

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
1	35694	10	0	0	0	0	This is a general comment concerning reviews of existing research results and it perhaps applies to other chapters of this report, as well. Central objective of this report is to evaluate the anticipated impacts of climate change on different ecosystems and economic sectors. This is typically achieved by pairwise comparisons of a projection with climate change and baseline projection without climate change. The divergence of these projections changes in time, and when reporting results from such comparisons carried out in different studies, the point in time and the benchmark situation should be each time made clear for a reader. In most occasions, these are clear (e.g. p. 26. l 21-23) but often it is unclear whether the results are presented for some future period or point of time or at present, or whether the period of time is the same for the two compared projections (e.g. p. 31, l. 22-23). Information about the assumed trend of baseline scenarios (without climate change) would also help a reader to put the results in proper scale and context. Also more discussion about how robust the existing results about the sign or magnitude of climate change effects are to uncertainties related to assumptions underlying modeling frameworks would be helpful. (Kari Hyytiäinen, MTT Agrifood Research Finland)	Assessment was drafted as an example of robust findings across scenarios, and details of specific scenarios are not relevant.
2	38570	10	0	0	0	0	See attached file "Infrastructure-Wright.docx" for comments relevant to chapter. (Richard Wright, Retired, U.S. National Institute of Standards and Technology)	no file provided
3	39062	10	0	0	0	0	This chapter should include a discussion on how climate change impacts will affect small to medium enterprises. Reference should be made to Murta, J., Gero, A., Kuruppu, N. & Mukheibir, P. 2012, 'Enhancing adaptive capacity of small to medium enterprises - Background Report', Institute for Sustainable Futures, University of Technology Sydney, Sydney, Australia, (specifically pages 13-15), and Hopkins, N., 2011. Adapting for a Green Economy: Companies , Communities And Climate Change - A caring for climate report, Sustainable Development. (Pierre Mukheibir, University of Technology Sydney)	SME's is not a 'sector' of the economy but a cross cut. Referred to Chapter 8
4	39075	10	0	0	0	0	SME Background report 29 Feb 2012 Final.pdf (emailed to wg2-ar5-supportingmaterial@ipcc-wg2.gov) (Pierre Mukheibir, University of Technology Sydney)	see above
5	39152	10	0	0	0	0	What strikes me about this chapter is that the impact of climate change itself on key industries is discussed quite cogently, but without taking into account the massive impact climate change mitigation will have, say on sectors such as energy. This exclusion, while it may be rational, renders the entire chapter somewhat implausible and reduces its value as a prediction of future developments. In short, the conclusions of this chapter are distorted by what is excluded. (Thomas Reuter, University of Melbourne)	Mitigation is beyond the scope of this chapter. The mandate here is to assess energy sector's exposure to impacts and the adaptation options. Mitigation will change the mix of resources and technologies, but not the unfolding impacts of climate change on the energy sector. Mitigation is addressed in WGIII Chapter 7 (cross-referenc inserted in the first paragraph of 10.2). The synthesis of impacts and mitigation will commence in the Synthesis Report.
6	40556	10	0	0	0	0	Cite: Hammer, S. A., J. Keirstead, S. Dhakal, J. Mitchell, M. Colley, R. Connell, R. Gonzalez, M. Herve-Mignucci, L. Parshall, N. Schulz, M. Hyams, 2011: Climate change and urban energy systems. Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network, C. Rosenzweig, W. D. Solecki, S. A. Hammer, S. Mehrotra, Eds., Cambridge University Press, Cambridge, UK, 85–111. (Cynthia Rosenzweig, NASA Goddard Institute for Space Studies/Columbia University)	considered, but the discussion of impacts on energy sector is short and does not add to already cited literature.
7	40557	10	0	0	0	0	Cite: Mehrotra, S., B. Lefevre, R. Zimmerman, H. Gerçek, K. Jacob, S. Srinivasan, 2011b: Climate change and urban transportation systems. Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network, C. Rosenzweig, W. D. Solecki, S. A. Hammer, S. Mehrotra, Eds., Cambridge University Press, Cambridge, UK, 145–177. (Cynthia Rosenzweig, NASA Goddard Institute for Space Studies/Columbia University)	Referred to Chapter 8
8	42613	10	0	0	0	0	As a reporting IPCC sector (under the National GHG Inventory Guidelines), waste management was not discussed nor included in the sectoral chapter (Chap 10) or in the urban chapter (Chap 8). Although (as determined in AR4 reports) waste is the smallest of the sectoral contributors to GHG emissions, it should be included for completeness. It is also important to emphasize that sustainable waste management is a significant challenge in developing countries where economic resources are scarce or nonexistent at the local level. With respect to recommended literature on waste management, pls. consult the following: 1) Chapter 10 of the AR4 for WGIII with respect to literature up to that time; 2) a new World Bank report on global waste: Hoorweg et al. (2012) available at www.worldbank.org; 3) one of the few reports in the literature with quantitative information on the impact of the informal sector with respect to waste management in developing countries: Medina, M. (2008) The World's Scavengers--Salvaging for Sustainable Consumption and Production, Globalization & the Environment Series, World Bank ; and 4) Some recent and ongoing work on improved site-specific quantification of landfill methane emissions (the largest GHG source for the waste&wastewater sector)--a. Spokas, K. et al., 2011, A new process-based inventory model for landfill methane emissions inclusive of soil microclimate and seasonal methane oxidation. J. Geophys. Res.-Biogeosciences, 116, paper G04017, 19 p. b. Bogner, J. et al., 2011, Seasonal GHG emissions (methane, carbon dioxide, nitrous oxide) from engineered landfills: daily, intermediate, and final California cover soils, J. Env. Qual., 40:1010-1020. c. Spokas, K., and Bogner, J.,2011, Limits and dynamics of methane oxidation in landfill cover soils, Waste Management, 8, 823-832. This process-based model linked to global climate and soil microclimate models emphasizes the dependency of landfill methane emissions on (changing) climate with respect to both soil gas transport rates and seasonal methane oxidation rates. (Jean Bogner, University of Illinois at Chicago (UIC))	Thank you. References referred to urban and other chapters on physical impacts.
