitly.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
359	49212	23	19	24	19	25	Could it made more clear wether the 6-10% yield reduction in 2030 comes in addition to the 7 % in 2000 or if it is compared with the same base line. (Oyvind Christophersen, Climate and Pollution Agency)	Relative yield loss is defined by Avnery et al. (2011a, b) as the reduction in crop yield from the theoretical yield that would have resulted without O3-induced damages. Regionally aggregated values of RYL are provided for 2000 (2011a paper) and for 2030 (2011b paper). Values provided in the text are hence compared to the same baseline without crop injuries from O3. This will be better explained.
360	51377	23	19	24	19	25	It would be helpful to clarify the percentages given here; the wording of the sentence suggests projected reductions increase by 2030, yet 6% is less than 7%. (Katharine Mach, IPCC WGII TSU)	See comment #359. The wording will be revised. A strong uncertainty needs to be attached to the increase/ decline of O3 induced yield losses of wheat and maize by 2030 compared to 2000. Wording to be revised accordingly.
361	38422	23	19	30	0	0	I would rephrase 'will probably influence' (Claire Goodess, University of East Anglia)	Agreed
362	48541	23	19	30	19	30	Citation of "Kersebaum et al. 2008" should be changed as the paper deals with climate change effects on crop yield, water and nitrogen management. It can be used on page 21 (see below). In this context the citation should be (Glauning, J. and K.C. Kersebaum, 2009. Effects of climate change on biogenic loss factors [Auswirkungen von Klimaveränderungen auf biogene Schadfaktoren. In: In: Agriculture under climate change [Landwirtschaft im Klimawandel]. J. Eitzinger, K.C. Kersebaum, H. Formayer. Agrimedia, Clenze, Germany) (Kurt Christian Kersebaum, Leibniz Centre for Agricultural Landscape Research)	The exact reference was missing. It is 'Potential strategies and future requirements for plant disease management under a changing climate. Author(s): Juroszek, P.; von Tiedemann, A. Source: PLANT PATHOLOGY Volume: 60 Issue: 1 Pages: 100-112 DOI: 10.1111/j.1365-3059.2010.02410.x Published: FEB 2011'. This will be corrected. Thank you for providing an additional reference. It will be assessed, also considering the use of peer reviewed/grey literature.
363	48544	23	19	36	19	36	Extension of corn borer area follows the extend of maize cultivation and is supported by the trend to minimum tillage which offers better chances for survival during winter. (Kurt Christian Kersebaum, Leibniz Centre for Agricultural Landscape Research)	The text refers to the climate niche of the corn borer, not to its actual extension. Indeed, the actual extension may differ from the climatic envelope (or niche) because of the extension of the host crop, of the control strategies and of the agricultural practices (like no-till) used by farmers. The text will be revised to make sure that there is no potential confusion on this issue.
364	51378	23	19	36	19	39	For the statements on these lines, the author team may wish to consider providing greater specificity. For example, what climate/socio-economic scenarios are relevant? For the example on lines 38-39, what is the relevant time frame? (Katharine Mach, IPCC WGII TSU)	To be refined, provided that there is enough space available
365	38423	23	19	42	0	0	Isn't disease management more of an adaptation strategy than an impact? (Claire Goodess, University of East Anglia)	It is both: the efficiency of a given crop protection measure may be affected by climate change (i.e. impact); however, changes in crop management measures may occur (i.e. adaptation). The sentence will be revised and placed in the next paragraph (dealing with adaptation).
366	48542	23	19	44	19	44	Citation of "Kersebaum et al. 2008" should be changed as the paper deals with climate change effects on crop yield, water and nitrogen management. It can be used on page 21 (see below). In this context the citation should be (Glauning, J. and K.C. Kersebaum, 2009. Effects of climate change on biogenic loss factors [Auswirkungen von Klimaveränderungen auf biogene Schadfaktoren. In: In: Agriculture under climate change [Landwirtschaft im Klimawandel]. J. Eitzinger, K.C. Kersebaum, H. Formayer. Agrimedia, Clenze, Germany) (Kurt Christian Kersebaum, Leibniz Centre for Agricultural Landscape Research)	See answer to comment #362. Reference will be changed accordingly.
367	38424	23	19	46	19	47	The first sentence implies you're talking about current adaptation - 'are' - but next sentence seems to talk about potential future adaptation - 'may be'. (Claire Goodess, University of East Anglia)	Correct. The first sentence is kept short given space limitation and as this has already been reported in AR4. The style will be improved.
368	53493	23	19	46	20	8	Are there studies of the impacts of greater climate variability? (Kristie L. Ebi, IPCC WGII TSU)	In this section, we address adaptation. No paper came to our attention mentioning how farmers currently adapt to an increased climatic variability in Europe, but we will check again (this may also be linked to issues concerning insurances and services in section 23.3. Concerning the impacts of climatic variability on agricultural production, they are assessed before (see the second para. of 23.4.1). Future adaptation to climatic variability is addressed in the last para. of 23.4.1
369	40232	23	19	53	19	54	Please add In order to balance the present and future reductions of rainfall and of surface and underground water resources in the irrigated olive groves of Andalusia, and the associated reduction in yields, Cohen et al. (submitted) and Ronchail et al. (submitted) suggest a reduction and a better repartition of water allocations. Ronchail, J., Cohen, M., Alonso-Roldan M., Garcin, H., Angles, S. and Sultan, B.: Adaptability of Mediterranean agro systems to climate change. The example of the Sierra Mágina olive growing region (Andalusia, Spain) II The future. Submitted to Weather, Climate and Society, 2012. Cohen, M., Ronchail, J., Alonso-Roldan M., Morcel, C., Angles, S. and Labat, D.: Adaptability of Mediterranean agro systems to climate change. The example of the Sierra Mágina olive growing region (Andalusia, Spain) I I Past and present. Submitted to Weather, Climate and Society, 2012 (Josyane Ronchail, LOCEAN - Laboratory of Oceanography and Climate)	Thank you for providing these references. When published, we will be able to consider them.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
370	38425	23	20	2	0	0	I don't really understand the sentence about 'breeding targets' - needs some expansion/rewording. (Claire Goodess, University of East Anglia)	We mean here that the objectives of plant breeding are altered when considering the needs for adapting crops to climate change. Below examples are provided. The style of this sentence will be revised.
371	38428	23	20	10	20	18	This paragraph talks about adaptation at a number of different scales. Is it possible to say anything about the spatial scale at which adaptation works 'best' in Europe? (Claire Goodess, University of East Anglia)	We refer here mainly to the farm scale. This will be made explicit.
372	38426	23	20	11	0	0	Isn't it rather hard to consider climate change and climate variability separately? (Claire Goodess, University of East Anglia)	What is implied here is that farmers need to integrate their adaptation to climate change and to climate variability. Obviously, adaptation to climate variability has occurred in agricultural systems long before the occurrence of anthropogenic climate change. This will be clarified.
373	38427	23	20	14	20	15	Is it possible to say anything about what type of farm type adapts 'best'? (Claire Goodess, University of East Anglia)	We did not yet find a reference answering this question in the context of Europe. We will check again.
374	36471	23	20	16	20	18	Audsley et al. (2008). The impact of future socio-economic and climate changes on agricultural land use and the wider environment in East Anglia and North West England using a metamodel system. Climatic Change 90(1-2), 57-88 has useful information on the impacts of both climate and socio-economic scenarios as well as indirect effects from other sectors in terms of urban growth, flooding risk, water quality and consequences for biodiversity for the UK. These issues do not seem to be well covered in this section. The approach is currently being expanded to the whole of Europe in the CLIMSAVE project where the agricultural model is linked with models covering 5 other sectors (see http://www.climsave.eu/climsave/doc/Report_on_the_specification_of_the_IAP.pdf , which is currently being written up in a paper for Regional Environmental Change which should be published by the end of 2012). (Paula Harrison, University of Oxford)	Thank you for pointing to the paper by Audsley et al. 2008 in Climatic Change and to another submitted study. Published papers (and grey literature) will be considered during the revision process in order to include if possible more information on potential consequences of climate change on grassland vs. arable systems.
375	38429	23	20	26	20	27	I don't understand how these thresholds operate - needs some rewording. (Claire Goodess, University of East Anglia)	This will be clarified. The cited studies have experimentally determined statistical thresholds for heat impacts on animal performance.
376	35857	23	20	26	20	30	meaning not clear. (Martin Price, University of the Highlands and Islands)	This paragraph is too dense and possibly too technical. The style will be revised.
377	48545	23	20	30	20	30	For poultry the risk of death increases dramatically if the enthalpy of the barn exceeds 67 kJ/kg air and reach a letal level at 72 kJ/kg air (Sleger, V. and P. Neuberger, 2006. Using meteorological data to determine the risk of heat stress. Res. Agr. Eng. 52, 39-47) (Kurt Christian Kersebaum, Leibniz Centre for Agricultural Landscape Research)	Thank you for pointing to this reference that will be considered during the revision process.
378	38430	23	20	46	0	0	Would it be more accurate to say that this has been 'partially' attributed? (Claire Goodess, University of East Anglia)	This sentence may need to be expanded and clarified (see next comment)
379	38910	23	20	46	20	48	"The spread of bluetongue ... Culicoides vectors". This sentence is a bit misleading. Indeed Guis et al., 2012 attributes the spread of bluetongue to climate warming in Europe. But they also show that changes in southern Europe are related to changes in the vector densities (Culicoides imicola, consistently with Wilson and Mellor, 2009) while simulated changes in northern Europe are more related to the impact of warmer temperatures on virus properties (by shortening the mean extrinsic incubation period). (Cyril Caminade, University of Liverpool)	This will be made more explicit to avoid possible misinterpretation.
380	45819	23	21	5	0	0	The contribution of Iglesias et al. (2012) dealing with agriculture impacts in Europe could be taken into account in this Chapter. Iglesias A, Garrote L, Quiroga S, M Moneo, 2012: A regional comparison of the effects of climate change on agricultural crops in Europe. Climatic Change (2012) 112:29-46 (Juan-Carlos Ciscar, European Commission)	Thank you for pointing to this recent publication that will be considered during the revision process.
381	35858	23	21	10	21	11	what is threshold violation? (Martin Price, University of the Highlands and Islands)	To be corrected. See answer to next comment. In physics, threshold violation points out potential problems with the solution. This wording can be replaced by exceedance, which is easier to understand.
382	38431	23	21	10	21	11	I would say exceedance rather than violation (Claire Goodess, University of East Anglia)	Agreed
383	48543	23	21	17	21	17	Changes in seasonal precipitation distribution, e.g., less precipitation in summer and higher rainfall during winter, can enhance nitrate leaching due to lower nitrogen use efficiency in dry periods with higher residual mineral nitrogen after harvest and increased percolation during winter (Kersebaum et al. 2008, see above). (Kurt Christian Kersebaum, Leibniz Centre for Agricultural Landscape Research)	This will be considered during the revision process. Thank you.
384	35859	23	21	26	0	0	need to be clear why the Beauce is a 'hotspot' (Martin Price, University of the Highlands and Islands)	Beuce is a hotspot because it is a dry region - see next line.
385	51379	23	21	30	21	31	For this example, the author team should consider indicating the relevant climate/socio-economic scenarios and time frame. (Katharine Mach, IPCC WGII TSU)	ok.
386	53494	23	21	50	22	3	This could use further elaboration to explain the assumptions and scenarios used. (Kristie L. Ebi, IPCC WGII TSU)	ok
387	35860	23	21	52	22	3	meaning not clear. (Martin Price, University of the Highlands and Islands)	paragraph has been shortened.
388	39202	23	22	0	0	0	Section 23.4.4: While the structure of this paragraph is quite clear, sometimes it would be good to make the relations between individual paragraphs a bit clearer or at least have a small subheading with the type of impact that is considered in this paragraph (like 'fire!...') (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Thank you for the suggestion. The text has been divided by small subheadings with the type of impact that is considered in each individual paragraph.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
389	43838	23	22	6	23	53	I would have expected to see papers on CO2 e.g. Keenan, T., J. Maria Serra, et al. (2011). "Predicting the future of forests in the Mediterranean under climate change, with niche- and process-based models: CO2 matters!" <i>Global Change Biology</i> 17(1): 565-579; Hickler, T., S. Fronzek, et al. (2009). "An ecosystem model-based estimate of changes in water availability differs from water proxies that are commonly used in species distribution models." <i>Global Ecology and Biogeography</i> 18(3): 304-313; Rickebusch, S., W. Thuiller, et al. (2008). "Incorporating the effects of changes in vegetation functioning and CO2 on water availability in plant habitat models." <i>Biology Letters</i> 4(5): 556-559 and Hickler, T., B. Smith, et al. (2008). "CO2 fertilization in temperate FACE experiments not representative of boreal and tropical forests." <i>Global Change Biology</i> 14(7): 1531-1542. (Pam Berry, Oxford)	Thank you for the useful suggestions. We have carefully considered the papers you have suggested and we added in the text some of the references relevant for the topic.
390	35861	23	22	9	22	10	all of Europe? reference refers only to beech trees. (Martin Price, University of the Highlands and Islands)	The cited reference refers only to beech trees in the title, but in the introduction the paper considers also the general impacts of climate change on tree population in Europe.
391	38854	23	22	9	22	13	Is this comparable for native and introduced species, such as the Mediterranean Eucalypt plantations? These might be better adapted to drought and heat stress. (see Godoy et al 2011). (Rob Jongman, Wageningen UR)	This sentence has been modified .
392	36472	23	22	15	0	0	This paragraph mixes up historic/recent observations of changes in forests with future projections. It would be clearer to separate these into different paragraphs. (Paula Harrison, University of Oxford)	Observed historic/recent observations and future projections have been separated into different paragraphs.
393	39201	23	22	25	22	27	This sentence needs a reference. (Christopher Reyer, Potsdam Institute for Climate Impact Research)	The statement has been shortened and the reference from Hlásny et al., 2011 has been reported.
394	51380	23	22	32	22	32	As possible, the author team should consider specifying the approximate time periods over which these long-term records were collected. (Katharine Mach, IPCC WGII TSU)	The sentence has been shortened due to limited space.
395	35862	23	22	50	0	0	trees are moving uphill as well as SW->NE (Martin Price, University of the Highlands and Islands)	Thank you, this has been considered in the text; a new reference (Feehan et al., 2009) has been added.
396	43839	23	22	50	0	0	Cross-refer to changes in forestry and forest tree projections with those from ecosystem chapter 4.3.3.1 (Pam Berry, Oxford)	Changes in forestry and forest tree projections from ecosystem chapter (4.3.3.1) have been cross-refered.
397	51381	23	22	50	22	53	For this statement, the author team could consider specifying the relevant scenarios of climate and socioeconomics, also indicating if projections differ across scenarios. (Katharine Mach, IPCC WGII TSU)	The climate scenario (A1B) has been specified in the text.
398	51382	23	23	1	23	1	The phrase "medium evidence," as calibrated uncertainty language, should be italicized. (Katharine Mach, IPCC WGII TSU)	The phrase has been reorganized with any reference to the calibrated uncertainty
399	53495	23	23	1	23	3	References are needed. (Kristie L. Ebi, IPCC WGII TSU)	The statement has been shortened and the reference from Rounsevell and Reay, 2009 has been reported.
400	49213	23	23	4	23	5	The sentence "High-end climate scenarios indicate that net GHG fluxes to switch from being a sink to a source" needs clarification; is it valid for forest in Europe as a whole or in certain areas? (Oyvind Christophersen, Climate and Pollution Agency)	The text has been shortened and this sentence has been removed due to limited space.
401	38432	23	23	7	0	0	Human factors have contributed to the observed changes in fire occurrence - not just climate change. In parts of the Mediterranean, the majority of fires are started by people - though the rate of spread etc will depend on weather conditions. In some parts of the Mediterranean (e.g., Tuscany), improved fire protection has led to reduced occurrence. (Claire Goodess, University of East Anglia)	This is true of course, but this section deal with "Implications of Climate Change for Forestry", so human factors are not addressed in this section while something on fire protection has been added.
402	38855	23	23	7	23	12	Does Mediterranean exclude parts of Southern Europe, such as Portugal? This statement is unclear as well as the "Mediterranean wildfires"; is this a special kind? (Rob Jongman, Wageningen UR)	The statement has been clarified.
403	41549	23	23	7	23	13	Please, pay attention, there is no an agreement about this increase of forest fires in Europe! In Southern Europe, especially in Mediterranean Basins, fire incidence is very high. In the last decades a series of Mediterranean wildfires broke out across France, Greece, Italy, Portugal, Spain, and key. The most severe were associated with strong winds that spread the fire during a hot, dry period of weather (see also EEA, 2008). However, in many Mediterranean regions fires number is decreasing (Camia et al. 2011; Turco et al. 2012), probably due to the increasing in fire prevention and management measures. The future climate change impacts on Mediterranean forest fires are not as clear. The possible pathways for climate change effects on fire might depend on the balance between higher fire flammability due to warmth and drier conditions and, alternatively, unfavourable smaller wildfire activity due to unfavourable condition for increasing vegetation (e.g. fine-fuel) and fuel connectivity (Moreira et al 2011). To realistically simulate the complex interactions existing between climate, vegetation, humans and fire regime changes remains a challenge (Hessl 2011). Camia, A., J. San Miguel Ayanz, L.Vilar del Hoyo and Durrant Houston, T.: Spatial and temporal patterns of large forest fires in Europe, in: EGU General Assembly, Vienna, 2011. Turco M., M.C. Llasat, J. Von Hardenberg, A. Provenzale, 2012. Impact of climate variability on summer fires in a Mediterranean environment (northeastern Iberian Peninsula). <i>Climatic Change</i> , DOI 10.1007/s10584-012-0505-6. Hessl A. E. 2011. Pathways for climate change effects on fire: Models, data, and uncertainties. <i>Progress in Physical Geography</i> , 35(3):393–407. Moreira F., O. Viedma, M. Arianoutsou, T. Curt, N. Koutsias, E. Rigolot, A.Barbati, P. Corona, P.Vaz, G. Xanthopoulos, F. Mouillot and E. Bilgili, 2011. Landscape wildfire interactions in southern europe: Implications for landscape management. <i>Journal of Environmental Management</i> , 92(10):2389 – 2402. (Maria-Carmen Llasat, University of Barcelona)	Thank you, the suggested paper from Camia et al. 2011; Turco et al. 2012; Moreira et al. 2011; Hessl 2011 have been carefully evaluated and some have been considered in the text.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
404	44171	23	23	7	23	13	The paragraph dedicated to the impacts of forest fires in Europe is in my view limited. The section limits its scope to the current problematic areas in which fire occurrences have been reported. The possible lengthening of the fire season is also not a new result. I suggest that the section on forest fires to be elaborated. The potential impacts of forest fires and its positive feedback with the climate system are too large to be dealt so simply. For example, in the Mediterranean basin the recurrence of forest fires are recognizably the main threat to biodiversity (see Moreno 1994). It is also argued that fire repetition at short intervals result in long-term cumulative effects on some ecosystems properties such as nutrient cycle and productivity (see Carter 2004). I also suggest that the section to be more prospective rather than repeating what has already pointed in the AR4. In this sense new lines of research could be to review what are the geographic areas of Europe are expected to suffer an increase of fire risk and at the same time what is the capacity (here probably qualitative) of its vegetation to withstand an increase in fire incidence. For example the meteorological fire risk is expected to increase in areas with formerly minor for occurrence compared to Southern Europe, such as Finland (Kilpeläinen et al. 2009) or the Alps (Wastl et al. 2012). Besides these meteorological changes, a strong effect of future vegetation changes has been identified for European forests (Schelhaas et al. 2010, Thnocke Cramer 2006). The reference to "Vilén and Fernandes" should not be used to justify the fire incidence increase since the topic of the paper is on CO2 emission from forest fire. The report should refer to the main publication of "Pausas 2008" within "Vilén and Fernandes". Secondly, the overall statement that Fire incidence has increased "dramatically in the past decade" should be avoided. In fact the picture of fire incidence (even in the Mediterranean Basin) is far from homogeneous. Overall the number of fire in the southern countries have suffered and increase in numbers until 2000-2004, afterwards they decreased. If one looks in detail at individual countries the picture is even more heterogeneous. In Italy forest fire numbers have been decreasing since the 90ies, 2010 was even one of the best years in the last 30. The major problem that the AR5 misses completely out is that the problem is not so much the fire incidence but the extension (area) of forest fires. The trend in Europe has been that a small number of fires have lead to large numbers of area burnt. The interaction of the processes controlling this phenomenon with climate change should be explored. References: Wastl C, Schunk C, Leuchner M, Pezzatti GB, Menzel A. 2012: Recent climate change: Long-term trends in meteorological forest fire danger in the Alps. Agricultural and Forest Meteorology 162–163: 1–13. Thonicke K, Cramer W 2006: Long-term trends in vegetation dynamics and forest fires in Brandenburg (Germany) under a changing climate. Natural Hazards 38: 283-300, doi: 10.1007/s11069-005-8639-8 Schelhaas, M.J., Hengeveld, G., Moriondo, M., Reinds, G.J., Kundzewicz, Z.W., ter Maat, H., Bindi, M., 2010. Assessing risk and adaptation options to fires and windstorms in European forestry. Mitigation and Adaptation Strategies for Global Change 15, 681-701. Kilpeläinen, A., Kellomäki, S., Strandman, H. and Venäläinen, A., 2010. Climate change impacts on forest fire potential in boreal conditions in Finland. Climatic Change (2010) 103:383–398, DOI 10.1007/s10584-009-9788-7 JRC (2011): Forest Fires in Europe 2010, report no. 11, http://effis.jrc.ec.europa.eu/reports/fire-reports/ Carter, MC, Foster, CD. Prescribed burning and productivity in southern pine forests: a review, Forest Ecology and Management, 191, pp. 93-109, 2004 Pausas J (2004) Changes in fire and climate in the Eastern Iberian Peninsula (Mediterranean Basin). Climatic Change 63:337–350 Moreno, JM., Oechel, WC. Fire intensity as a determinant factor of post-fire plant recovery in southern California chaparral, The Role of Fire in Mediterranean-Type Ecosystems, JM Moreno, WC Oechel (eds), Ecological studies Vol.107, Sprinfer-Verlag, Berlin-New York, pp. 26-45, 1994 (Anne Holsten, Potsdam Institute for Climate Impact Research)	Thank you. We have considered in the text a great part of the proposed suggestions and the paragraph dedicated to the impacts of forest fires in Europe has been enhanced in the in the chapter.
404.2	44171	23	23	7	23	13		
405	51383	23	23	12	23	13	For this statement, it would be helpful to specify more explicitly if this is an increase that has been observed or is projected. (Katharine Mach, IPCC WGII TSU)	The increase has been observed. This has been clarified in the text.
406	44139	23	23	18	23	18	References are missing: Evidence for such increases in impacts is already available for Western Germany: Stronger gusts over Western Germany will cause considerable increases in storm damages in forests in future (Pinto et al. 2010, Klaus et al. 2011). In more detail: Klaus et al. project a strong decrease in the recurrence rate of severe damages (applying the damage of the Kyrill storm event in 2007 as the reference) for Western Germany based on the regional models CCLM and REMO. Based on a mesoscale simulation, Pinto et al. 2010 find increases in storm losses by 8-19% (scenarios A1B and B2 respectively) for the same region in Western Germany. References: Pinto JG, Neuhaus CP, Leckebusch GC, Reyers M, Kerschgens M (2010) Estimation of wind storm impacts over West Germany under future climate conditions using a statistical-dynamical downscaling approach. Tellus A, 62:188-201 doi: 10.1111/j.1600-0870.2009.00424.x Klaus M., Holsten A., Hostert P., Kropp J.P. (2011): An integrated methodology to assess windthrow impacts on forest stands under climate change. Forest Ecology and Management, 261/11, 1799-1810 (Anne Holsten, Potsdam Institute for Climate Impact Research)	Thank you for the suggestion. The references have been integrated in the text.
407	38433	23	23	19	0	0	Clarify the phrase 'medium evidence' (Claire Goodess, University of East Anglia)	The phrase has been reorganized with any reference to the calibrated uncertainty
408	51384	23	23	19	23	19	The phrase "medium evidence," as calibrated uncertainty language, should be italicized. (Katharine Mach, IPCC WGII TSU)	The phrase has been reorganized with any reference to the calibrated uncertainty

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409	39203	23	23	20	23	22	It is unclear why the accessibility issue appears together with the storm damage. Maybe you can move this sentence to the forest management paragraph further below? (Christopher Reyer, Potsdam Institute for Climate Impact Research)	The sentence has been moved to the forest management paragraph below.
410	38856	23	23	24	23	26	Is there a parasite distribution change due to shorter and less severe winters in the Boreal zone? In Finland there is surely research done on this issue. (Rob Jongman, Wageningen UR)	This is valid comment. We would greatly appreciate the suggestion by the reviewer of any references (after 2006) in this regard.
411	51385	23	23	28	23	30	It would be helpful to indicate as appropriate the relevant climate/socioeconomic scenarios for this statement. (Katharine Mach, IPCC WGII TSU)	The future climate change scenarios (SRES A2, A1B and B2) have been indicated in the text.
412	48546	23	23	30	23	30	Bark beetle damages in Austrian spruce forests are projected to double under a + 2.4 °C temperature scenario until 2100 assuming no adaptation measures (Seidl, R, M.-J. Scheelhaas,, M. Lindner, M.J. Lexer, 2009. Modelling bark beetle disturbances in a large scale forest scenario model to assess climate change impacts and evaluate adaptive management strategies. Regional Environmental Change 9, 101-119) (Kurt Christian Kersebaum, Leibniz Centre for Agricultural Landscape Research)	Thank you for the suggestion. The references have been integrated in the text.
413	39205	23	23	35	23	36	dry and cold conditions can also be detrimental to fungi (no reference at hand unfortunately) (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Thank you for the comment. We would greatly appreciate the suggestion by the reviewer of any references (after 2006) in this regard.
414	39204	23	23	46	23	46	"possible response approaches" to what? Specify (e.g. to the above mentioned impacts or so...) (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Thank you for the suggestion. Possible response approaches are related to the impacts of climate change on forestry. The statement has been clarified in the text.
415	35863	23	23	51	23	53	reduced vulnerability also from stands with greater species diversity and range of ages. (Martin Price, University of the Highlands and Islands)	This is true of course but we didn't find any references supporting this for European forests. Could you please provide us some references?
416	38434	23	24	4	0	0	Should 'likely' be in italics - not clear if this is calibrated language use or not. (Claire Goodess, University of East Anglia)	The word "likely" has been italicized.
417	51386	23	24	4	24	4	"Likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	The word "likely" has been italicized.
418	38857	23	24	4	24	14	Have a look at the climate benefits and costs (see Hein and Leemans, Ambio 2012) (Rob Jongman, Wageningen UR)	Thank you for the suggestion of the interesting references. However this section is focussed on the impact of climate change on bioenergy production while this paper discusses the impact of biofuels on climate and food. For this reason it has not been included here.
419	38435	23	24	4	24	15	If all the information in this paragraph comes from Tuck, I would put the reference first. Otherwise need to add references. (Claire Goodess, University of East Anglia)	Yes, all the information in this paragraph comes from Tuck et al. 2006. However the section has been reorganized and an extra reference from Tuck et al. 2006 has been added to avoid this doubt.
420	53496	23	24	6	24	6	Is the science unequivocal that these grasses will respond in the way described? (Kristie L. Ebi, IPCC WGII TSU)	Yes, there is high level of agreement and evidence about this.
421	51387	23	24	7	24	13	For the statements, the author team should consider specifying relevant climate/socioeconomic scenarios, and also indicating any differences in outcomes anticipated across them. (Katharine Mach, IPCC WGII TSU)	The relevant climate scenarios and some differences in outcomes have been specified.
422	38436	23	24	11	24	12	It is perhaps more useful to know the sort of impact model used than exactly which four GCMs. (Claire Goodess, University of East Anglia)	The sentence has been shortened because of the need to respect the assigned length and the names of the four GCMs have been deleted.
423	53497	23	24	11	24	13	References are needed. (Kristie L. Ebi, IPCC WGII TSU)	The reference is from Tuck et al. 2006. However the section has been reorganized and each sentence has its reference now.
424	51388	23	24	23	24	23	As calibrated uncertainty language, "medium evidence" should be italicized. Additionally, the author team might consider presenting a summary term for agreement as well. (Katharine Mach, IPCC WGII TSU)	The phrase has been reorganized and the calibrated uncertainty refers to likelihood.
425	39206	23	24	23	24	24	A brief explanation why northward expansion of SRC could erode the European terrestrial carbon sink would be beneficial here. (Christopher Reyer, Potsdam Institute for Climate Impact Research)	The issue has been better explained in the text.
426	54508	23	24	23	24	24	The corresponding Executive Summary text uses "medium confidence" rather than evidence, which seems more appropriate (other alternative is a paired statement about evidence and agreement, perhaps as basis for a confidence statement). In addition, it would be useful to explain a bit further why the sink would be eroded here. (Michael Mastrandrea, IPCC WGII TSU)	The statement has been corrected with is likely as calibrated uncertainty language which is more appropriate in this part of the text. Moreover it has been better explained in the text why the terrestrial carbon sink would be eroded.
427	51389	23	24	27	0	0	Section 23.4.6. For this section, the chapter team may wish to consider and cross-reference chapter 6 and 30. (Katharine Mach, IPCC WGII TSU)	Noted.
428	35864	23	24	27	25	30	Section 23.4.6 – I would suggest separating the marine and freshwater parts of this section. (Martin Price, University of the Highlands and Islands)	Agreed.
429	38859	23	24	27	25	30	I miss the impact of climate change on fish populations and fisheries in the Mediterranean and Black sea. (Rob Jongman, Wageningen UR)	Text has been added, also to the box on Mediterranean.
430	35865	23	24	38	24	39	rather general statement; needs to be more specific. (Martin Price, University of the Highlands and Islands)	Text has been revised.
431	51390	23	24	38	24	40	For this observed change, are other drivers (for example, fishing pressure) relevant? (Katharine Mach, IPCC WGII TSU)	text has been revised

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432	38858	23	24	45	24	53	Could you expand on the species and population shifts from south to north and the potential impact on fisheries and species composition? (Rob Jongman, Wageningen UR)	Text has been revised to address this, but space is limited.
433	53498	23	24	48	24	48	This sounds like an attribution statement. Is that the intent? (Kristie L. Ebi, IPCC WGII TSU)	No. Text has been revised
434	38801	23	24	51	0	0	I suggest to incorporate the reference of [Bañón, R. 2009.Variacions na diversidade e abundancia ictiolóxica en Galicia por efecto do cambio climático. In: Pérez Muñuzurri, V. Fernández, M. Gómez, J.L (eds): Evidencias e impactos do cambio climático en Galicia. Xunta de Galiza. 391-401] as example of changes in species and on fished species objectives in the west Iberian Peninsula, mmostly of new species of warmer waters (Ricardo Anadon, University of Oviedo)	Ref not included.
435	35469	23	25	2	25	2	To add the following reference into the brackets: (..., 2010; Garza et al., 2011). (M. Dolores Garza-Gil, University of Vigo)	ref included.
436	35470	23	25	15	25	15	To add the comment after of 2008): In the Iberian-Atlantic fishing grounds, a case study of sardine fishery concluded that the biomass and profits will further decrease with greater intensity if the effects of global warming on the water temperature become more significant (Garza et al., 2011). In the Portuguese coast, a commercial opportunity for fisheries could arise since most the new potential species were marketable species and not many current species were lost under different climate scenarios (Vinagre et al., 2011). In (M. Dolores Garza-Gil, University of Vigo)	text on sardines revised.