9	44512	10	0	0	0	0	Tables 10.3 and 10.5: would be good to put the results from climate change projections used as the basis for these impacts results into perspective with what WGI AR5 will be providing as for 21st century projections. This would also help ensure that inconsistencies between WGI AR5 assessment and individual studies cited in these tables can be avoided. (Thomas Stocker, IPCC WGI TSU)	We attempt to synthesize findings across the multiple studies/scenarios in the text and key messages while the tables present details.

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10	50581	10	0	0	0	0	1) Overall -- In preparing the 2nd-order draft, the chapter team should prioritize making each section of the chapter a 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 a very solid first-order draft. To inform further chapter development, I provide some general and specific comments below. (Katharine Mach, IPCC WGII TSU)	noted.
11	50582	10	0	0	0	0	2) Highlighting key findings -- In developing the second-order draft, the chapter team should continue clearly presenting key findings across chapter sections, 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)	traceable accounts included
12	50583	10	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)	Noted and revised
13	50584	10	0	0	0	0	4) Specificity of described observations and projections -- The chapter team has done a nice job of ensuring specificity in describing observed and projected impacts, while still presenting information concisely. I encouraged the author team to continue ensuring specificity: indicating relevant time periods, geographic areas, etc. for observations; indicating the relevant time frames, climate/socio-economic scenarios, geographic regions, or other assumptions for projections; and characterizing key driving factors where ranges of outcomes are presented. (Katharine Mach, IPCC WGII TSU)	Noted. included where relevant and other areas findings are robust across scenarios
14	50585	10	0	0	0	0	5) Conditional constructions -- The chapter team has also done a nice job of using conditional constructions that explicitly separate physical changes from corresponding conditional impacts. The chapter team is encouraged to continue using such constructions, also separately characterizing the degree of certainty for a physical change and the corresponding conditional impact where appropriate. (Katharine Mach, IPCC WGII TSU)	Noted and revised
15	50586	10	0	0	0	0	6) Figures -- Figures represent an important and effective vehicle for clear communication of assessment and corresponding key findings. The chapter team is very much encouraged to continue developing figures to complement the robust assessment already present in the chapter text. (Katharine Mach, IPCC WGII TSU)	Noted.
16	50587	10	0	0	0	0	7) 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)	Noted and revised
17	50588	10	0	0	0	0	8) 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)	noted
18	52804	10	0	0	0	0	This is a good chapter. However, (sorry) the words detection and attribution do not really appear in it (with the exception of hurricanes). Each chapter is required to treat this topic by the plenary approved outline. Please take a look at the chapter 18 handouts repeatedly sent and the material in chapter 18 dealing with chapter 10 material. It is key that AR5 WG2 uses consistent evidence, language and confidence statements throughout the report. (Maximilian Auffhammer, University of California, Berkeley)	Literature is predominantly based on modeling and forecasts, except in specific sectors, and does not align with detection and attribution approach
19	52806	10	0	0	0	0	The whole chapter takes a forward looking approach. This leaves little room for detection and attribution in the sense of chapter 18. It is important to coordinate with chapter 18 on this topic. (Maximilian Auffhammer, University of California, Berkeley)	Literature is predominantly based on modeling and forecasts, except in specific sectors, and does not align with detection and attribution approach
20	54420	10	0	0	0	0	GENERAL COMMENTS: I would like to thank the authors for an interesting and enjoyable FOD. Various general and specific comments follow. 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)	noted.

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21	54421	10	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. Several of the bold findings tend to the general, however, often with nonbold sentences that communicate more specific points. For example, "climate change will very likely affect the health sector" or "Climate change is very likely to have substantial impacts on water resources and water use" set up a discussion of risks for these sectors, but do not communicate anything further. Other findings, such as those on pipelines/electricity grids and tourism, communicate more information in the bold statement, with the nonbold sentences providing further context. For the SOD, I suggest considering opportunities for each bold finding to provide more specific information, highlighting key insights of your assessment that will be of interest to readers. (Michael Mastrandrea, IPCC WGII TSU)	Revised Exec Summary
22	54422	10	0	0	0	0	TRACEABLE ACCOUNTS: The author team has made a good start to providing traceable accounts for assessment findings and highlighting the location of those traceable accounts in the Executive Summary. In general, I would recommend the author team consider ways to more clearly identify assessment findings in the chapter text to link with the Executive Summary. One approach would be 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. Currently, the likelihood and agreement/evidence language in the Executive Summary is not mentioned in the corresponding sections. In particular, in situations where evidence and/or agreement is not robust and/or high, it would be useful to understand why the author team has made this judgment (e.g., why is evidence not robust, why is agreement not high). 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. It would also be useful to better understand the basis for the author team's assignments of likelihood language where it is used, as currently this is not explicitly addressed. One option could be a box or short section describing the nature of evidence assessed by the chapter (see example in Chapter 12, Box 12-2) and in what areas/for what sectors quantitative information is available upon which to base a likelihood assignment. This would also aid understanding of when likelihood language is used and when it is not. Finally, please be as specific as possible regarding the line of sight indicators to chapter sections in the Executive Summary. (Michael Mastrandrea, IPCC WGII TSU)	Revised Exec Summary
23	54867	10	0	0	0	0	Literature permitting, the chapter team is encouraged to add more cases to support their findings. Moreover, it would be useful if the enabling or deterring factors, drivers etc., are explicitly stated where ever possible. (Monalisa Chatterjee, IPCC WGII TSU)	Literature Updated
24	54868	10	0	0	0	0	The author team should update the reference list and remove citation inconsistencies between in text citations and full citations given in the reference list. Please see supplementary document named WG2AR5-Chap10_Reference Checks.pdf at <a href="https://ipcc-wg2.gov/AR5/author/FOD/SuppMat">https://ipcc-wg2.gov/AR5/author/FOD/SuppMat</a> (Monalisa Chatterjee, IPCC WGII TSU)	updated
25	54870	10	0	0	0	0	The author team is encouraged to consolidate discussions and synthesize findings from sections in the chapter to avoid repetition. Moreover, the author team is requested to use strategies like tables, figures, maps to present synthesized findings where ever possible. (Monalisa Chatterjee, IPCC WGII TSU)	noted
26	39014	10	1	1	0	0	It is unfortunate that chapter 10 does not discuss the extent to which impacts of recent climate change have already affected key economic sectors. It might be that such impacts do not exist, or it might be that they exist and are insufficiently studied - in both cases there would be a need to document and communicate this situation in clear terms. (Wolfgang Cramer, Potsdam Institute for Climate Impact Research)	chapter assesses the literature , in some sectors current impacts are noted.