437	53499	23	25	15	25	15	Is the science unequivocal that these changes will occur? (Kristie L. Ebi, IPCC WGII TSU)	Text revised.
438	51391	23	25	16	25	37	"likely" on lines 16, 19, 37 -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. If the use is casual, a word such as "expected" could be used instead. (Katharine Mach, IPCC WGII TSU)	Text revised.
439	45820	23	25	35	0	0	The analysis of Watkiss and Hunt (2012) regarding impacts on human health in Europe could be added to the Chapter. Various health impacts resulting from climate change (temperature-related mortality effects, salmonellosis and coastal flooding-induced mental) are considered. Watkiss, P and A. Hunt, 2012: Projection of economic impacts of climate change in sectors of Europe based on bottom up analysis: human health, <i>Climatic Change</i> , 112, 101-126. (Juan-Carlos Ciscar, European Commission)	ref included.
440	53500	23	25	35	26	53	Please ensure consistency with chapter 11. (Kristie L. Ebi, IPCC WGII TSU)	Done.
441	40588	23	25	35	27	17	Mortality analysis of the following study to be considered - Matzarakis, A., Muthers, S., Koch, E., 2011: Human-biometeorological evaluation of summer mortality in Vienna. <i>Theoretical and Applied Climatology</i> 105, 1-10. (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	There are several references that describe mortality effect of weather -but it is not possible to include them all unless they are of particular relevance to climate change impacts.
442	40589	23	25	35	27	17	Mortality analysis of the following study to be considered - Muthers, S., Matzarakis, A., Koch, E., 2010: Climate Change and Mortality in Vienna—A Human Biometeorological Analysis Based on Regional Climate Modeling. <i>Int. J. Environ. Res. Public Health</i> 7, 2965-2977. (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	There are several references that describe mortality effect of weather -but it is not possible to include them all unless they are of particular relevance to climate change impacts.
443	40590	23	25	35	27	17	A paragraphy about Heat Helath Warning Systems should be included (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	A range of adaptation options are discussed. HHWS were addressed in detail in AR4. Only new evidence will be included here.
444	46470	23	25	37	27	16	The text on human health impacts is narrowly focused on heat-related issues. While this may be an area where evidence is more readily available, an effort should be made to take a more comprehensive look to at least identify some of the other potential health-related impacts so that adaptation to them would at least enter the agenda for future discussion. For example, there seems to be some evidence of increased range of ticks that spread the borreliosis variant of the Lyme's disease as well as other diseases. For example, see T. N. Petney, J. Skuballa, S. Muders, M. Pfäffle, C. Zetlmeisl and R. Oehme (2012) The Changing Distribution Patterns of Ticks (Ixodida) in Europe in Relation to Emerging Tick-Borne Diseases. <i>Parasitology Research Monographs</i> , 2012, Volume 3, 151-166, DOI: 10.1007/978-3-642-28842-5_7; Fox tapeworm spread alveolar echinococcosis may be another issue, see M. Miterpáková and P. Dubinský (2011) Fox tapeworm (<i>Echinococcus multilocularis</i>) in Slovakia — summarizing the long-term monitoring, <i>HELMINTHOLOGIA</i> , Volume 48, Number 3 (2011), 155-161, DOI: 10.2478/s11687-011-0023-5, and West Nile virus a third one, see Shlomit Paz (2012) West Nile Virus Eruptions in Summer 2010 – What Is the Possible Linkage with Climate Change? NATO Science for Peace and Security Series C: Environmental Security, 2012, 253-260, DOI: 10.1007/978-94-007-2430-3_21. While these health risks may not expose large populations, health care systems are largely unprepared for diagnosing and treating them, as well as engaging in preventive measures (despite the fact that vaccinations are now available for borreliosis for example). Calling attention to potential risks would lead to their more comprehensive assessment. (Jouni Paavola, University of Leeds)	References on ticks will be included. It is not correct that health systems are unprepared as most have surveillance systems for these notifiable diseases.
445	46469	23	25	39	27	45	The text suggests that population in Southern Europe are particularly sensitive to weather and also more exposed; the reason why these populations are supposedly more sensitive is not reasoned out sufficiently. It is obvious that Southern populations are more EXPOSED to heat and they may also have less adaptive capacity to deal with it, both factors contributing to their vulnerability. But why they would be more sensitive than say Northern Central Europeans is less clear - the latter would not have customary know-how to the same extent to handle heat stress, and demographic factors that could explain sensitivity are also non-obvious. The measures to handle heat stress are also rather narrowly construed, focusing on residence level technological solutions and preparedness plans. In densely settled urban areas neighbourhood level solutions such as parks and safe outdoor areas are important as well. See Brisley, R., Welstead, J., Hindle R., Paavola J. (2012) Just Adaptation Responses to Climate Change. York: Joseph Rowntree Foundation. Available online at http://www.jrf.org.uk/publications/socially-just-adaptation-climate-change (Jouni Paavola, University of Leeds)	Will clarify text. Several analyses show the southern Europeans are more sensitive to heat effects (biostatistics) but cannot show why. The evidence for health benefits of indoor vs. outdoor interventions is limited but will be discussed.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
446	38437	23	25	40	25	42	What do you mean by 'sensitive' and 'less likely to be prepared'? What about adaptation/acclimatisation? Heat-related studies use higher thresholds for southern Europe than northern. (Claire Goodess, University of East Anglia)	OK. This will be clarified in the text - sensitivity and thresholds are different aspects of the temperature- mortality relationship.
447	51392	23	25	47	25	47	It would be preferable to specifically reference the section meant here in the parenthetical reference. (Katharine Mach, IPCC WGII TSU)	OK. Detail on heat wave exposures.
448	51393	23	26	2	26	2	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Done.
449	51394	23	26	8	26	9	For this statement, it would be preferable to indicate the relevant climate/socio-economic scenario considered, as well as the importance of various drivers. (Katharine Mach, IPCC WGII TSU)	Agreed. Will add socio-economic scenario (which was no change).
450	39306	23	26	14	0	19	On albopictus: the origins of the European infestation are most probably Japan, via the United States, though imports of plants from south China have also been implicated. At present the species has already infested at least 16 countries and is moving northwards. I seen no reason why it should not move as far north as Stockholm; in the US it is well established in Chicago and indianapolis. All this because it is cold hardy and has a winter diapause mechanism. In, Albania, which has been infested since at least the 1970s (probably came from China) the species is present to at least 1200m in places where the snow is on the ground for up to 6 months of the year... All this to say that the species is well-adapted to infest all of Europe IF ECOLOGICAL FACTORS PERMIT. (PAUL REITER, INSTITUT PASTEUR)	OK. Note comment below. New assessment of cc risks on albopictus and on dengue in europe from ECDC is included
451	48547	23	26	14	20	18	Extension of the climatic niche for the Asian tiger mosquito (Aedes albopictus) increase risk for for the Chikungunya fever in Europe (Queyriaux, B., A. Armengaud, C. Jeannin, E. Coutourier, F. Peloux-Petiot, 2008. Chikungunya in Europe. Lancet. 371, 723-724). (Kurt Christian Kersebaum, Leibniz Centre for Agricultural Landscape Research)	See above. Unclear how climate change will modify the risk of chikungunya transmission.
452	38911	23	26	16	26	17	"An assesment of ... (ECDC, 2009)". Big mistake, If you read the related ECDC report, the Balkans becomes less suitable only if you consider what ECDC named "the minimal impact long-term range scenario", Fig 7b in the report. For all the other scenarios (Fig 7a, 7c), the Balkans appear to be more suitable in that report. Note that most up to date studies (using an ensemble of impact models and climate models) corroborate that central northwestern Europe and the Balkans appear to be more suitable for the mosquito in the future while climate might become less suitable over southern Europe (especially southern Spain, see Caminade et al., 2012 and Fisher et al., 2011). The related references should be added: Caminade C., J.M. Medlock, S. leach, K.M. McIntyre, M. Baylis, A.P. Morse (2012). Climate suitability of the Asian tiger mosquito Aedes Albopictus in Europe: recent trends and future scenario. Journal of the Royal Society Interface. Published online doi:10.1098/rsif.2012.0138. Fisher D., S.M. Thomas, F. Niemitz, B. Reineking, C. Beierkuhnlein, 2011. Projection of Climate suitability for Aedes albopictus Skuse (Culicidae) in Europe under climate change conditions. Global and Planetary Change, 78:54-65. A. albopictus should deserve a longer discussion in Chapter 23, because of 1) its vectorial capacity to transmit infectious diseases, 2) its biting nuisance, 3) the "already observed" spread of that species in Europe over the last couple of decades (note that it has been detected few weeks ago in Paris, in north-western Turkey and Bulgaria, countries "climatically" at risk according to Caminade et al., 2012) and 4) the recent published papers (IPCC orientated) on that topic. (Cyril Caminade, University of Liverpool)	Section has been revised. Refs included.
453	51395	23	26	20	26	20	"unlikely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Text revised.
454	38438	23	26	21	0	0	While these definitions may be relevant in the context of this particular study, I think it would be generally more usual in the context of climate change studies to consider 15-20 years as near term. (Claire Goodess, University of East Anglia)	Text revised.
455	39307	23	26	24	0	0	I suggest a little of the history of malaria in Europe should be added. The article by Reiter: Reiter, P.Malaria Journal 2008, 7(Suppl 1):S3 (11 December 2008) gives details of history and reasons for disappearance, even as global temperatures were increasing. (PAUL REITER, INSTITUT PASTEUR)	Ref not added. Limited space for this discussion on historical issues.
456	51396	23	26	42	26	42	Given the description of evidence here, the author team may wish to consider presenting summary terms for evidence and agreement. (Katharine Mach, IPCC WGII TSU)	Text revised.
457	51397	23	26	49	26	49	The author team may wish to consider the wording on this line to ensure it would not be interpreted as potentially prescriptive. (Katharine Mach, IPCC WGII TSU)	Text revised.
458	38860	23	27	8	27	12	Fires were both forests and agricultural crops and had stronger impacts in southern Russia than in Moscow (e.g. Voronez region) (Rob Jongman, Wageningen UR)	Text on wildfires has been revised, but no new refs on the air pollution effects in russia were found.
459	38439	23	27	16	0	0	Can you give some examples of how the energy sector was affected? (Claire Goodess, University of East Anglia)	Refs added, where possible.
460	46471	23	27	23	27	34	The text on health systems and critical infrastructure is not sufficiently comprehensive. Recent experience from extreme weather for example in Sweden and Finland (winter storms 2007, 2011) highlights how storms can lead to to chain of events from felling of trees (in Sweden, the winter storm of 2007 fell in two hours so many trees that they amounted to 10 years worth of logging) to electricity blackouts lasting weeks at worst when the grid was compromised by felling of trees, to paralysis of services such as rail transport but also many other public services that depend on grid electricity. After the 2011 winterstorm and repeat experience the utility companies have been required to compensate their customers to the extent that the utilities are now replacing 10kV distribution lines with underground cabling which is more storm-proof - there are 55000 kilometers of lines to replace in Finland alone. (Jouni Paavola, University of Leeds)	It is difficult to find peer reviewed publications on impactson health systems. This example added to text.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
461	46472	23	27	23	27	34	While the example above is from Nordic countries and relates to winstorms only, other climate-related phenomena can also threaten vital services. Wild fires can compromise electricity supplies and overburden rescue services. Flooding can compromise energy supply, water supply and other public services locally. Similarly, extreme snowfall poses significant problems for transport sector and delivery of public services. Snow-related issues are insufficiently covered in the whole chapter - the recent climate science has established that warming is consistent with winters with more substantial snow fall, meaning that over the next several decades extreme events involving snow may become more frequent and severe across much of Europe despite warming trend. That is, extreme snow-related events are among adaptation challenges in Europe and local and sectoral authorities outside the Nordic region are not well placed to deal with it. (Jouni Paavola, University of Leeds)	Agreed. References needed to support evidence of these impacts.
462	38440	23	27	31	27	34	This paragraph could be merged with the previous one, since it actually discusses health systems/infrastructures. More relevant than schools - which do not really seem critical infrastructure in the context of your definition. (Claire Goodess, University of East Anglia)	Text revised.
463	38441	23	27	40	0	0	Is it possible to give a specific reference for the JRC report? (Claire Goodess, University of East Anglia)	ref added.
464	45821	23	27	40	0	0	The specific JRC report could be specified in the references list. (Juan-Carlos Ciscar, European Commission)	ref added.
465	51398	23	27	40	27	40	It would be preferable to spell out the acronym here and provide a citation to the report. (Katharine Mach, IPCC WGII TSU)	ref added.
466	53501	23	27	40	27	40	Please define JRC. (Kristie L. Ebi, IPCC WGII TSU)	Not in main text.
467	51399	23	27	42	27	42	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Text revised.
468	38442	23	27	45	0	0	Can you give the section number rather than 'see above'? (Claire Goodess, University of East Anglia)	agreed.
469	38861	23	27	45	28	3	It would be important to know the floodable area in Europe in relation to its population to value this statement. (Rob Jongman, Wageningen UR)	Not clear which statement this is referring to. There are various definitions for "floodable" so not clear if this would be useful.
470	35866	23	27	46	27	47	other studies about post-flood displacement? (Martin Price, University of the Highlands and Islands)	Agreed. Few references found, except study in Hull.
471	51400	23	28	1	28	1	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Text revised.
472	41550	23	28	2	28	2	I would add a comment about the role that can play in the impact, mitigation and adaptation measures in front of climate change and climate risks, the societal and individual perception of both problems (Llasat et al, 2009) Llasat, M.C., M. Llasat-Botija and L. López, 2009. A press database on natural risks and its application in the study of floods in northeastern Spain. Nat. Hazards Earth Syst. Sci., Sci., 9, 2049–2061, www.nat-hazards-earth-syst-sci.net/9/2049/2009/ (Maria-Carmen Llasat, University of Barcelona)	Comment unclear. Is this about perception of disasters. This is probably too detailed for this chapter.
473	38802	23	28	4	0	0	Eliminate the first are from the phrase ... populations are present in Arctic regions are considered (Ricardo Anadon, University of Oviedo)	agreed
474	38803	23	28	8	0	0	There are references of rapid coastal retreat due to melting of coastal permafrost in the Laptev Sea [Semiletov I.P., and O. Gustafsson, 2009. East Siberian Shelf Study Alleviates Scarcity of. Observations. Eos, Transactions, AGU, vol. 90, number 17] and probably occurs in other Siberian areas with potential effects on native peoples. I suggest to comment this aspect. (Ricardo Anadon, University of Oviedo)	Permafrost issues discussed in polar chapter.
475	36485	23	28	19	0	0	This section could include a brief discussion of the forthcoming reforms to the Common Agricultural Policy and their links to Rural Development Plans. (Paula Harrison, University of Oxford)	Don't agree. There is no literature to suggest how the CAP reforms will relate to climate change impacts and adaptation
476	51401	23	28	22	28	25	For these statements, it would be preferable to indicate the relevant climate/socioeconomic scenarios. (Katharine Mach, IPCC WGII TSU)	Reference to the relevant scenarios will be included
477	38443	23	28	22	28	32	Is it possible to indicate which impacts are temperature related and which precipitation related? Why might frost damage increase in permafrost areas? And why might salt crystallisation damage increase? (Claire Goodess, University of East Anglia)	The text has been edited to clarify this point
478	53502	23	28	23	28	23	Is the science unequivocal that these changes will occur? (Kristie L. Ebi, IPCC WGII TSU)	The level of confidence in these statements will be added
479	38314	23	28	25	28	25	Delete Bonazza et al 2009b which does not refer to surface recession (CRISTINA SABBIONI, CONSIGLIO NAZIONALE DELLE RICERCHE)	Reference deleted
480	38315	23	28	26	28	26	Delete Bonazza et al 2009a which does not refer to thermal stress (CRISTINA SABBIONI, CONSIGLIO NAZIONALE DELLE RICERCHE)	Reference deleted
481	51402	23	28	27	28	27	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	The language has been changed
482	51403	23	28	30	28	30	It may be preferable to adopt a more conditional framing for the description of higher precipitation levels here, unless they are uniformly predicted to increase in these regions of Europe. (Katharine Mach, IPCC WGII TSU)	The sentence edited to account for this
483	53503	23	28	35	28	35	Please define MOSE. (Kristie L. Ebi, IPCC WGII TSU)	revised.
484	35867	23	28	42	28	47	mention High Nature Value farmland: new book edited by Oppermann et al (though it does not mention climate change) (Martin Price, University of the Highlands and Islands)	HNV farmland is not really a cultural landscape per se
485	51404	23	28	42	28	47	Can any citations be provided to support the statements? If not, the qualification provided on line 49 would be helpful at the start of this paragraph. (Katharine Mach, IPCC WGII TSU)	The text will be edited accordingly
486	53504	23	28	42	28	47	References are needed. (Kristie L. Ebi, IPCC WGII TSU)	Refs added, where possible.
487	38444	23	28	42	29	2	Is it possible to include some references in these two paragraphs? (Claire Goodess, University of East Anglia)	Refs added, where possible.
488	40290	23	28	44	28	44	insert: "machair in Scotland, peatlands in Ireland." (John Sweeney, National University of Ireland Maynooth)	Done

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
489	40291	23	28	50	28	50	insert: "some climate envelope modelling of likely changes of likely changes in some has occurred e.g. for Irish blanket bogs (Coll et al, 2011)." (Coll, J et al (2011) , Developing a predictive modelling capacity for a climate change-vulnerable blanket bog habitat: Assessing 1961–1990 baseline relationships, Irish Geography 44(1) 27-60. (John Sweeney, National University of Ireland Maynooth)	Requested insert is not clear
490	35868	23	29	1	29	2	needs a reference. Recent IUCN Peatlands Enquiry in UK is relevant here and also at end of p 30. (Martin Price, University of the Highlands and Islands)	ref included
491	53505	23	29	4	29	19	This information was covered elsewhere in the chapter. (Kristie L. Ebi, IPCC WGII TSU)	Text revised.
492	51406	23	29	14	29	14	"unlikely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	To be checked, but the point here is different from elsewhere since this discusses vinelands as cultural (not productive) landscapes
493	40289	23	29	21	29	21	"such as Ireland," (Holden, N. , Brereton, A., and Fitzgerald, J. (2008), Impact of Climate Change on Irish Agricultural Production Systems. In Sweeney, J. (ed) Climate Change in Ireland: Refining the Impacts, Irish Environmental Protection Agency, Johnstown Castle, Wexford, 163pp. (John Sweeney, National University of Ireland Maynooth)	Ref not included.
494	38804	23	29	25	0	26	This sentence is unclear. I consider that biodiversity must be the substrata for ecosystem services, not biodiversity as a service provides by terrestrial and freshwater ecosystems. The question is that diverse ecosystem and diversity of species and genotypes are intrinsically part of the biodiversity itself (f.i. see the p 31 lin 52. I suggest to eliminate biodiversity as service, instead if Stoate et al 2009 incorporate this idea in their paper. As a good and very recent reference I suggest the paper Reich, P.B. Tilman, D. Isbell, F. Mueller, K. Hobbie, S.E. Flynn, D.F.B. Eisenhauer, N. 2012. Impacts of Biodiversity Loss Escalate Through Time as Redundancy Fades. Science 336: 589-592] that reflects long term changes in ecosystem services due to the loss of species in the ecosystems (Ricardo Anadon, University of Oviedo)	Text has been revised to clarify this point, and discussion on ecosystem services has been developed further.
495	36473	23	29	26	29	26	Biodiversity is not an ecosystem service in its own right, rather it underpins the delivery of many services. It can be defined as a cultural service in terms of hunting species, charismatic species or attractive landscapes, etc. There are many papers describing the contribution of biodiversity to ecosystem services through the identification of Ecosystem Service Providers, Service Providing Units or Functional traits, e.g. Luck et al. (2009). Quantifying the contribution of organisms to the provision of ecosystem services. Bioscience, 59(3): 223-235. (Paula Harrison, University of Oxford)	Text has been revised to clarify this point, and discussion on ecosystem services has been developed further.
496	38445	23	29	35	0	0	Can you give a source for this table/information? Include references in the table? (Claire Goodess, University of East Anglia)	Table not referenced because it is synthesis of evidence across multiple studies. Refs are in the section which are listed.
497	44888	23	29	38	30	9	see also http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/Climate-change/activities/prevention,-preparedness-and-response/heathealth-action-plans/heat-threatens-health-key-figures-for-europe (Sabine Wurzler, LANUV NRW)	Some discussion of heat wave warning systems is included based on primary research. The link provided by the reviewer is not an appropriate reference and does not provide new information from ar4. [check].
498	38446	23	29	40	29	50	Is it possible to comment on regional differences in air quality changes over Europe? (Claire Goodess, University of East Anglia)	reference on current regional differences added. Limited information on future effects but cross ref chapter 21
499	38447	23	29	46	0	0	Define CTM (Claire Goodess, University of East Anglia)	Chemistry transport models [will add to glossary as well]
500	51405	23	29	46	29	48	For this statement, it would be helpful to specify relevant climate/socioeconomic scenarios as relevant. Additionally, if "likely" on line 47 is being used as calibrated uncertainty language, it should be italicized; casual usage of this reserved likelihood term should be avoided. (Katharine Mach, IPCC WGII TSU)	Text revised.
501	38448	23	29	52	29	53	Really need references to these 'model studies' and 'recent evidence' (Claire Goodess, University of East Anglia)	Text revised.
502	53506	23	29	52	30	2	References are needed. (Kristie L. Ebi, IPCC WGII TSU)	done
503	38449	23	30	8	0	0	Is this referring to one particular event/year? (Claire Goodess, University of East Anglia)	Corrected
504	53507	23	30	9	30	30	Please ensure consistency with chapter 3. (Kristie L. Ebi, IPCC WGII TSU)	Agreed
505	38805	23	30	23	0	0	The reference of Garcia-Ruiz is duplicated (Ricardo Anadon, University of Oviedo)	revised
506	51407	23	30	28	30	36	For the statements, the author team should specify the relevant scenarios of climate change as appropriate. (Katharine Mach, IPCC WGII TSU)	Agreed.text revised.
507	38806	23	30	35	0	0	I suggest to change the phase in mineral soils organic carbon stocks, by less confusing for not specialist: in the organic carbon stocks of mineral soils (Ricardo Anadon, University of Oviedo)	Text clarified.
508	35869	23	31	11	31	30	Section 23.6.3 should mention impacts of changes in flows on water quality. (Martin Price, University of the Highlands and Islands)	Some discussion added.
509	52479	23	31	11	31	30	these papers are potentially relevant here: Howden, NJK, Burt, TP, Worrall, F, Whelan, MJ & Bierzoa, MZ. 'Nitrate concentrations and fluxes in the River Thames over 140 years (1868 - 2008): are increases irreversible?', Hydrological Processes, 24, (pp. 2657-2662), 2010. 10.1002/hyp.7835; Macleod C.J.A., Falloon P.D., Evans R., and Haygarth P.M. 2012. The Effects of Climate Change on the Mobilization of Diffuse Substances from Agricultural Systems. Advances in Agronomy 115, 41-47 (Peter Falloon, Met Office Hadley Centre)	Text not included. Not directly relevant.
510	36478	23	31	20	31	22	I don't understand this statement as Natura 2000 area are protected areas - they mainly consist of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). What protected areas are considered for the first set of figures and do these overlap with Natura 2000 sites? It would be much more interesting to compare figures for protected areas vs non-protected areas. (Paula Harrison, University of Oxford)	The sentence on pag 32 line 20-22 about protected areas in particular Natura2000 areas has been clarified, adding a comparison with unprotected ones.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
511	43840	23	31	27	0	0	Cross-reference to Chap 4.3.2.5 (Pam Berry, Oxford)	OK.
512	36481	23	31	33	0	0	Section 23.6.4: I am missing two important aspects from this section (i) The possibility of a species expanding its range depends on its dispersal ability and the role of long-distance dispersal. Dispersal models have been linked with niche-based models to examine this aspect (for example see del Barrio et al. (2006). Integrating multiple modelling approaches to predict the potential impacts of climate change on species' distributions in contrasting regions: comparison and implications for policy. Environmental Science and Policy, 9: 129-147. Increasing the connectivity or the permeability of the landscape to allow species movement is also crucial. (ii) a summary of research on indirect effects which I think is a key research gap, but there have been a few studies linking agricultural land use and biodiversity (e.g. Audsley et al. (2006) - see comment for page 20, line 16-18 for full reference and Berry et al. (2006). Assessing the vulnerability of agricultural land use and species to climate change and the role of policy in facilitating adaptation. Environmental Science and Policy, 9(2), 189-204. Also for wetlands: Harrison et al. (2008). Impact of socio-economic and climate change scenarios on wetlands: linking water resource and biodiversity meta-models. Climatic Change, 90, 113-139. (Paula Harrison, University of Oxford)	Thank you for the useful suggestions. We have carefully considered the papers you have suggested and we added in the text some of the references relevant for the topic.
513	53508	23	31	33	34	24	Please ensure consistency with chapter 4. (Kristie L. Ebi, IPCC WGII TSU)	No major inconsistencies have been identified so far, also in combination with the response of Chapter's 4 authors to FOD review comments.
514	36475	23	31	35	31	37	Add the reference or references that support this statement. (Paula Harrison, University of Oxford)	This statement has been deleted due to limited space.
515	36479	23	31	40	0	0	Section 23.6.4.1: Harrison et al. (2006) Modelling climate change impacts on species' distributions at the European scale: Implications for conservation policy. Environmental Science and Policy, 9: 116-128 contains results from modelling dominant and sensitive species within 10 habitats which are important in 6 European countries. The consequences of climate change for the different habitats are variable. Where the trend for component species is consistent, as is the case for the mountain hay meadows in Italy and Mediterranean arid rangelands in Spain, then it could be assumed that they would retract or expand their range respectively. This assumption is based on other component species showing a similar response. Elsewhere, the future of the habitat appears to depend much more on the species under consideration. If the dominants continue to find suitable climate space, as is the case in acidic beech woodlands, then it could be assumed that the habitat would continue in existence, but with a slightly different species composition. Other habitats, such as cereal field margins and lowland calcareous grassland in the UK, however, show a mixed response between species and scenarios. The paper also discusses adaptation measures which could safeguard vulnerable species and facilitate the movement of others. The movement of species highlights and nature conservation under climate change will require EU policy strategies that are more dynamic and holistic, and which are regularly reviewed and updated as scientific knowledge is advanced. (Paula Harrison, University of Oxford)	Thank you for the useful suggestions. However the concept is already marked in the sections of plant and animal species, and the reference has not been added here due to limited space.
516	43841	23	31	40	0	0	I am surprised that some comment is not made about palsa mires, which although they may be considered localised are very threatened by climate change and have CO2 consequences see FRONZEK, S., LUOTO, M. & CARTER, T. R. (2006). Potential effect of climate change on the distribution of palsa mires in subarctic Fennoscandia. Climate Research 32, 1-12. (Pam Berry, Oxford)	Thank you for the useful suggestions. We have carefully considered the paper you have suggested and added in the text.
517	49864	23	31	40	32	24	There are several papers reporting the disappearance of discontinuous permafrost (habitats for breeding birds) in northern Europe, which incidentally also apply probabilistic projections of climate taken from the ENSEMBLES project as well as treating impact model uncertainties in a more rigorous way than is typically undertaken: Fronzek, S., Carter, T.R., Räisänen, J., Ruokolainen, L. and Luoto, M. 2010a. Applying probabilistic projections of climate change with impact models: a case study for sub-arctic palsa mires in Fennoscandia. Climatic Change 99: 515-534; Fronzek, S., Carter, T.R. and Luoto, M. 2011. Evaluating sources of uncertainty in modelling the impact of probabilistic climate change on sub-arctic palsa mires. Nat. Hazards Earth Syst. Sci. 11, 2981-2995. Finally, in this section and in relation to species distributions, a very nice reference source that emerged out of the FP6 ALARM project is: Settele, J., Penev, L., Georgiev, R. G., Grobelenik, V., Hammen, V., Klotz, S., Kühn, I. (eds.). Atlas of Biodiversity Risks. Sofia & Moscow: Pensoft. (Timothy Carter, Finnish Environment Institute)	Thank you for the useful suggestions. We have carefully considered the papers you have suggested and added in the text.
518	38862	23	31	42	31	49	This section is named habitats and starts with species trends. This is not logical. The use of habitat in Europe should be better explained as habitat is also defined in the sense of ecosystems in the EU habitats Directive and has a special meaning in Nature conservation policy. Habitats are specifically referred to in the European Union (EU) Habitats Directive which includes a list (Annex I) of habitats to be protected (Council Directive 92/43/EEC). These habitats are described in various levels of detail in the Interpretation Manual (European Commission, 2007). In general species and habitats are not clearly separated. (Rob Jongman, Wageningen UR)	Thank you. The phrase dealing with species trends has moved to the species's section.
519	51408	23	31	45	31	47	It would be helpful to indicate which climate scenarios correspond to the lower and upper bounds of estimates provided here. (Katharine Mach, IPCC WGII TSU)	The corresponding climate scenarios (B1 and A1FI) to the lower and upper bounds of estimates have been provided here.
520	38029	23	31	49	31	49	suggest to add at the end of the paragraph: 'A hybrid model that combines projections of habitat shifts with simulations of demography and seed dispersal forecasts for the European Alps and 150 alpine plant species an average range size reduction of 44-50% and also suggests that on average 40% of the range still occupied at the end of the century will be climatically unsuitable and, thus, creating an extinction debt (Dullinger et al. 2012)'. New reference: Dullinger, S., Gattringer, A., Thuiller, W., Moser, D., Zimmermann, N.E., Guisan, A., Willner, W., Plutzer, C., Leitner, M., Mang, T., Caccianiga, M., Dirnböck, T., Siegrun, E., Fischer, A., Lenoir, J., Svenning, J.-C., Psomas, A., Schmatz, D.R., Silc, U., Vittoz, P. & Hülber, K. (2012) Extinction debt of high-mountain plants under twenty-first-century climate change. Nature Climate Change, doi 10.1038/NCLIMATE1514. (Harald Pauli, Austrian Academy of Sciences)	Thank you for the useful suggestion. We have added the sentence in the text.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
521	43843	23	31	51	0	0	Following on from the previous paragraph it would be helpful to start this paragraph with the general statement "The projected climatic changes are likely to affect habitat composition". For example, in the uplands of Great Britain (Pam Berry, Oxford)	The sentences has been shortened and modified.
522	36477	23	31	51	31	52	Do you mean upland ecosystem services or all terrestrial ecosystem services here? (Paula Harrison, University of Oxford)	The sentences has been shortened and modified due to limited space.
523	38450	23	31	51	32	6	Does all this relate to the UK? If so, please make that clear. I would avoid saying 'will'. (Claire Goodess, University of East Anglia)	The paragraph has been reorganized, shortened and clarified in the text to avoid confusion.
524	43842	23	31	51	32	6	There is a need to make clear that all this paragraph refers to a study in Great Britain (Pam Berry, Oxford)	The paragraph has been reorganized, shortened and clarified in the text to avoid confusion.
525	35870	23	31	52	0	0	meaning not clear. (Martin Price, University of the Highlands and Islands)	The text has been clarified to avoid confusion.
526	36476	23	31	52	31	54	Define "upland area" so that this statement makes sense. Although it is not clear why low altitude areas are most vulnerable. (Paula Harrison, University of Oxford)	The "upland area" refers to < 300 m of altitude. This has been clarified in the text.