27	50589	10	2	0	0	0	Executive Summary - Throughout the executive summary, all calibrated uncertainty language used, including summary terms for evidence and agreement provided parenthetically, should be italicized. (Katharine Mach, IPCC WGII TSU)	Noted and revised
28	37049	10	2	48	4	19	ES should include statement(s) on observed impacts. While the current state mirrors the weak coverage of observed impacts and their attribution throughout the Chapter, this is a marked difference to many other Chapters, and should be considered to be given explicit reference (even if such statement(s) may be low confidence). (Gerrit Hansen, Potsdam Institute for Climate Impact Research)	Noted and revised
29	54200	10	2	50	2	51	Following on my general comment on traceable accounts, in the introduction to section 10.2, a similar statement to that in bold here is presented without calibrated uncertainty language, more as a "fact." Further clarification of the linkage between the chapter text and the executive summary findings would be helpful in this case and others. (Michael Mastrandrea, IPCC WGII TSU)	ES is based on chapter body. 10.2 Introduction summarizes and links this to earlier findings, followed by evidence in the section. No change.
30	49816	10	2	50	4	20	The temperature is not going up and there is no evidence it is influenced by greenhouse gases. All these opinions have no basis in evidence. (Vincent Gray, Climate Consultant)	The chapter is about what impacts would occur should climate change. Other parts of the IPCC report deal with the questions whether climate has change, why, and how it might change further.
31	38244	10	3	6	3	8	Executive Summary. "Climate change will virtually certainly affect different energy sources and technologies differently, depending on the resources (water flow, wind, insolation), the technological processes (cooling) or the locations (coastal regions, floodplains) involved (high agreement, robust evidence)." Question: In particular, what will be the impact of climate change on the wind energy? Will the wind speed increase or decrease both globally and regionally? (Abdalah Mokssit, Direction de la Météorologie Nationale (DMN))	wind conditions will change as a result of temperature and pressure changes. Discussed in the text but not appropriate to explain details in ES. No change.
32	54196	10	3	16	3	22	Regarding the traceable account for this finding, this is an example where explanation in the cited chapter section of the likelihood (and evidence/agreement) language used would be very helpful. (Michael Mastrandrea, IPCC WGII TSU)	This is the final conclusion from 10.2.3. No change.
33	54197	10	3	24	3	25	Is there any way to quantify or clarify what is meant by "substantial" further? (Michael Mastrandrea, IPCC WGII TSU)	Revised
34	54198	10	3	31	3	31	Please consider ways to construct a more informative bold finding for this paragraph. (Michael Mastrandrea, IPCC WGII TSU)	Revised

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35	49081	10	3	32	3	32	Please delete ", which would happen more frequently should climate change". Rationale: The statement is unprecise and unnecessary since so many parameters in the climate system is already changing. As it stands in this version the statement should be linked to change in extremes that the transportation infrastructure is not designed for, and not to climate change in general. (Oyvind Christophersen, Climate and Pollution Agency)	Revised
36	45883	10	3	43	3	44	It is unclear what "strongly influences" means. The following sentence provides more caution, if disasters would increase. Please rewrite. (Laurens Bouwer, Vrije Universiteit Amsterdam)	Revised
37	37050	10	3	43	3	50	while the bold sentence suggests that insurance sector is already impacted, the following text refers to the future only - needs clarification (Gerrit Hansen, Potsdam Institute for Climate Impact Research)	Revised
38	49082	10	3	44	3	44	Please replace "would" with "will". Rationale: To be consistent with the next section where you use will when you state "Climate change will very likely ..... throuht increases in the frequency, intensity, and extent of extreme weather events ....." (Oyvind Christophersen, Climate and Pollution Agency)	Revised
39	45884	10	3	44	3	46	Not only large events/disasters, but also many (consecutive) small events are potentially problematic, please include these. (Laurens Bouwer, Vrije Universiteit Amsterdam)	Revised
40	50590	10	3	52	3	53	The author team may wish to qualify further the characterization of changes in extreme weather events given here. Since not all extreme weather events will increase in frequency, intensity, and/or extent, slightly more qualified wording may be clearer. (Katharine Mach, IPCC WGII TSU)	Revised
41	45572	10	4	4	4	8	Relate potential for carbon markets, depending on their design characteristics, to amplify or limit "spillovers" (line 8) or leakages in conventional markets. (Yanna Antypas, U.S. Energy Information Administration (Department of Energy))	We refer broadly to markets, which includes carbon markets. There is no literature on the impact of climate change on carbon markets, which would be tertiary effect only.
42	54199	10	4	11	4	11	Is "climate variability" meant here? (Michael Mastrandrea, IPCC WGII TSU)	Revised.