527	38807	23	31	53	0	0	I suggest a change of order, high and low, by low and high, because the first values are related to low emission scenarios (?) (Ricardo Anadon, University of Oviedo)	Thank you, this has been changed in the text. It was a typing mistake.
528	51409	23	32	3	32	6	For this statement, the author team should indicate the relevant climate/socioeconomic scenarios as relevant. Additionally, if "likely" is being used on line 4 as calibrated uncertainty language, it should be italicized. Casual usage of this reserved likelihood term should be avoided. (Katharine Mach, IPCC WGII TSU)	The climate scenarios have been added.
529	38863	23	32	8	32	16	It might be important to give general European trends and/or make regional divisions between Mediterranean, Alpine (Gloria network Pauli et al 2012, Dullinger et al 2011, Grabherr 2010), Boreal, Continental and Atlantic as there are serious differences between them, for instance in invasive species (e.g. Corripes). (Rob Jongman, Wageningen UR)	This paragraph has been shortened and reorganized due to limited available space.
530	52646	23	32	9	0	0	Shorter and milder winters may also results in reduced fish survival due to reduced or lack protective ice cover during winter as well as increased metabolic rates during winter and spring. (Else Marie Løbersli, Norwegian directorate for nature management)	Thank you for the suggestions, however we found only few papers dealing with effects of reduced ice covering on fish survival. We would greatly appreciate suggestions by the reviewer of any references (after 2006) in this regard.
531	44141	23	32	13	32	16	References missing (Anne Holsten, Potsdam Institute for Climate Impact Research)	References from Blaustein, et al., 2010; Hartel, et al. 2011; Gómez-Rodríguez et al. 2010; Della Bella et al. 2008; Morán-López et al, 2012; elzinga et al, 2007 have bene added.
532	38451	23	32	14	0	0	What do you mean by 'hydroperiods' (Claire Goodess, University of East Anglia)	"Hydroperiods" stands for the length of time and portion of year the wetland holds ponded water. This has been clarifie din the text.
533	51412	23	32	15	32	15	"very likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	This was a casual usage of likelihood term, so it has been removed.
534	38864	23	32	16	32	16	The statement on river fragemntation is stand alone, and need a better reference. Will climate change have an impact on fragmentation and if so how and based on which reference? (Rob Jongman, Wageningen UR)	References from Blaustein, et al., 2010; Hartel, et al. 2011; Gómez-Rodríguez et al. 2010; Della Bella et al. 2008; Morán-López et al, 2012; elzinga et al, 2007 have bene added.
535	44142	23	32	18	32	20	Protected areas can also play a key role in the regional water cyle under climate change, especially when they comprise larger wetland areas: A study for Northeastern Germany, with relatively dry climatic conditions, has shown a strong reductions in plant available soil moisture within nature conservation areas in future, with large shares of wetland. However, the total amount of available soil water in these areas still remains much higher than in the sourrounding areas, which underline the role of these areas for the regionl water balance (Holsten et al. 2009). Holsten, A.; Vetter, V.; Vohland, K.; Krysanova, V. (2009): Impact of climate change on soil moisture dynamics in Brandenburg with a focus on nature conservation areas. Ecological Modelling, 220/17, 2076-2087 (Anne Holsten, Potsdam Institute for Climate Impact Research)	Thank you. This is of great interest but due to limited space we have shortened the paragraph.
536	37043	23	32	18	32	24	Please rephrase. The first sentence makes no sense as climate is equal for protected and not-protected areas that are adjacent to each other. Can a species lose its climate? (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	Climate is equal for protected and not-protected areas, however this sentence deal with their capacity to retain climatic suitability for species under climate change. However this paragraph has been reorganized in order to avoid confusion.
537	38865	23	32	18	33	44	There is more written about this than only by Araujo, See among others Evans, 2006, 2010, Mücher et al 2009, I also would expect more reference to fragmentation and climate change cf Schippers et al 2011, Verboom et al 2010 (Rob Jongman, Wageningen UR)	Thank you, more refernces have been evaluated and added.
538	51410	23	32	20	32	22	For this statement, it would be helpful to indicate the relevant climate/socio-economic scenarios, along with specifying the key drivers for projected changes. (Katharine Mach, IPCC WGII TSU)	The relevant emission scenarios (A1FI, A2, B1, B2) have been added
539	35871	23	32	22	0	0	very few, if any, conservation areas are selected taking climate change into account: it is not a hypothesis! (Martin Price, University of the Highlands and Islands)	More references confirming this have been added and teh term "hypotesis" has been deleted.
540	44140	23	32	29	32	29	More detailed evidence of phenology shifts in Europe is available: An average earlier onset of plant phases of 3.8 days per 1 °C increase over the last decades has been observed for Europe, with negative shifts for spring and summer phases and positive shifts for fall phases (Estrella et al. 2009). N. Estrella, T.H. Sparks, A. Menzel, Effects of temperature, phase type and timing, location, and human density on plant phenological responses in Europe, Climate Research 39 (3) (2009) 235–248. (Anne Holsten, Potsdam Institute for Climate Impact Research)	Thank you for the useful suggestion, however due to limited space this will be only sketched in the text.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
541	43844	23	32	35	32	39	Reference needed (Pam Berry, Oxford)	Reference from Alkemade et al.,2011 has been added
542	36480	23	32	36	32	39	Include reference for this study. (Paula Harrison, University of Oxford)	Reference from Alkemade et al.,2011 has been added
543	38866	23	32	36	32	39	References? (Rob Jongman, Wageningen UR)	Reference from Alkemade et al.,2011 has been added
544	43097	23	32	41	32	49	The work of Trivedi et al. in Scotland shows that mountain top flora can be more vulnerable than previously thought as a result of bioclimatic envelope models underestimating sensitivity to climate by averaging over large grid squares: Trivedi, et al. (2008) Spatial scale affects bioclimate model projections of climate change impacts on mountain plants. Global Change Biology 14: 1-15. Trivedi et al. (2008) Potential effects of climate change on plant communities in montane nature reserves in Scotland, UK. Biological Conservation. 141:1665-1675. (Michael Morecroft, Natural England)	Thank you for the useful suggestion, however due to limited space this can not be included in the text.
545	51411	23	32	46	32	49	For this statement, it would be helpful to specify the relevant time frame. (Katharine Mach, IPCC WGII TSU)	The relevant time frame (2001-2008) has been reported in the text.
546	52647	23	32	51	33	17	How will European forests respond to increased drought (and associated increased fire) and flooding events? (Else Marie Løbersli, Norwegian directorate for nature management)	The point is interesting. Nevertheless the paragraph is mainly based on the impacts of climate change on the ecosystems it is interesting of course also to know how they respond to the observed and projected impacts. However there is a dedicated section dealing with "forests" where these issues are analyzed.
547	38452	23	32	54	0	0	By 'all models' - do you mean all climate models (scenarios) - or all vegetation models? (Claire Goodess, University of East Anglia)	The sentences has been modified to avoid confusion.
548	51413	23	33	1	33	1	The genus and species name provided here should be italicized. (Katharine Mach, IPCC WGII TSU)	The genus and species name have been italicized
549	38453	23	33	3	0	0	I'm not sure what is meant by 'versatility of forest tree formations' (Claire Goodess, University of East Anglia)	The sentence has been shortened and partially deleted due to limited space.
550	39191	23	33	4	33	7	Here it could be added that fragmentation can also 'protect' populations from pollen flow from sites not adapted to this or future situations (see Kremer et al. 2012 Ecology Letters 15: 378–392. (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Thank you for the useful suggestion, however due to limited space this can not be included in the text.
551	38454	23	33	10	0	0	To what extent do these studies take into account landuse/ecosystem changes as well as climate change - i.e., are they considering direct and indirect effects of climate change - or mainly just direct? (Claire Goodess, University of East Anglia)	All the paragraph has been reorganized in order to be clearer.
552	54503	23	33	11	3	13	Please check the relevance of section 23.8.3 to this finding. In addition, the traceable account for the last statement that adaptation can prevent most of the projected damages is not completely clear, as the extent to which this is possible is not directly discussed in the referenced sections. (Michael Mastrandrea, IPCC WGII TSU)	Section 23.8.3 has been cross checked and the paragraph has been reorganized in order to be better understandable.
553	35872	23	33	12	0	0	'advancement in the life cycles': needs better wording (Martin Price, University of the Highlands and Islands)	This sentence has been deleted due to limited space.
554	43845	23	33	12	33	13	This is in contrast to some species in Japan where some spring phenology has been delayed (See Lee, 2011; Ogawa-Onishi and Berry, in press) (Pam Berry, Oxford)	This is probably true, however the chapter deal specifically about Europe. However we would greatly appreciate the suggestion by the reviewer of any references (after 2006 and for Europe) in this regard.
555	43098	23	33	25	33	32	See also Keith et al (2009) Non-analogous community formation in response to climate change. Journal for Nature Conservation 17: 228-235. (Michael Morecroft, Natural England)	Thank you for the useful suggestion. The reference from Keith et al (2009) has been added.
556	51414	23	33	27	33	30	For this statement, the relevant climate/socioeconomic scenarios should be specified. (Katharine Mach, IPCC WGII TSU)	The section has been shortened and this statemnet has been removed.
557	38808	23	33	31	0	32	The reference of [Williams, J.W. Jackson, S.T. 2007. Novel climates, no-analog communities, and ecological surprises. Frontiers in Ecology and the Environment, 5 (9): 475-482] I thought is interestinf to reinforce the idea. Also the guest editorial of [Bridgewater, P. Higgs, E.S. Hobbs, R. J. Jackson, S.T. Engaging with novel ecosystems. Frontiers in Ecology and the Environment, 9 (8): 423] could be referred as interesting reference about novel ecosystems anf climate change (Ricardo Anadon, University of Oviedo)	Thank you for the suggestion, but these papers refere to America and tropical and subtropical regions, while this chapter is specific for Europe.
558	38809	23	33	39	0	0	I suggest to refer to: Lemoine et al (2007a) and Lemoine et al (2007b) showed (Ricardo Anadon, University of Oviedo)	The sentence has been reorganized.
559	38455	23	33	46	33	52	Does all the information in this paragraph come from Schaefer et al? Perhaps cite earlier in paragraph (Claire Goodess, University of East Anglia)	All the paragraph has been reorganized in order to avoid confusion and the reference from Schaefer et al has been added.
560	51415	23	33	49	33	49	The phrase "limited evidence" as calibrated uncertainty language should be italicized. Additionally, the author team should consider assigning a summary term for agreement. (Katharine Mach, IPCC WGII TSU)	The phrase has been reorganized with any reference to the calibrated uncertainty
561	51416	23	34	6	34	6	It would be preferable to specify which 2 scenarios are meant here. (Katharine Mach, IPCC WGII TSU)	The two scenarios A1 and B2 have been specified.
562	38810	23	34	11	0	0	Correct direct and direct, by direct and indirect ... (Ricardo Anadon, University of Oviedo)	Thank you, this has been changed in the text. It was a typing mistake.
563	35873	23	34	11	34	24	Section 23.6.4.4 should mention publications driving from Mountain Invasion Research Network (MIREN): se http://www.miren.ethz.ch/publications/index.html (Martin Price, University of the Highlands and Islands)	Thank you for the useful suggestions. We have carefully considered the papers you have suggested and we added in the text some of the references relevant for the topic.
564	38867	23	34	11	34	24	There is better information on invasive species than presented here, what seems rather anecdotic. See among others Genovesi 2011, Lambertini et al 2011, Vila 2010, Roy et al 2011, 2012. (Rob Jongman, Wageningen UR)	Thank you for the useful suggestions. We have carefully considered the papers you have suggested and we added in the text some of the references relevant for the topic.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
565	44735	23	34	11	34	25	I think forestry should be better treated in Chapter 23.6.4.4 - see for example results from and references in the article "Combining ecological and economic modelling in analysing a pest invasion contingency plan – The case of pine wood nematode in Norway" DOI:10.1080/02827581.2011.637509 (Birger Solberg, Norwegian University of Life Sciences)	Thank you for the useful suggestion. However this is probably of more interest for the section 23.4.4. on "Forestry". However because of limited space it has not be added.
566	38030	23	34	18	34	19	suggest to add scientific plant names (Harald Pauli, Austrian Academy of Sciences)	The scientific plant names of Gunnera manicata and G. tinctoria have been added.
567	52648	23	34	19	34	21	Interesting statement, but reference to scientific publication is lacking. (Else Marie Løbersli, Norwegian directorate for nature management)	The reference is from the scientific publication of Petitpierre et al., 2012. However the paragraph has been shortened and reorganized in order to avoid confusion.
568	38456	23	34	22	33	24	I don't really understand the significance of the point about ecological niche models. Are such models used appropriately in the literature - or do they tend to be used inappropriately - or not used at all? (Claire Goodess, University of East Anglia)	This sentence has been deleted due to limited space.
569	36482	23	34	27	0	0	Section 23.6.5: Richards et al. (2008) Regional assessment of climate change impacts on coastal and fluvial ecosystems and the scope for adaptation. Climatic Change 90 141-167 has results for saltmarsh and coastal grazing marsh coastal habitats in the UK. (Paula Harrison, University of Oxford)	ref not included.
570	51417	23	34	27	0	0	Section 23.6.5. The author team should consider and reduce overlap between this section and 23.4.6. Additionally, the author team may wish to consider and cross-reference chapters 6, 5, or 30, and potentially also the working group 1 contribution to the 5th assessment report. (Katharine Mach, IPCC WGII TSU)	Any overlap between sections will be removed
571	53509	23	34	27	35	26	Please ensure consistency with chapter 5. (Kristie L. Ebi, IPCC WGII TSU)	Consistency checked with Ch 5
572	38811	23	34	41	0	0	I suggest to incorporate a reference not only to Celtic seas, if not west and Northwest Iberian Peninsula, in which recent paper has demonstrated long term very crucial changes in intertidal and subtidal communities. Good references were [Lima, F.P. Ribeiro, P.A. Queiroz, N. Hawkins, S. J. Santos, A.M. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern?. Global Change Biology, 13: 2592-2604; Fernández, C. 2011. The retreat of large brown seaweeds on the north coast of Spain: the case of Saccorhiza polyschides. European Journal of Phycology, 46:352-360; Lamela, C., Fernández, C., Arrontes, J. y Anadón, R. 2012. Fucoids Assemblages on the North Coast of Spain: Past and Present (1977-2007). Botánica Marina, 55: 199–207; Díez, I. Muguerza, N. Santolaria, A. Ganzedo, U. Gorostiaga J.M. 2012. Seaweed assemblage changes in the eastern Cantabrian Sea and their potential relationship to climate change. Estuarine, Coastal and Shelf Science 99: 108-120] (Ricardo Anadon, University of Oviedo)	These references will reviewed but not included
573	38457	23	34	44	0	0	Clarify what is meant by 'varying rates of phenologies' (Claire Goodess, University of East Anglia)	Text clarified.
574	38812	23	34	51	0	0	The reference of [Sabatés, A. Martín, P. Lloret, J. Raya, V. 2006. Sea warming and fish distribution: the case of the small pelagic fish, Sardinella aurita, in the western Mediterranean. Global Change Biology, 12: 2209-2219] shows the changes of a small pelagic sardine fishery in the Iberian Mediterranean. With this reference expansion of warmer species in different seas than East Atlantic (Ricardo Anadon, University of Oviedo)	More relevant to the fisheries section rather than here? Not published since 2008 but will note if there are limited publications on this topic since AR4.
575	38813	23	35	10	0	0	The are a good reference of changes in stratification lengthening [González-Taboada, F. y Anadón, R. online. Patterns of change in sea surface temperature in the North Atlantic during the last three decades: beyond mean trends. Climatic Change. http://www.springerlink.com/content/n1171w7628217167/?MUD=MP], and long-term influences on nutrient concentration as well changing upwelling regime as well phytoplankton responses [Llope, M., Anadón, R., Viesca, L., Quevedo, M., González-Quirós, R., Stenseth, N.C. 2006 Hydrography of the Southern Bay of Biscay shelf break region: integrating the multi-scale physical variability over the period 1993-2003. J. Geophys. Res. 111, C0921, doi:10.1029/2005JC002963; Llope, M., Anadón, R., Sostres, J.A., Viesca, L. (2007) Nutrients dynamics in the southern Bay of Biscay (1993-2003): winter supply, stoichiometry, long-term trends and their effects on the phytoplankton community. J.Geophys.Res. doi:10.1029/2006JC003575; F I Z F. PÉ REZ*, XOSE A . PADÍN, YOLANDA PAZOS, MIGUEL GILCOTO, MANUEL CABANAS, PAULA C. PARDO, Maria DOLORES DOVALand LUIS FARINA-BUSTO. (2010) Plankton response to weakening of the Iberian coastal upwelling. Global Change Biology 16, 1258–1267, doi: 10.1111/j.1365-2486.2009.02125.x] (Ricardo Anadon, University of Oviedo)	These references were revised and included if appropriate.
576	51418	23	35	13	35	15	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	The language reviewed
577	40292	23	35	38	35	38	The important role played by legislative instruments in Europe requires a mention here. IN particular the requirement under the EU Directive on Strategic Environmental Assessment that plans, programmes and policies shall be accompanied by an impact statement whcih explicitly considers climate change impacts among others. (John Sweeney, National University of Ireland Maynooth)	Agreed, SEA and EIA guidance now appearing in the EU will be included. More in general, the section 23.7 will start with an overview of European legislation on adaptation (White paper and other policy areas) TBD
578	48783	23	35	43	0	44	Other studies can be mentioned : Pfenninger, Hanger, Dreyfus, Dubel, Hernández-Mora, Esteve, Varela-Ortega, Watkiss and Patt (2012), "Report on perceived policy needs and decision contexts", for the European commission in the MEDIATION project framework, and Dumollard G and Leseur A (2011) Drawing up a national adaptation policy: feedback on five European case studies, CDC Climat Research report, Paris. (ALEXIA LESEUR, CDC Climat Research)	Thanks, will include
579	36483	23	35	43	35	43	See also Swart, R. et al. (2009). Europe Adapts to Climate Change: Comparing National Adaptation Strategies. PEER Report No. 1, Helsinki: Partnership for European Environmental Research. Available from www.peer.eu . (Paula Harrison, University of Oxford)	Agreed, will include reference to PEER report, which is same as Biesbroek et al paper
580	38109	23	35	43	35	43	add to Biesbroek et al., 2010 this following citation: "PEER, 2009). (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	Agreed, will include reference to PEER report, which is same as Biesbroek et al paper

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
581	41551	23	35	43	35	53	It would be interesting to start with the reference of the European Union, "White paper. Adapting to climate change: Towards a European framework for action" that define the framework of actuation in front of climate change impacts. From the national perspective, France has presented recently its climate change adaptation plan (Ministère de l'Écologie, du Développement Durable, des Transports et de Logement, 2011), that involve all the sectors that could be affected by climate change, including natural and technological risks, different actors, prevention, mitigation and resilience measures, etc. The plan will be monitored by the National Observatory for the Effects of Global Warming (ONERC). European Commission, 2009a. White paper. Adapting to climate change: Towards a European framework for action. COM(2009) 147. Brussels, 1 April 2009 Ministère de l'Écologie, du Développement Durable, des Transports et de Logement, 2011. French National Climate Change Impact Adaptation Plan, 2011 – 2015. (Maria-Carmen Llasat, University of Barcelona)	It is not the purpose of this chapter to discuss policy instruments and the EU legislation is described elsewhere.
582	49865	23	35	44	35	44	It might also be useful to reference the full report: Swart, R., Biesbroek, R., Binnerup, S., Carter, T.R., Cowan, C., Henrichs, T., Loquen, S., Mela, H., Morecroft, M., Reese, M. and Rey, D. 2009. Europe Adapts to Climate Change: Comparing National Adaptation Strategies. PEER Report No 1. Helsinki: Partnership for European Environmental Research, 280 pp. (Timothy Carter, Finnish Environment Institute)	Agreed, will include reference to PEER report, which is same as Biesbroek et al paper
583	38111	23	35	45	35	45	add after "relates to": "natural hazard prevention, environment protection" (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	Agreed, will add
584	41552	23	36	1	36	1	P.36, l1. Before speaking of local government level, I would add a regional government level, perhaps something like this: "At regional level, in deep studies on the impact of climate change in the region and subsequent mitigation and adaptation strategies have been done. This is the case of Catalonia, Spain (Llebot (coord), 2010) Llebot (coord.), J.E., 2010.Segon informe sobre el canvi climàtic a Catalunya, Institut d'Estudis Catalans i Generalitat de Catalunya, Departament de la Vicepresidència, Consell Assessor per al Desenvolupament Sostenible de Catalunya, pp. 243-307, ISBN (IEC): 978-84-9965-027-2, ISBN (Gencat): 978-84-393-8615-5, Dipòsit Legal: B. 44160-2010. An executive summary in English can be found at the web of CADS, Generalitat de Catalunya. http://www15.gencat.net/cads/AppPHP/index.php (Maria-Carmen Llasat, University of Barcelona)	Our aim is not to list all national, regional and local studies. We cover scientific literature on the development of these policies here.
585	35874	23	36	1	36	7	also need to mention adaptation in smaller urban centres and rural areas; cf Clim-ATIC project (www.clim-atic.org) and publications by Carlo Aall caa@vestforsk.no (Martin Price, University of the Highlands and Islands)	Agreed, will contact and add
586	38868	23	36	21	36	29	I would like to see an overview which (urbaised) regions have made these kind of analysis/plans (Rob Jongman, Wageningen UR)	Purpose of chapter is not to provide overview, but will include more regional plans (also in line with comments 584 and 85)
587	54897	23	36	32	0	0	Figure 23.7 The author team may wish to coordinate with chapter 2 and 8 about decision making process figures. (Monalisa Chatterjee, IPCC WGII TSU)	This figure has been dropped.
588	35875	23	36	36	36	54	Section 23.7.2 should mention the Water Framework Directive (Martin Price, University of the Highlands and Islands)	Agreed
589	43846	23	37	3	0	0	How about including about the UK Climate Change Risk Assessment see http://www.defra.gov.uk/environment/climate/government/risk-assessment/ (Pam Berry, Oxford)	Agreed, some chapters have been cited.
590	35876	23	37	3	37	25	Section 23.7.3 should mention risk and management of fires. Risks in general are likely to increase particularly in mountain areas. (Martin Price, University of the Highlands and Islands)	Agreed, fire risk is now included in section 23.3
591	41553	23	37	5	37	6	The own climate change is a risk. I would add a comment about the risks in international security associated to climate change that was presented by the High Representative of European Union (European Commission, 2008): conflicts due to resources availability and distribution, energy supply, economic losses and displacements due to the increase of some climate risks and sea level, etc. Besides this, the European Commission has made a communication about a community approach to the prevention of natural and anthropogenic disasters (European Commission, 2009). In the same line, the government of Spain (Gobierno de España, 2011) has presented a strategy of security that deals with the potential conflicts due to the water scarcity, the poverty raise, the displacements of population from Africa as a consequence of climate change (climate refugees), the impact of climate change in floods, droughts,... European Commission, 2008. Climate change and International security. Paper from the High Representative and the European Commission to the European Council S113/08. 14 March 2008. European Commission, 2009. Communication to the European Parliament, to the Council, to the Economic and Social Committee, and to the Regions Committee. A community approach for the prevention of natural and anthropogenic catastrophes. COM(2009) 82. Gobierno de España, 2011. Estrategia española de seguridad. Una responsabilidad de todos. Depósito Legal: M-28305-2011. http://www.lamoncloa.gob.es (Maria-Carmen Llasat, University of Barcelona)	Partially agreed. International security is a non-European issue; we can mention in section 23.9; and will include EU communication and Spanish strategy [check chapter on Human Security]
592	41466	23	37	25	37	25	Could be mention here WMO Disaster Risk Reduction Programme. This includes observing, detecting, monitoring, predicting and early warning of a wide range of weather, climate and water-related hazards. Through a coordinated approach, and working with its partners, WMO addresses the information needs and requirements of the disaster risk management community in an effective and timely fashion. One of the recent outcome from DRR-SEE Project which includes Strengthening Multi-Hazard Early Warning Systems and Risk Assessment in the Western Balkans and Turkey: assessment of capacities, gaps and needs has been published at: http://library.wmo.int/pmb_ged/SEEPPhaseI-FinalReport.pdf (SERHAT SENSOY, TURKISH STATE METEOROLOGICAL SERVICE)	Will review, but only include when relevant for climate impact and adaptation
593	43847	23	37	28	0	0	Wilson, E and Piper, J. 2012 Spatial Planning and Climate Change. Taylor & Francis and articles therein are useful for this section. (Pam Berry, Oxford)	ref not included.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
594	51419	23	37	38	37	38	The phrase "limited evidence" as calibrated uncertainty language should be italicized. (Katharine Mach, IPCC WGII TSU)	language reviewed
595	35493	23	37	46	37	51	The Helsinki Metropolitan Area Climate Change Adaptation Strategy (HSY 2012) has been published in Finnish and is available at: http://www.hsy.fi/tietoahsy/Documents/Julkaisut/10_2012_paakaupunkiseudun_ilmastonmuutokseen_sopeutumisen_strategia.pdf The strategy will be published in English in August 2012, reference: HSY 2012. Helsinki Metropolitan Area Climate Change Adaption Strategy. HSY Publications 11/2012. Edita Prima Oy, Helsinki, 32 p. The English version will be available at: http://www.hsy.fi/tietoahsy/julkaisut/Sivut/Julkaisut.aspx (Susanna Kankaanpää, Helsinki Region Environmental Services Authority (HSY))	The report will be reviewed and if relevant incorporated
596	51420	23	38	7	38	7	It would be preferable to specify the emissions scenario explicitly. (Katharine Mach, IPCC WGII TSU)	The emissions scenario will be specified
597	36484	23	38	11	0	0	This paragraph could be expanded to include discussion of the Ecosystem Approach and how an ecosystem services approach or ecosystem-based adaptation (EbA) can help with climate change adaptation. EbA is promoted as a cost-efficient means of climate adaptation: healthy natural systems can provide us with autonomous adaptation and provide their services to human communities free of charge. The CBD Ad Hoc Technical Expert Group on Biodiversity and Climate Change define this as follows: "Ecosystem-based adaptation (EbA) may be described as the use of ecosystem management activities to support societal adaptation. EbA identifies and implements a range of strategies for the management, conservation and restoration of ecosystems to provide services that enable people to adapt to the impacts of climate change. It aims to increase the resilience and reduce the vulnerability of ecosystems and people in the face of climate change." EbA draws heavily from the Millennium Ecosystem Assessment linking biodiversity, ecosystem services and human well-being. It emphasizes economic arguments that show that it is a good investment to put our resources into maintaining our natural resource base and healthy functioning ecosystems, in restoring them (if necessary due to degradation), and even developing them through investments in green infrastructure. EbA can be applied in any sector affected by climate change and hence it can contribute to climate policy integration if other policy sectors take into consideration the potential services nature provides and build their policies accordingly. Further, in many protected areas conservation needs to be integrated into other policies, including those relating to land use (especially agriculture and forestry), as the preservation of biodiversity and services in the designated sites may require human activities to be maintained or encouraged. (Paula Harrison, University of Oxford)	Further review will assess whether relevant literature with respect to climate change merits inclusion of a discussion of this point
598	35877	23	38	19	38	32	Section 23.7.5 is not entirely correct. For instance, the Alpine Space programme is explicitly considering the impacts of climate change on rural development, and so are projects in other Interreg programmes. (Martin Price, University of the Highlands and Islands)	This section indicated that little research had been conducted on rural development, rather than none. What is being undertaken appears to be 'in-progress' as indicated by the suggested on-going projects. However, these sources will be further reviewed, with their inclusion dependent on the availability of relevant literature with respect to climate change.
599	38458	23	38	27	0	0	Is it possible to give a reference for the EU Leader programme? (Claire Goodess, University of East Anglia)	No space to include this.
600	41779	23	38	31	0	32	Perch-Nielsen 2008 - does not assess climate change and snowmaking. There are studies that do however and they should be cited. See work of Steiger, Vanham, et al. and other recent work in Switzerland and Austria to support this discussion (as well as work in North America and Australia - see the review by Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232). (Daniel Scott, University of Waterloo)	This point refers to another part of the document: page 39 (not 38* lines 31-32)
601	53510	23	38	35	38	50	Please ensure consistency with chapter 17. (Kristie L. Ebi, IPCC WGII TSU)	This section was prepared by R. Mechler from Chapter 17
602	37712	23	38	38	0	0	Can you give a specific example reference or two for the "previous studies" noted in AR4. (seem nasty to have to work through AR4 if this point is of interest to the reader. Also having a reference will help the search through AR4. (George Backus, Sandia National Laboratories)	reference to AR4 section added.
603	45822	23	39	1	0	0	The authors of the Chapter could maybe add a subsection on security of energy supply, as an additional benefit of climate mitigation. The importance of it in macroeconomic terms is significant. For instance, the paper by Maisonnave et al. (2012) assesses the relative degree of protection provided by climate policy when an oil price shock occurs. Maisonnave H, Pycroft J, Saveyn B, JC Ciscar: 2012. Does climate policy make the EU economy more resilient to oil price rises? A CGE analysis. Energy Policy (2012), http://dx.doi.org/10.1016/j.enpol.2012.04.053 (Juan-Carlos Ciscar, European Commission)	There is limited literature on this. Not included in the chapter.
604	46473	23	39	4	39	5	The statement about the absence of economic rationale for mitigation at national or sub-national levels is an over-statement: mitigation actions have often substantial co-benefits in terms of reduced energy costs, improved air quality, energy security, employment effects etc. Indeed, there is substantial evidence of the existence of cost-saving mitigation alternatives which can motivate both private and public actors to mitigate voluntarily (but not sufficiently on the global scale to address climate change satisfactorily). For review of some of the literature and evidence, see Paavola J. 2011. Climate change: the ultimate 'Tragedy of the Commons'? In D. Cole & E. Ostrom (eds). Property in Land and Other Resources. Cambridge, MA: Lincoln Institute for Land Policy; and the works of Elinor Ostrom cited in the publication. (Jouni Paavola, University of Leeds)	The text will be revised to discuss the scientific evidence only. Statement removed.
605	53511	23	39	8	39	8	Please define good evidence. (Kristie L. Ebi, IPCC WGII TSU)	Does not need to be defined.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
606	51421	23	39	15	39	15	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	text revised.
607	46474	23	39	15	39	37	This section on energy saving and consumption in the residential sector does mention co-benefits of mitigation and adaptation but should perhaps be more explicit about the contradiction / absence of co-benefits as the most obvious adaptations to heat stress involve increased energy use and thus conflict with mitigation goals. The conflict may be avoidable but the realisation of co-benefits does not happen autonomously. (Jouni Paavola, University of Leeds)	Agreed.text clarified.
608	35878	23	39	22	39	25	are these national-level statistics? Numbers seem rather high! (Martin Price, University of the Highlands and Islands)	Not clear which numbers comment referring to.
609	38459	23	39	31	39	37	Another relevant example here would be energy use for desalination plants. (Claire Goodess, University of East Anglia)	Agreed. Added.
610	35879	23	39	37	0	0	meaning not clear (Martin Price, University of the Highlands and Islands)	Agreed. Will clarify.
611	39192	23	39	40	0	0	Section 23.8.2: this sections seems to be very much focussed on agriculture and a little bit of forestry and bioenergy but fisheries do not appear at all although they appear in the title. Also for vbioenergy one would suggest a discussion of the trade-offs between bioenergy production and the emissions occurring during harvesting and transport or from increased fertilization that is necessary to maintain the productivity (see e.g. Schulze et al. 2012 GCB Bioenergy doi: 10.1111/j.1757-1707.2012.01169.x). (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Agreed. Fisheries no longer in title.