43	49083	10	4	11	4	12	Please consider to replace "could be" with "is", "the" with "many", and "may" with "will". The sentence will then read "Climate change variability is one of many causes why some countries are trapped in poverty, and climate change will make it harder to escape poverty traps." (Oyvind Christophersen, Climate and Pollution Agency)	Revised
44	39515	10	5	1	0	0	Section 10.2: Other studies to consider: De Groot, R.S. et al. (2006): Climate adaptation in the Netherlands ( <a href="http://www.rivm.nl/bibliotheek/rapporten/500102003.pdf">http://www.rivm.nl/bibliotheek/rapporten/500102003.pdf</a> ); Van Ierland, E.C., de Bruin, K., Dellink, R.B., Ruijs, A. (2007): A qualitative assessment of climate adaptation options and some estimates of adaptation costs. Routeplanner Report 3; Mansanet-Bataller, M., Hervé-Mignucci, M., Leseur, A. (2008): Energy Infrastructures in France: Climate Change Vulnerabilities and Adaptation Possibilities. Mission Climate Working Paper, Nr. 2009-2, Caisse des Dépôts, Paris. (Sven Schulze, Hamburgisches WeltWirtschaftsinstitut (HWWI))	Considered, but these are Europe-specific; should be cited in the regional (Europe) chapter. No change.
45	37053	10	5	2	0	0	There is much redundancies between sections, and between section text and tables, this should be streamlined. Information on observed impacts is missing, e.g. Impacts of past heat waves on thermal power generation (e.g. Poumadère et al., 2005), or damages to pipelines in permafrost. In this context, a discussion of detection and attribution of such impacts would be beneficial. Section would very much profit from referencing the IPCC Special Report on Renewable Energies and Climate Change mitigation, and literature cited therein. (Gerrit Hansen, Potsdam Institute for Climate Impact Research)	Redundancies reduced. Looked explicitly for publications with statements on attributing observed impacts to CC. Inspected SREN but found little CC impact assessment there.
46	37962	10	5	16	6	2	Specific reference should be made in this section on the seasonal impacts of CC on electricity demand, which may be by far much more severe than overall annual figures. This variation is the major cause for significant cost increases in electricity generation at least in Southern Europe (see ref. Mirasgedis, S., Sarafidis, Y., Georgopoulou, E., Kotroni, V., Lagouvardos, K., Lalas, D.P. (2007), Modelling framework for estimating impacts of climate change on electricity demand at regional level: Case of Greece, Energy Conversion and Management 48, 1737-1750 on this). Chapter 8 (p. 22, lines 7-12) also discusses this, as well as Chapter 23 (Europe). (Elena Georgopoulou, National Observatory of Athens)	Added seasonal discussion and considered paper, but it should be considered in the Europe chapter.
47	50591	10	5	24	5	24	The 1st half of this sentence could perhaps benefit from clarification--energy demand for heating increases over time in general or in a changing climate? (Katharine Mach, IPCC WGII TSU)	problem resolved by deleting this 'orphan' paragraph, no two paragraphs below.
48	37960	10	5	24	5	26	There is a repetition with what is written next (lines 46-48). See also next comment made. (Elena Georgopoulou, National Observatory of Athens)	repetition removed.
49	54201	10	5	28	5	29	Does this mean that all studies assessed in this section were also included in Williams and Toth, 2012? Please consider updating the figure for the SOD of the chapter if additional studies are added that do not appear in that paper. (Michael Mastrandrea, IPCC WGII TSU)	Figure is not from Williams and Toth. Source citation corrected. No additional studies were found.
50	54869	10	5	28	5	31	Figure 10.1 The author team may wish to further explain the diagram by using a couple of country examples. (Monalisa Chatterjee, IPCC WGII TSU)	Country examples were intentionally removed. Patterns are explained in more detail in the underlying paper. No change.
51	50592	10	5	36	5	41	It may be helpful to provide examples of citations for the described trends. (Katharine Mach, IPCC WGII TSU)	Country examples were intentionally removed. Patterns are explained in more detail in the underlying paper. No change.
52	35830	10	5	41	5	41	"energy demand for air conditioning": more accuretaly, this would be "energy demand for residential air conditioning" (Andries Hof, Netherlands Environmental Assessment Agency)	Corrected.
53	50593	10	5	45	5	46	Given the statement at the end of this sentence regarding the importance of increasing income, it would be useful to indicate the magnitude of the increase with no climate change--is the magnitude almost the same? (Katharine Mach, IPCC WGII TSU)	fractions provided based on source (Isaac and van Vuuren 2009).

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54	37961	10	5	46	5	48	The energy demand for heating up to 2100 does not increase in Europe according to Isaac and van Vuuren (2009) which is used as a ref at the paragraph. Instead, as shown in Figure 5 of the paper, the energy demand for heating in 2050 and 2100 a) decreases (compared to 2000) significantly in Western Europe (where the thermal comfort has already been achieved) and b) in Russia and the Rest of Europe remains stable in 2050 and decreases in 2100. See also Table 5 in the same paper. (Elena Georgopoulou, National Observatory of Athens)	text modified to indicate decrease in some regions.
55	50594	10	5	50	5	54	The author team may wish to indicate here which citations support the described trends, also to clarify further the last sentence of the paragraph. (Katharine Mach, IPCC WGII TSU)	this is assessment text based on sources underlying Figure 1. No change.
56	49817	10	6	22	6	34	Since the temperatures are not rising this does not apply (Vincent Gray, Climate Consultant)	All this is structured conditionally in 'what if' form; i.e., what is projected to happen if temperatures were increasing after all. No change.
57	37688	10	6	31	0	0	The U.S. NCA work would see relevant here. Add(?): The U.S. National Climate Assessment has considered how climate change affects the energy, water, land nexus and how changes in electric generation affects other economic sectors. (Skaggs et al, 2101, Wilbanks et al., 2012) [Skaggs, R., T.C. Janetos, K.A. Hibbard, and J.S. Rice, 2012: Climate and Energy-Water-Land System Interactions: Technical Report to the U.S. Department of Energy in Support of the National Climate Assessment, Report PNNL-21185, Pacific Northwest National Laboratory, Richland, Washington. Available at: <a href="http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-21185.pdf">http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-21185.pdf</a> ] [Wilbanks, T., S. Fernandez, et al, 2012: Climate Change and Infrastructure, Urban Systems, and Vulnerabilities: Technical Report For The U.S. Department of Energy in Support of the National Climate Assessment. Oak Ridge National Laboratory, Oak Ridge, Tennessee. Available at: <a href="http://www.esd.ornl.gov/eess/Infrastructure.pdf">www.esd.ornl.gov/eess/Infrastructure.pdf</a> ] (George Backus, Sandia National Laboratories)	considered these publications. Energy-water-land links are addressed at several places in the WGII report; urban systems and infrastructure issues addressed in Chapter 8. See Cross chapter box on energy, water, food, climate.
58	37689	10	6	41	0	0	For a discussion of specific options that the electric generation system can use for responding to droughts, I think Kelic et.al should be added as a reference. [Kelic, A., V. Loose, V. Vargas, and E. Vugrin, 2009: Energy and Water Sector Policy Strategies for Drought Mitigation. Report SAND 2009-1360, Sandia National Laboratories Albuquerque, NM. Available at: <a href="http://prod.sandia.gov/techlib/access-control.cgi/2009/091360.pdf">http://prod.sandia.gov/techlib/access-control.cgi/2009/091360.pdf</a> DOI 10.2172/974886] (George Backus, Sandia National Laboratories)	considered this publication. Energy-water links are addressed at several places in the WGI report; source does not provide additional information to the already cited peer-reviewed sources. No change here.
59	37052	10	7	11	7	18	Reference to more specific sections of Ch3 would be useful (e.g. 3.4, 3.5.3, and 3.7, 3.8) Reference to the terrestrial ecosystems chapter 4 not evident. (Gerrit Hansen, Potsdam Institute for Climate Impact Research)	cross references made more explicit.
60	54202	10	7	22	7	24	The current formulation here makes the target of "likely" unclear. An alternative formulation might be, "generation is likely to increase in most regions and decrease in some, with diversity across regions, watersheds within regions, and even river basins within watersheds." This would more clearly highlight the target of "likely," if I understand the intention correctly. (Michael Mastrandrea, IPCC WGII TSU)	thanks; sentence rephrased as suggested.
61	50595	10	7	31	7	31	Presumably this expectation holds true across a wide range of climate/socio-economic scenarios? It could potentially be helpful to specify this. (Katharine Mach, IPCC WGII TSU)	Specification included.
62	37054	10	7	39	7	45	Rationale for the expected increase in cloudiness with Climate Change is missing. Please provide references for this assumption. (Gerrit Hansen, Potsdam Institute for Climate Impact Research)	conditional formulation made explicit: should cloudiness increase .... here are the impacts. Reference to WGI chapters included.
63	37690	10	8	31	0	0	Comment 1: The discussion needs to include other energy sources beyond electricity. Add(?): Refineries, gas pipelines, oil and gas production facilities, and coal transport is also susceptible to climate change events (Paskal 2009, Ebinger and Vergara 2011, Staudt and Curry, 2011). Heavy rain fall affects the rail transport, while drought affects the river transport of coal. Storms can restrict off-shore oil and gas production as well as affecting coastal refiners, while flooding and permafrost-melting can disrupt pipeline service (as noted in section 10.4). [Paskal, C., 2009: The Vulnerability of Energy Infrastructure to Environmental Change, Chatham House, London UK. <a href="http://www.chathamhouse.org/sites/default/files/public/Research/Energy,%20Environment%20and%20Development/bp0409energy.pdf">http://www.chathamhouse.org/sites/default/files/public/Research/Energy,%20Environment%20and%20Development/bp0409energy.pdf</a> ] (George Backus, Sandia National Laboratories)	Some of these points discussed in other subsection (pipelines in 10.2.3); non-power impacts added and proposed publications reviewed and some of them are cited.
64	37691	10	8	31	0	0	Comment 2: [Ebinger, J., W. Vergara, 2011: Climate Impacts on Energy Systems: Key Issues for Energy Sector Adaptation. World Bank, Washington, DC. Available at: <a href="http://www.esmap.org/esmap/sites/esmap.org/files/DocumentLibrary/E-Book_Climate%20Impacts%20on%20Energy%20Systems_BOOK_resized.pdf">http://www.esmap.org/esmap/sites/esmap.org/files/DocumentLibrary/E-Book_Climate%20Impacts%20on%20Energy%20Systems_BOOK_resized.pdf</a> ] [Staudt, A. and R. Curry, 2011: More Extreme Weather and the U.S. Energy Infrastructure, National Wildlife Federation Reston, VA, Available at: <a href="http://www.nwf.org/~media/PDFs/Global-Warming/Extreme-Weather/Final_NWF_EnergyInfrastructureReport_4-8-11.ashx">http://www.nwf.org/~media/PDFs/Global-Warming/Extreme-Weather/Final_NWF_EnergyInfrastructureReport_4-8-11.ashx</a> ] (George Backus, Sandia National Laboratories)	proposed publications reviewed and some of them are cited.
65	52805	10	9	10	11	0	These studies deal with evidence using ex post observed data. It is important to classify the evidence in what has been detected and what has been attributed. (Maximilian Auffhammer, University of California, Berkeley)	Not applicable to this sub-section. No change
66	45809	10	9	27	0	0	This subsection mainly deals with impacts in the energy sector. It is suggested to change its name. (Juan-Carlos Ciscar, European Commission)	FT Outline and titles were provided by the IPCC Plenary; no change.
67	50596	10	9	42	9	42	It would be helpful to indicate more precisely what is meant by "moderate." Additionally, if "likely" is being used for the uncertainties guidance for authors, it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Revised
68	54203	10	9	44	9	44	Other climate impacts beyond those caused by temperature increase? It would be useful to clarify this. (Michael Mastrandrea, IPCC WGII TSU)	Revised

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
69	50597	10	9	49	9	49	"likely" -- If this term 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)	Revised
70	48294	10	10	10	0	0	Please provide a short explanation of computable general equilibrium in the appendix (Malini Nair, Indian Institute of Science)	the cited literature provides guidance for additional reading on CGE and other models. No change.
71	50598	10	10	10	10	26	As appropriate for statements made in these paragraphs, the author team should specify the relevant scenarios of climate change and socio-economics. (Katharine Mach, IPCC WGII TSU)	Each study conducts multiple scenarios. Specifying them here would make these paragraphs overly complicated and would contribute little to the main points of these paragraphs. No change.