612	37044	23	39	40	40	22	Despite the header, this section does not contain any information on fisheries and only very little on forestry or bioenergy. And a very common misconception shines through the text: forestry has very little emissions in real life, they are just attributed to harvests because of a limited feasibility to follow the fate of each single piece of harvested wood through the production and product chain until the C stored therein is really released. Thus, the challenge for forestry is not to reduce emissions IN FORESTRY, but to sequester as much C as possible through sustained annual increment and transfer this to the wood-based industries, into channels that generate a maximum in replacement effects. Forestry should be aimed at mitigation through maximized production (that is, if one only focussed on GHG concentrations). The co-effects of A&M could thus be changes in management practices, tree species composition, management intensity (leading to higher employment in rural areas), and could generate adverse effects for water availability, biodiversity / nature conservation. Please have a look at: Bolte, A., C. Ammer, M. Lof, P. Madsen, G. J. Nabuurs, P. Schall, P. Spathelf and J. Rock (2009). "Adaptive forest management in central Europe: Climate change impacts, strategies and integrative concept." Scandinavian Journal Of Forest Research 24(6): 473-482; Rock, J. (2011). Ertragskundliche Orientierungsgrößen für eine "klimaoptimale" Waldbewirtschaftung. Deutscher Verband Forstlicher Forschungsanstalten Sektion Ertragskunde: Beiträge zur Jahrestagung 2011. J. Nagel. Göttingen, NW-FVA, DVFFA: 173 - 180 (http://www.nw-fva.de/~nagel/SektionErtragskunde/band2011/Tag2011_18.pdf); Rock, J. and A. Bolte (2011). "Auswirkungen der Waldbewirtschaftung 2002 bis 2008 auf die CO2-Bilanz." AFZ / Der Wald(15): 22 - 24; Rüter, S., J. Rock, M. Köthke and M. Dieter (2011). "Wie viel Holznutzung ist gut fürs Klima?" AFZ / Der Wald(15): 19 - 21. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	Agreed. Fisheries no longer in title. Paragraph on fisheries moved to impact section.
613	52480	23	39	42	39	22	this paper may also provide some useful discussion and references on links between adaptation and mitigation in agriculture and water:Falloon P.D., Betts R.A. 2010. Climate impacts on European agriculture and water management in the context of adaptation and mitigation - the importance of an integrated approach. Science of the Total Environment 408 (2010) 5667-5687 (doi 10.1016/j.scitotenv.2009.05.002).) (Peter Falloon, Met Office Hadley Centre)	Ref and discussion added.
614	39193	23	40	0	0	0	Section 23.8.3: the significant research that has occurred since AR4 is not really presented here or the references to it are missing or does it only consist of two papers (by Haines)? (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Health and wellbeing. There is information on co-benefits of mitigation for health in WGIII and cross ref has been added.
615	39194	23	40	0	0	0	Section 23.8.4: the content of this section doesn't really fit the heading because a strong focus on MPAs (this would need at least an introductory sentence) and the implications of the bioenergy paragraph (page 41, Line 12-19) for biodiversity conservation are not made clear so that the reader can only imagine why it appears here in this detail. (Christopher Reyer, Potsdam Institute for Climate Impact Research)	This section will be clarified, and links to bioenergy made clear (depending on the evidence).
616	51422	23	40	33	40	36	The author team should provide citations as appropriate for this paragraph. (Katharine Mach, IPCC WGII TSU)	References for co-benefits to health from mitigation policies will be added.
617	38814	23	40	41	0	43	I suggest to incorporate the idea of co-management as a tool for conservation of marine resources. This effective tool has been incorporated to legislation in Chile and other countries, and demonstrate successful results. In brief consider differences between artisanal and industrial fleets, and consider the binomial exploitation-conservation as objective for fishermen and society. As good references I suggest [Fischer, J. Peterson, G.D. Gardner, T.A. GFordon, L.J. Fazey, I. Elmquist, T. Felton, A. Folke, C. Dovers, S. 2009. Integrating resilience thinking and optimisation for conservation. Trends in Ecology and Evolution, 24 (10): 549-554; Carpenter, S.R. Folke, C. Norström, A. Olsson, O. Schultz, L. Agarwal, B. Balvanera, P. Campbell, B. Castilla, J.C. Cramer, W. DeFries, R. Eyzaguirre, P. Hughes, T.P. Polasky, S. Sanusi, Z. Scholes, R. Spierenburg, M. 2012. Program on ecosystem change and society: an international research strategy for integrated social-ecological systems. Current Opinion in Environmental Sustainability, 4: 1-5] (Ricardo Anadon, University of Oviedo)	Paragraph revised.
618	51423	23	40	47	40	47	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	text revised.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
619	43848	23	41	10	0	0	Figure 23.8. I think the reference should either be Paterson et al 2008 or Berry et al., 2009 (Paterson, J.S., Araújo, M.B., Berry, P.M., Piper, J.M., and Rounsevell, M.D.A.R. (2008) Mitigation, adaptation and the threat to biodiversity. Conservation Biology, 22, 1352-1355. ;Berry, P.M. (ed.) (2009) Biodiversity in the Balance – Mitigation and Adaptation Conflicts and Synergies. Pensoft Publishers, Sofia, Bulgaria.) (Pam Berry, Oxford)	OK. Reference to be checked.
620	54898	23	41	10	0	0	Figure 23.8 It will be preferable if the author team explicitly explain what win(1) -lose (2)- win(3), 1,2,or 3 order of placing means. (Monalisa Chatterjee, IPCC WGII TSU)	Noted.
621	38815	23	41	16	0	17	The use of agricultural residues to produce biofuels could be at least in part with the alternative use of manure and agricultural residues to incorporate organic matter to agricultural soils, decreasing the demand of irrigation water and fertilizer addition. This last option was one of recommended in other sections of the chapter. (Ricardo Anadon, University of Oviedo)	Text revised.
622	38460	23	41	22	0	0	This section reads rather weakly. This is due in part to the lack of appropriate studies - so perhaps this needs to be said. (Claire Goodess, University of East Anglia)	The section has been enhanced and more contents included.
623	54955	23	42	11	0	0	Box 23-3 The authors might be interested to include evidence from the following peer reviewed book publication: Hydrological, Socioeconomic and Ecological impacts of the North Atlantic Oscillation in the Mediterranean region, Ed. Vicente-Serrano S. and Trigo R. M, Advances in Global Change Research 46, Springer, 41-56, 2011 (Juerg Luterbacher, Justus Liebig University Giessen)	The related paper from Trigo & Serrano has been considered and included.
624	54956	23	42	11	0	0	Box 23-3 Please consider also the recent peer reviewed book contributions from the Mediterranean, specifically the change of meteorological extremes (heatwaves, droughts), sea level changes (chapters Xoplaki et al.; Gomis et al. and Ulbrich et al.) and related impacts in the Mediterranean, the book is published in 2012 http://www.giub.unibe.ch/~juerg/MedClivar_Book_2012.PDF (Juerg Luterbacher, Justus Liebig University Giessen)	The reference has been used for the text.
625	54957	23	42	11	0	0	Box 23-3 please cite for this statement Luterbacher et al. 2012; Luterbacher, J., R. García-Herrera, S. Akcer-On, R. Allan, M. C. Alvarez-Castro, G. Benito, J. Booth, U. Büntgen, N. Cagatay, D. Colombaroli, B. Davis, J. Esper, T. Felis, D. Fleitmann, D. Frank, D. Gallego, E. Garcia-Bustamante, R. Glaser, J. F. González-Rouco, H. Goosse, T. Kiefer, M. G. Macklin, S. Manning, P. Montagna, L. Newman, M. J. Power, V. Rath, P. Ribera, D. Riemann, N. Roberts, M. Sicre, S. Silenzi, W. Tinner, B. Valero-Garces, G. van der Schrier, C. Tzedakis, B. Vannière, S. Vogt, H. Wanner, J. P. Werner, G. Willett, M.H. Williams, E. Xoplaki, C. S. Zerefos, and E. Zorita, 2012: A review of 2000 years of paleoclimatic evidence in the Mediterranean. In: Lionello, P. (Ed.), The Climate of the Mediterranean region: from the past to the future. Elsevier, Amsterdam, The Netherlands, 87-185. (Juerg Luterbacher, Justus Liebig University Giessen)	The reference has been cited in the text.
626	53512	23	42	13	42	37	Please ensure consistency with WGI. (Kristie L. Ebi, IPCC WGII TSU)	Consistency with WGI has been checked
627	51424	23	42	18	42	34	Calibrated uncertainty language used on these lines (very likely, high confidence, likely, robust evidence) should be italicized. Casual usage of these terms should be avoided. (Katharine Mach, IPCC WGII TSU)	Yes, this has been italicized.
628	38461	23	42	33	42	34	Is 'very likely' here used in the formal IPCC guidance context? (Claire Goodess, University of East Anglia)	Yes, this has been italicized.
629	38031	23	42	34	42	34	you may add after 'Hoff, 2012': Vegetation in Mediterranean mountain ranges is to a large proportion composed of endemic species which are restricted to highly fragmented areas of the uppermost elevation belts (Blanca et al. 2002, Pauli et al. 2003, Noroozi et al. 2011). Accelerating climate warming, combined with decreasing precipitation, is expected to lead to biodiversity losses among these narrowly restricted cold-adapted species (Pauli et al. 2012, reference already included). New references: Blanca, G., López Onieva, M.R., Lorite, J., Martínez Lirola, M.J., Molero Mesa, J., Quintas, S., Ruiz Girela, M., Ángeles Varo, M.D.L. & Vidal, S. (2002) Flora amenazada y endémica de Sierra Nevada. Universidad de Granada y Junta de Andalucía, Granada. Pauli, H., Gottfried, M., Dirnböck, T., Dullinger, S. & Grabherr, G. (2003) Assessing the long-term dynamics of endemic plants at summit habitats. In: Alpine biodiversity in europe - a europe-wide assessment of biological richness and change (ed. by L. Nagy, G. Grabherr, C. Körner and D.B.A. Thompson), pp. 195-207. Springer, Berlin. Noroozi, J., Pauli, H., Grabherr, G. & Breckle, S.-W. (2011) The subnival-nival vascular plant species of iran: A unique high-mountain flora and its threat from climate warming. Biodiversity and Conservation, 20, 1319-1338. (Harald Pauli, Austrian Academy of Sciences)	The suggested references are interesting but the publication dates are too old for this report.
630	41780	23	42	36	0	37	This sentence as it stands contradicts section 23.3.6. However, there is a broader literature that supports this view that questions the extent to which warmer temperatures will impact tourism in the Med (e.g., see survey by Moreno 2010 as well as other work cited in the review by Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232 (Daniel Scott, University of Waterloo)	This sentence (saying that it is uncertain if tourism flows will decline in the Mediterranean as a result of climate change) does not contradict section 23.3.6; the latter says that although some studies say that the climatic conditions for tourism in the Mediterranean will deteriorate in summer after 2050, but improve in spring and autumn, there are also other studies saying that the Mediterranean will not become too hot for beach or summer tourism (at least not before 2030 or even 2060).
631	38462	23	42	48	42	52	The UK Foresight work is relevant here - http://www.bis.gov.uk/foresight/our-work/projects/published-projects/global-migration/reports-publications . A number of related papers are also published in Environmental Science and Policy (Claire Goodess, University of East Anglia)	ref not added.
632	38463	23	43	1	0	0	This section could be better related to/linked to earlier sections. Some editing is needed as bullet points are repeated. Perhaps the emerging vulnerabilities could be highlighted more in the executive summary. (Claire Goodess, University of East Anglia)	text revised but format is the same.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
633	53513	23	43	1	44	23	Please include time slices, scenarios, and key assumptions. You also could look at how the Australia/NZ chapter summarized their findings by avoidable and unavoidable impacts. (Kristie L. Ebi, IPCC WGII TSU)	We have summarised the key findings. We agreed not to use the Australia/NZ chapter figure format as too complicated.
634	51425	23	43	3	0	0	Section 23.10.1. It would be helpful to reference the criteria from chapter 19 if they were used by the author team here. Additionally, for each finding presented in this section, the author team should provide a line-of-sight reference to the supporting chapter assessment. (Katharine Mach, IPCC WGII TSU)	Noted. But criteria not as useful in Europe where focus is more on risk management. And we had limited evidence of impacts under high scenarios.
635	36486	23	43	16	43	17	YES - this is key and a major gap in the chapter (or perhaps it just needs to be stated as a key research need). The section which has "Cross-sectoral" in the heading only really focused on policy and didn't cover the scientific understanding of cross-sectoral or indirect effects which is vital to underpin the policy process. There is an European project (CLIMSAVE; www.climsave.eu) which is modelling cross-sectoral impacts for Europe and an overview should be available in Regional Environmental Change by the end of 2012. (Paula Harrison, University of Oxford)	Text revised, hopefully to better address this point.
636	35880	23	43	21	43	31	already known vulnerabilities: what about loss of glaciers? (Martin Price, University of the Highlands and Islands)	We do not include discussion of Glaciers in this chapter.
637	51426	23	43	39	43	39	"likely" -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	text revised
638	39252	23	43	45	43	49	the increased exposure of houses to overheating and damage from subsidence and flooding is repeated again under the 6th bullet-point (Thomas Voigt, Umweltbundesamt / Federal Environment Agency)	This is correct. The 6th bullet point of FOD has been deleted.
639	38464	23	43	46	0	0	I think it would be more appropriate to say 'may not be' rather than 'are not' - depends on location and timeframe etc. (Claire Goodess, University of East Anglia)	The 7th bullet point, which is the one to remain in the text, said that it is unlikely to be sufficient. Nevertheless, the text has been rephrased further in order to highlight conditionality of this statement.
640	51427	23	43	48	43	48	"likely" (also "unlikely") -- If this term is being used per the uncertainties guidance for authors (reflecting a probabilistic basis for its assignment), it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Since in page 12, lines 45-46 it was written that "There is little evidence regarding the estimated costs of retrofitting European housing stock (Parry et al., 2009)", the text has been changed to "may be expensive".
641	38465	23	44	5	44	6	I don't recall this mismatch between observed and simulated migration rates being discussed in the text (but may be mistaken). (Claire Goodess, University of East Anglia)	Text has been revised, and is also discussed in chapter 4.
642	43849	23	44	5	44	6	Many modelling studies assume that species fulfil their ecological niche i.e. Perfect full dispersal or that they do not disperse. These assumptions are very explicit and thus this statement needs modifying to reflect this binary state of (most) modelling (Pam Berry, Oxford)	Agreed. text revised.
643	39195	23	44	6	44	7	Are the legal barriers to introducing new species mentioned somewhere earlier in the text? (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Discussion of barriers to species movement need to be discussed in 23.6.4
644	43850	23	44	16	44	18	Repeats Lines 1-3. (Pam Berry, Oxford)	text revised
645	44736	23	44	16	44	18	Said before (line 1-3) (Birger Solberg, Norwegian University of Life Sciences)	text revised
646	54954	23	44	22	0	0	Table 23-5 It would be nice to list also the exceptionally warm autumn of 2006 and winter 2007 in this table with the reported impacts (Juerg Luterbacher, Justus Liebig University Giessen)	These events are not included.
647	38466	23	44	41	44	48	This is perhaps the first paragraph where confidence language is used. It really needs to be used more consistently throughout the chapter (and so feed into the executive summary). (Claire Goodess, University of East Anglia)	Agreed. Text revised.
648	51428	23	44	43	44	46	Calibrated uncertainty language used on these lines should be italicized. (Katharine Mach, IPCC WGII TSU)	Agreed. Text revised.
649	43351	23	44	51	45	11	Section 23.10.3 is very short, and the identified research needs appear arbitrary. It should be seen as a placeholder for a more comprehensive treatment of this topic. (Hans-Martin Füssel, European Environment Agency)	More research needs have been added.