72	50599	10	10	39	10	44	As appropriate for these projections, the author team should specify the relevant scenarios of climate change, temperature, or socio-economics. (Katharine Mach, IPCC WGII TSU)	Each study conducts multiple scenarios. Specifying them here would make these paragraphs overly complicated and would contribute little to the main points of these paragraphs. No change.
73	50600	10	11	1	0	0	Section 10.2.5. For conclusions communicated in this section, the author team should evaluate and communicate its degree of certainty in the assessment findings, using calibrated uncertainty language per the guidance for authors. (Katharine Mach, IPCC WGII TSU)	Done
74	37051	10	11	5	0	0	statement for hydropower is not consistent with text (suggest to state "potential changes" instead of "decrease") (Gerrit Hansen, Potsdam Institute for Climate Impact Research)	Removed mention of hydropower as increasing temperatures alone may not have a significant impact on hydropower
75	52807	10	11	10	11	0	The material on historical evidence should be classified in detection and attribution terms. Chapter 18 should be referenced. (Maximilian Auffhammer, University of California, Berkeley)	Not applicable to this sub-section. No change
76	54204	10	11	15	11	16	It is important to make clear that the 1.3% drop in GDP mentioned in the sentence is for Europe only, not globally. (Michael Mastrandrea, IPCC WGII TSU)	Revised
77	48295	10	11	20	0	0	Explain partial equilibrium models, CGE modeling studies is largely focused on energy demand here (Malini Nair, Indian Institute of Science)	This is the summary part of the subsection. Details are explained in preceding paragraphs. No change.
78	50601	10	11	31	11	31	"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)	changed to 'probably'
79	37055	10	11	45	0	0	Section 10.3.1 would benefit from references to IPCC SREX and the more recent references cited therein (Gerrit Hansen, Potsdam Institute for Climate Impact Research)	Srex cited in 10.3.1
80	39516	10	11	45	0	0	Section 10.3.1: A few words of caution on that magnitude of damage figures (better and more data, more assets and people at risk due to demographics and economic development etc.) would give a more comprehensive view of the matter. (Sven Schulze, Hamburgisches WeltWirtschaftsinstitut (HWWI))	referred to 10.7.3 and revised text
81	45810	10	11	45	0	0	The contribution of Feyen et al. (2012) dealing with river floods simulations to the end of the XXI century in Europe could be considered. The article uses a bottom-up, hydrological model to make projections, based on high resolution (daily) climate data, obtaining interesting insights on the spatial distribution of impacts in Europe. The methodology and main results could be included in the Chapter. Feyen, L., R. Dankers, K. Bódis, P. Salamon, and J.I. Barredo, 2012: Fluvial flood risk in Europe in present and future climates. <i>Climatic Change</i> , 112, 47-62. (Juan-Carlos Ciscar, European Commission)	Cited in 10.3.1
82	50602	10	11	48	11	48	It would be beneficial to clarify if developing countries are hardest hit in terms of the rate of increase in losses? (Katharine Mach, IPCC WGII TSU)	Not supported by literature
83	54205	10	11	53	11	54	It would also be useful to link to the SREX report here. (Michael Mastrandrea, IPCC WGII TSU)	Done in 10.3.1
84	50603	10	12	9	12	11	For the described projections, it would be helpful to clarify the relevant climate/socio-economic scenarios and key drivers. (Katharine Mach, IPCC WGII TSU)	Assessment was drafted as example of robust findings across multiple scenarios and details of specific scenarios were not included
85	48852	10	12	13	12	16	Conservation tillage on its own sequester little carbon. You need to actually add carbon -- with manures, compost, organic fertilizers -- to get real levels of carbon sequestration. (Doreen Stabinsky, College of the Atlantic)	This is covered in Chapter 3 and 4.
86	50604	10	12	29	12	31	For this statement, as appropriate it would be useful to clarify the relevant climate/socio-economic scenarios. (Katharine Mach, IPCC WGII TSU)	text added
87	54206	10	12	30	12	31	What return periods do they consider? (Michael Mastrandrea, IPCC WGII TSU)	text added
88	50605	10	12	36	12	38	As possible, the author team may wish to provide an indication of adaptation costs that have been reported. (Katharine Mach, IPCC WGII TSU)	Covered elsewhere in AR
89	50606	10	12	42	12	46	The author team may wish to clarify if these estimates pertain to a range of climate/socio-economic scenarios. This comment also applies to lines 51-54 on this page. (Katharine Mach, IPCC WGII TSU)	Assessment was drafted as example of robust findings across multiple scenarios and details of specific scenarios were not included
90	50607	10	12	48	12	48	It would be preferable to specify the timeframe and scenario relevant to this described impact. (Katharine Mach, IPCC WGII TSU)	Scenario added no time frame in article

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
91	37963	10	13	9	13	9	The potential overload of the capacity of wastewater treatment plants as a result of heavy rainfall events is a risk only for combined sewerage systems (where there is a common pipe for municipal wastewater and run-off), while in separate sewerage systems (which are the most common in developed countries) there is a separate collection of municipal wastewaters (blackwater from toilets, greywater and industrial wastewater) and surface run-off (rainwater and stormwater). This is an advantage of separate systems, i.e. they prevent the overflow of sewer systems and treatment stations during rainy periods. Therefore, a distinction should be made here regarding wastewater treatment plants. (Elena Georgopoulou, National Observatory of Athens)	Referred to Chap 3 &17
92	50608	10	13	12	13	17	For these statements as appropriate, it would be helpful to specify the relevant scenarios of climate change and/or socio-economics. (Katharine Mach, IPCC WGII TSU)	Assessment was drafted as example of robust findings across multiple scenarios and details of specific scenarios were not included text added
93	50610	10	13	22	13	24	For this estimate, it would be preferable to specify the relevant time frame, as well as the climate/socio-economic scenarios used. (Katharine Mach, IPCC WGII TSU)	text added
94	37964	10	13	22	13	27	For further enriching the regional dimension regarding the effects of CC on cooling water for thermal power, you can add also text for Europe. In this, see Kopytko and Perkins (2011), Rübbecke and Vögele (2011), Linnerud et al. (2011), Förster and Lilliestam (2010). These refs are also mentioned in Chapter 23 (Europe) and thus a link to this chapter can also be made. (Elena Georgopoulou, National Observatory of Athens)	Defer to Ch 23 did add Van Vleit 2012 which includes Europe
95	50611	10	13	34	13	34	"likely" – If the 2nd usage of "likely" on this line is per the uncertainties guidance for authors, it should be italicized. The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	confirmed. Italized
96	50609	10	13	48	13	54	For these statements as appropriate, it would be helpful to specify the relevant scenarios of climate change and/or socio-economics. (Katharine Mach, IPCC WGII TSU)	text added
97	39517	10	14	36	0	0	Section 10.4: Hunt, A. (2008): Informing Adaptation to Climate Change in the UK: Some Sectoral Impact Costs. The Integrated Assessment Journal, Vol 8, Nr. 1, 41-71 could also be considered in this section. (Sven Schulze, Hamburgisches WeltWirtschaftsinstitut (HWWI))	Cite added
98	37965	10	14	38	14	54	The section could mention also the project EWENT ("Extreme Weather impacts on European Networks of Transport"), funded under Task TPT.2008.1 by the Directorate General for Research and Technical Development (DG-RTD) of the European Commission. The project, which is coordinated by VTT Technical Research Centre of Finland, studies the effects of extreme weather events on the safety and reliability of traffic systems in Europe and estimates the cost effects of weather-related disruptions. It has started in 2010 and ends in 2012. (Elena Georgopoulou, National Observatory of Athens)	Under Review
99	38575	10	14	43	14	46	Transportation systems also are vulnerable to wind and wildfires. (Richard Wright, Retired, U.S. National Institute of Standards and Technology)	text added
100	37966	10	15	5	15	21	The section is devoted only to the direct impacts of CC on road infrastructure. However, there is a much larger number of recent studies on CC impacts on traffic safety and congestion (see also Chapter 23-Europe), which are in the majority of cases in line with AR4, while they provide also some cost figures on these CC impacts. At least a link should be made on this to Chapter 8 which in page 22 discusses these impacts. (Elena Georgopoulou, National Observatory of Athens)	text added
101	37967	10	15	5	15	21	The references included here are rather old (i.e. 5 out of 9 are before 2007). What about more recent ones? If they do not exist, this should be clearly mentioned in order to highlight the relevant gap of knowledge. (Elena Georgopoulou, National Observatory of Athens)	text added
102	37968	10	15	26	15	32	You should add some text on the effect of CC on rail infrastructure, e.g. rail buckling due to increased temperatures, and impacts as a result of less ice. For more on these and refs see Chapter 23-Europe. At least a link to this Chapter should be made here. (Elena Georgopoulou, National Observatory of Athens)	Covered in Chpt 23
103	37969	10	15	50	16	2	The reference included (Middelkoop et al., 2001) is too old. More recent estimates on Rhine and CC: Linde, 2007; Jonkeren et al., 2007; Jonkeren, 2009; Krekt et al., 2011; Jonkeren et al., 2009 - See Chapter 23 (Europe) for more details on these refs. These refs indicate that CC will cause low river flow which, on its turn, will pose obstacles to inland navigation. Regarding high water levels during future winters, the need of transport blockage for safety reasons during future high water levels is not yet known (Krekt et al., 2011). (Elena Georgopoulou, National Observatory of Athens)	Defer to Ch 23
104	37970	10	16	1	16	2	You can include some cost figures here. For these figures see Jonkeren et al., 2007; Jonkeren, 2009 - Chapter 23 Europe for more details on these. (Elena Georgopoulou, National Observatory of Athens)	Defer to Ch 23
105	54207	10	16	10	16	12	Does the citation included here imply that these statements with likelihood language are meant only to pertain to Canada, or are these global statements? It would be useful to clarify the geographic scope intended. (Michael Mastrandrea, IPCC WGII TSU)	Yes, this is specifically for Canada, but author feels by analogy similar Northern latitude nations will have the same impacts.....
106	37692	10	16	19	0	0	I think Nicholls should be added as a reference. [Nicholls, R. J. et al., 2008: Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes: Exposure Estimates. OECD Environment Working Papers, No. 1, OECD Publishing, Paris,, <a href="http://dx.doi.org/10.1787/011766488208">http://dx.doi.org/10.1787/011766488208</a> ] (George Backus, Sandia National Laboratories)	Cite added--double check--and forwarded to Chpt 8
107	54208	10	17	14	0	0	Section 10.5.1.2: Are there studies available about the economic impacts of pest outbreaks related to changes in climate conditions that would be relevant here? (Michael Mastrandrea, IPCC WGII TSU)	There could be some studies linking physical relationship between climate change and pest outbreak, but I could not find any studies that measures the economic impacts of pest outbreaks due to changing climates.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
108	37009	10	17	14	17	23	This paragraph does in no way reflect the impact climate change can have on forestry and forest-related economics. I suggest you include the differing influences of disturbances on markets, the uncertainties in demand for biofuels (also increased by some adaptation and mitigation pathways), and the problem that a shift of a biome over the landscape does not mean the services of said biome are available constantly. Trees need time to grow, so abrupt changes in e.g. forest composition in N America due to changes in regional climate need decades to be noticeable in timber supply. Please check your sources whether the models applied therein accounted for the possibility of disrupted timber supply, time-lags or reduced supply due to disturbances and "chaotic" shifts in forest composition. You may want to have a look at the following paper: Kirilenko, A. P. and R. A. Sedjo (2007). "Climate change impacts on forestry." Proceedings of the National Academy of Sciences 104(50): 19697-19702, and you may want to pay more attention to Chapter 4 of "Adaptation of Forests and People to Climate Change ..." (which, as far as I know, should be cited as "Seppälä, R., A. Buck, P. Katila (eds.) (2009): Adaptation of Forests and People to Climate Change -- A Global Assessment Report. IUFRO World Series 22, International Union of Forest Research Organizations, Helsinki, 224 p." It would also be fair to cite the chapter in the same way you want your contribution to the AR5 to be cited. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	As Kirilenko and Sedjo (2007) noted that the limiting factors such as pests, weeds, competition for resources etc., are not implemented in these models.