650	46475	23	45	1	45	12	The identified research needs do not in the best possible way reflect the evidence reported earlier and gaps in it. It appears that human health issues other than those related to heat exposure are poorly understood and there is little evidence on them, suggesting that this should be an area for future research. Also, the text suggests earlier that costs of adaptation have not been assessed systematically and comprehensively, not to speak of effectiveness of adaptation measures or their benefits in terms of reduced costs through avoided adverse climate change impacts. That is, there would appear to be a strong case for research to establish the evidence base on costs, benefits and effectiveness of adaptation in Europe. (Jouni Paavola, University of Leeds)	More research needs have been added.
651	36487	23	45	2	0	0	Other research needs include: (i) More research on the cross-sectoral effects of climate change and socio-economic change for multiple sectors; (ii) There is a need to enable decision-makers at a range of scales to deal knowledgeably with complex uncertainties and to explore the need for transformation and new policy paradigms to cope with cross-sectoral, multi-scale adaptation challenges; (iii) bottom-up understanding of decision-making processes which captures and quantifies knowledge on individual and institutional behavioural processes that underpin the adaptation process. To do this successfully, there is a need to integrate stakeholders in the research process to fully understand their needs and ensure that models and methods provide relevant and useful information; (iv) there is a lack of embedding of the climate adaptation discourse in the overall sustainable development discourse. Adaptation strategies are needed that support the overall goal of sustainable development. Otherwise, counter-productive solutions could be proposed; (v) There is a lack of knowledge on tipping points beyond which certain processes become vulnerabilities. (Paula Harrison, University of Oxford)	More research needs have been added.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
652	38467	23	45	2	45	11	This list currently seems a bit selective. There are probably many other things that could be added. Is it possible to tailor it a bit more to the European context? (Claire Goodess, University of East Anglia)	More research needs have been added.
653	40591	23	45	7	45	7	this sentence has to be in accordance to chapter 10. In addition the sentence should be modified in: More research on the assessment and quantification of climate for tourism is required. (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	Not added
654	51429	23	45	14	0	0	Frequently Asked Questions -- Complete questions and answers must be developed by the 2nd order draft. (Katharine Mach, IPCC WGII TSU)	Done.
655	38112	23	45	19	0	0	"Section "References" comment": add the following 3 references: 1) PEER, 2009: "Europe Adapts to Climate Change: Comparing National Adaptation Strategies", PEER Report No 1, 23 June 2009, Helsinki, http://peer-initiative.org/media/m256_PEER_Report1.pdf 2) COMMISSION OF THE EUROPEAN COMMUNITIES, 2009 (a): White Paper, "Adapting to climate change: Towards a European framework for action", Brussels, 1 April 2009, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0147:FIN:EN:PDF 3) EEA, 2012: Urban adaptation to climate change in Europe. European Environment Agency, Copenhagen, (EEA Report No 2/2012) (Sergio Castellari, Centro Euro-Mediterraneo sui Cambiamenti Climatici)	Refs have checked.
656	35471	23	53	52	53	52	To include the reference: Garza-Gil, M.D, J. Torralba-Cano, and M. Varela-Lafuente, 2011: Evaluating the economic effects of climate change on the European sardine fishery. Regional Environmental Change, 11, 87-95. (M. Dolores Garza-Gil, University of Vigo)	Done.
657	35472	23	70	47	70	47	To include the reference: Vinagre, C., F. Duarte Santos, H. Cabral, and M.J. Costa, 2011: Impact of climate warming upon the fish assemblages of the Portuguese coast under different scenarios. Regional Environmental Change, 11, 779-789. (M. Dolores Garza-Gil, University of Vigo)	done
658	39196	23	73	0	0	0	Table 23-1: the link at the bottom of the table to the indices does not work. (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Spelling mistake. Will be changed in SOD: http://ccma.seos.uvic.ca/ETCCDI/list_27_indices.shtml
659	44585	23	73	0	0	0	footnote 1 http reference false : http://ccma.seos.uvic.ca/etccdi/list_27_indices.shtml (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	Spelling mistake. Will be changed in SOD: http://ccma.seos.uvic.ca/ETCCDI/list_27_indices.shtml
660	49866	23	73	0	0	0	Table 23-1: Nice tables but might it be additionally useful for policy makers to have equivalent statistics offered for the near-term and medium-term future (e.g. 30 years centred on 2035 and/or 2050)? (Timothy Carter, Finnish Environment Institute)	New tables in SOD
661	51430	23	73	0	0	0	Table 23-1. For each row of this table, the word "likely" should be italicized. Additionally, in the table caption, it would be helpful to clarify more specifically what is meant by min and max. Do they represent minimum and maximum average values or the full range of projections obtained across simulations? (Katharine Mach, IPCC WGII TSU)	New tables in SOD
662	53993	23	73	0	0	0	Table 23-1: It would be helpful for readers if a brief description of the indices is included in a caption or footnote. (Also, the link provided in the footnote is dead.) (Yuka Estrada, IPCC WGII TSU)	New tables in SOD
663	37045	23	73	0	73	0	Table 23-1: Please set this in black and white, light colours are too faint to be easily readable. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	New tables in SOD
664	36474	23	74	0	0	0	Table 23-2: What is the source of the information in this table. Is it based on one paper or a summary from multiple papers/studies? If it is the latter, then couldn't many other services be added such as erosion regulation, pollination, etc. What does "Yes" mean in the last row? - this does not match the key. (Paula Harrison, University of Oxford)	Table is based on synthesis of evidence in the chapter (multiple studies and expert opinion).
665	38468	23	74	0	0	0	What is meant by 'Yes' in the bottom row of Table 23.2? Yes there is an impact - but don't know direction? (Claire Goodess, University of East Anglia)	Table clarified.
666	38469	23	74	0	0	0	Table 23.3. Are these really the only available estimates? And none after 2009? (Claire Goodess, University of East Anglia)	Ranges are for usual scenarios, more information in references; section text will include some more specifics (R. Mechler)
667	38816	23	74	0	0	0	In the table 23-2 biodiversity (local loss of species) is nominated as a service. In a previous comment I recommended to eliminate biodiversity because the number of species is a part of the functionality of ecosystem, and not a service per se. For instance, a change from tundra to taiga could reduce the number of species but do not decrease the carbon sequestration. (Ricardo Anadon, University of Oviedo)	Ranges are for usual scenarios, more information in references; section text will include some more specifics (R. Mechler)
668	39197	23	74	0	0	0	Table 23-3 Are these examples or all existing studies? Should come up in the title of the table. (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Ranges are for usual scenarios, more information in references; section text will include some more specifics (R. Mechler)
669	48131	23	74	0	0	0	Table 23-2: Please provide the references. Why is water quality negatively affected in the North and unknown for Alpine and Southern regions (were decreasing water amounts during summer may perhaps have an impact on quality) ? Explain the meaning of "Yes" in the last line. (Philippe Marbaix, Université catholique de Louvain)	Table will link to relevant sections of chapter rather than individual references. Last row will be clarified.
670	51431	23	74	0	0	0	Table 23-2. For each box in this table, the author team may wish to provide specific examples and relevant citations to maximize the utility of the table. (Katharine Mach, IPCC WGII TSU)	Table will link to relevant sections of chapter rather than individual references. Last row will be clarified.
671	51432	23	74	0	0	0	Table 23-3. Are there relevant climate/socioeconomic scenarios or other assumptions that could be specified for each entry? (Katharine Mach, IPCC WGII TSU)	Ranges are for usual scenarios, more information in references; section text will include some more specifics (R. Mechler)
672	37046	23	74	0	74	0	Table 23-2: Please rework - the "*" is not related to anything in the table. "Loss of alpine species" does not need to be mentioned in addition to the downward arrow in this cell. And what do you want to indicate by "yes"? (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	Table will link to relevant sections of chapter rather than individual references. Terms will be clarified.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
673	38817	23	75	0	0	0	In the Atlantic region in which I live (N Spain) the skiing period is decreasing in number of days with natural snow, and also decrease the possibility to use artificial snow. The decreasing trend in the amount of snow in mountains, as well as a increasing trend in winter temperature and decreasing rainfall were detected by the Meteorological Institute of Spain, and for the Secretary in charge of Hydrographic studies. (Ricardo Anadon, University of Oviedo)	The Atlantic /ski tourism cell in the Table (being blank in the FOD) has been changed to "?". We would appreciate the suggestion by the reviewer of specific peer-reviewed references in order to further characterize the climate change impact.
674	39198	23	75	0	0	0	Table 23-4: Why are there no information on forest productivity changes in the continental and atlantic region available although in chapter 23.4.4 some information is given? (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Forest productivity now in table on ecosystem services
675	43352	23	75	0	0	0	Table 23-4: The ambivalent terms "positive/negative impacts" should be replaced by "beneficial/adverse impacts". (Hans-Martin Füssel, European Environment Agency)	Agreed.
676	49867	23	75	0	0	0	Table 23-4: This table could also indicate the magnitude of climate changes assumed in these studies (presumably rather mixed, but at least the range of scenarios applied could be offered). Again, this emphasises the mismatch between the climate projections being offered in Table 23-1 and the impact projections described here. (Timothy Carter, Finnish Environment Institute)	Agreed. Will consider but may be difficult (could use colour or bold).
677	51433	23	75	0	0	0	Table 23-4. For examples in this table, it would be helpful to comment in the table caption on how projections differ for other emissions/climate scenarios, potentially also providing further information in the table if relevant. (Katharine Mach, IPCC WGII TSU)	This information is too much to include in the table but will be addressed in the text.
678	53514	23	75	0	0	0	Please add a footnote explaining what assumptions were included in medium emissions. (Kristie L. Ebi, IPCC WGII TSU)	Agreed.
679	38470	23	76	0	0	0	Table 23.5. I have seen some higher estimates for 2003 heat-related deaths. (Claire Goodess, University of East Anglia)	These are the correct (best) estimates.
680	38471	23	76	0	0	0	Perhaps separate out the two 2007/2008 events. For wildfires, could also add deaths in Greece. (Claire Goodess, University of East Anglia)	Agreed. Will include if supporting references are found.
681	43353	23	76	0	0	0	Table 23-6: The title is confusing. Replace with "Observed changes in key climate-sensitive indicators related to ecological and human systems." (Hans-Martin Füssel, European Environment Agency)	Agreed. Table title will be changed to "Observed changes in key outcomes in ecological and human systems"
682	49868	23	76	0	0	0	Table 23-5: Finnish all time high temperature record was broken in July 2010, which makes me wonder if it would it be possible or useful to compile a list of new outstanding records such as this for Europe? (Timothy Carter, Finnish Environment Institute)	Compiling a list probably beyond author team - but will see if one has been done by an authoritative source, e.g. KNMI
683	51434	23	76	0	0	0	Table 23-5. Should the heat wave of 2006 also be characterized here? (Katharine Mach, IPCC WGII TSU)	It is not included.
684	53515	23	76	0	0	0	Why the last column? (Kristie L. Ebi, IPCC WGII TSU)	Column removed.
685	38472	23	77	0	0	0	The table title refers to impacts - but the final column makes a distinction between I, A and P. But for natural systems, some of the things classified as A could equally be viewed as I. (Claire Goodess, University of East Anglia)	Agreed. Table title will be changed to "Observed changes in key outcomes in ecological and human systems"
686	38473	23	77	0	0	0	Is it appropriate to give 'high confidence' when only a single study is involved? Though perhaps some of these are review papers. (Claire Goodess, University of East Anglia)	Will be checked for the SOD, high confidence will be reserved for cases with several studies
687	39199	23	77	0	0	0	To the forestry section, a line regarding disturbances with a reference to Seidl et al. 2011 GCB 17, 2842–2852 could be added. (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Table has been revised.
688	51435	23	77	0	0	0	Table 23-6. Calibrated uncertainty language used in this table (summary terms for evidence and agreement and levels of confidence) should be italicized. (Katharine Mach, IPCC WGII TSU)	text revised.
689	53516	23	77	0	0	0	Please explain how attribution was determined (e.g. by the authors of the papers and using what D&A approach). (Kristie L. Ebi, IPCC WGII TSU)	text revised.
690	36459	23	78	0	0	0	Figure 23-1: Would be good to add the political boundaries to the map of the 5 climate zones. (Paula Harrison, University of Oxford)	Still under discussion.
691	44574	23	78	0	0	0	Figure 23.1: the level of detail pretends a to high confidence (Frank Kreienkamp, Climate & Environment Consulting Potsdam GmbH)	Comment is unclear. This is a descriptive figure. Confidence not relevant.
692	52644	23	78	0	0	0	Fig 23-1. Although generalizations are necessary within the context of reports such as this, the heterogeneity and complexity of the Norwegian natural environment is very simplified when denominated as mostly Alpine. (Else Marie Løbersli, Norwegian directorate for nature management)	Agreed. But generalizations within sub-region are necessary.
693	48132	23	79	0	0	0	Figure 23.2: Please indicate the emission scenario. It would be interesting to discuss in the text the extent to which the lowest emission scenario (RCP 2.6) may have a positive impact on this indicator. What is the associated uncertainty? Do we know if RCP 2.6 would significantly reduce the number of heat waves, compared to the shown scenario? if so, do we have an idea about how much it would be reduced? (Philippe Marbaix, Université catholique de Louvain)	The emission scenario are indicated in new figures
694	53995	23	79	0	80	0	Figure 23-2 and 3: Hatched areas (especially on darker background) are a little hard to see. It may help some if the color of ocean is changed to different (darker?) color so that the hatched lines would not blend in the background color. Other chapter (Figure 25-2) uses "dots" instead of hatched areas to describe significant level, but it would be ideal to have cross-chapter consistency. (Yuka Estrada, IPCC WGII TSU)	New figures
695	37047	23	79	0	81	0	Figures 23-2 to 23-4: Why do you give robustness and significance overlaying each other? How do you assess significance if significant differences could be achieved with less than 66% of the models agreeing on direction of change? (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	Legend describes method.
696	36469	23	82	0	0	0	Figure 23-5: Some strange shading has occurred over the summer months making the graph difficult to read. It would also be easier if the order of the key and the columns in the graph were the same. The 2 colours of purple are also too similar to clearly distinguish between them. (Paula Harrison, University of Oxford)	At a later stage, the authors of the figure could be contacted so that some colour improvements to the graph are made.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
697	53996	23	84	0	0	0	Figure 23-7: It would be helpful for readers to have further explanation. For instance, what are the two red boxes and dashed lines associate with those boxes? What are the magenta arrows coming from boxes and what does it mean when it reaches the top x-axis labeled maximum water level rise:? What are the items depicted in green? Also, d/s and u/s should be spelled out. (Yuka Estrada, IPCC WGII TSU)	Figure dropped.
698	39200	23	85	0	0	0	Figure 23-8: this figure needs more explannation in the caption. E.g. what determines the length of the 'error bars' or does the order win-win-win always refer to biodiversity - mitigation- adaptation or which way around? (Christopher Reyer, Potsdam Institute for Climate Impact Research)	Agreed.
699	53517	23	85	0	0	0	Please explain the Lose-Win-Win, Win-Win-Win, etc. (Kristie L. Ebi, IPCC WGII TSU)	Agreed.
700	53997	23	85	0	0	0	Figure 23-8: It would be helpful to have further explanation. It is not clear to me what it means to "win" or "lose" in terms of mitigation and adaptation. (Yuka Estrada, IPCC WGII TSU)	Agreed.
701	37048	23	85	0	85	0	Figure 23-8: Please add text. What does "win-win-win" (etc.) refer to? The figure does not explain itself, so what is shown here? For example, what do you mean by "forest conservation"? Conservation of forest area as managed forests or land-USE change from managed forest to non-managed forest reserve? For Europe, the latter would constitute a rather weak mitigation effort, be no guarantee for adaptation and thus would not qualify for a "win - win - win" strategy. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	Agreed.