109	50612	10	17	17	17	19	For the described acceleration of tree growth, it would be helpful to specify the relevant scenarios of climate change and socio-economics (aside from inclusion of adaptation), perhaps along with the relevant timeframe. (Katharine Mach, IPCC WGII TSU)	since we could not find any published study in the required area.
110	50613	10	17	36	17	36	"likely" -- If this term 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)	the word is replaced by expected
111	54209	10	17	37	17	40	Please specify the timeframe and climate scenarios employed in these projections, as well as other key assumptions made. (Michael Mastrandrea, IPCC WGII TSU)	The timeframe covered in the cited studies is 1990 to 2005 and it based on observed climate.
112	43322	10	17	53	17	53	Water sources will be damaged locally by opening more mining pits, as the water springs are destroyed by the earth movement. Also, ore pipelines take a lot of fresh water from high regions to ocean coasts. This will decrease water security for humans near the mining regions. (Milton Nogueira da Silva, Climate Change Forum of Minas Gerais, Brazil)	as the cited literature is silent on this count.
113	39518	10	18	4	18	16	Section 10.5.2.1: See also Huebler, Klepper & Peterson, S. (2008) Costs of climate change - The effects of rising temperatures on health and productivity in Germany, Ecological Economics, 68 (1-2). pp. 381-393. (Sven Schulze, Hamburgisches WeltWirtschaftsinstitut (HWWI))	Reference Added.
114	37971	10	18	8	18	8	Not only the quality but also the safety of product (Popov Janevska et al., 2010; Jaxsens et al., 2010). (Elena Georgopoulou, National Observatory of Athens)	as the references belong to the area of cold chain management rather than the economic impact of climate change on product safety.
115	37693	10	18	15	0	0	Comment 1: Maybe change the line to say " ... there is no literature that broadly quantifies..." and add: Sandia National Laboratories did produce a bottom-up study that evaluated the interaction among 70 industries and consumers, with the interconnect United States as climate change-induce shifts in water supply and cause population and business migration as well as change in price that affected demand (Backus et al., 2012). The impact through the year 2050 exceeds one trillion U.S. dollars, with employment loss of nearly 7 million person-years. Other U.S. studies have evaluated the impacts across infrastructure and several industries, but with limited emphasis on the interaction among industries and across regions (Wilbanks et al., 2012, Niemi 2009a, 2009b, 2009c, Repetto 2011a, 2011b, 2012a, 2012b, 2012c, 2012d). [Wilbanks, T., S. Fernandez, et al, 2012: Climate Change and Infrastructure, Urban Systems, and Vulnerabilities: Technical Report For The U.S. Department of Energy in Support of the National Climate Assessment. Oak Ridge National Laboratory, Oak Ridge, Tennessee. Available at: <a href="http://www.esd.ornl.gov/eess/Infrastructure.pdf">www.esd.ornl.gov/eess/Infrastructure.pdf</a> ] (George Backus, Sandia National Laboratories)	Reference is more relevant to Chapter 08 so forward to chapter 8 team
116	37694	10	18	15	0	0	Comment 2: [Niemi E. (2009a). An Overview of Potential Economic Costs to Washington of a Business-As-Usual Approach to Climate Change. The Program on Climate Economics, Climate Leadership Initiative, Institute for a Sustainable Environment, Eugene, OR: University of Oregon.] [Niemi E. (2009b). An Overview of Potential Economic Costs to Oregon of a Business-As-Usual Approach to Climate Change. The Program on Climate Economics, Climate Leadership Initiative, Institute for a Sustainable Environment, Eugene, OR: University of Oregon.] [Niemi E. (2009c). An Overview of Potential Economic Costs to New Mexico of a Business-As-Usual Approach to Climate Change. The Program on Climate Economics, Climate Leadership Initiative, Institute for a Sustainable Environment, Eugene, OR: University of Oregon.] [Backus, G., T. Lowry and D. Warren, 2012: The near-term risk of climate uncertainty among the U.S. states. Climatic Change, Online First 23 June 2012. Doi: 10.1007/s10584-012-0511-8] [Repetto, R. 2012a: Economic And Environmental Impacts Of Climate Change In Virginia, DEMOS, New York, NY. Available at: <a href="http://www.demos.org/publication/economic-and-environmental-impacts-climate-change-virginia">http://www.demos.org/publication/economic-and-environmental-impacts-climate-change-virginia</a> ] (George Backus, Sandia National Laboratories)	Reference is more relevant to Chapter 08 so forward to chapter 8 team



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117	37695	10	18	15	0	0	Comment 3: [Repetto, R. 2011a: Economic And Environmental Impacts Of Climate Change In Nevada, DEMOS, New York, NY. Available at: <a href="http://www.demos.org/publication/economic-and-environmental-impacts-climate-change-nevada">http://www.demos.org/publication/economic-and-environmental-impacts-climate-change-nevada</a> ] [Repetto, R. 2012b: Economic And Environmental Impacts Of Climate Change In Florida, DEMOS, New York, NY. Available at: <a href="http://www.demos.org/publication/economic-and-environmental-impacts-climate-change-florida">http://www.demos.org/publication/economic-and-environmental-impacts-climate-change-florida</a> ] [Repetto, R. 2011b: Economic And Environmental Impacts Of Climate Change In Arizona, DEMOS, New York, NY. Available at: <a href="http://www.demos.org/publication/economic-and-environmental-impacts-climate-change-arizona">http://www.demos.org/publication/economic-and-environmental-impacts-climate-change-arizona</a> ] [Repetto, R. 2012c: The Rising Risks of Climate Change in Massachusetts, Energy Future Coalition, Washington DC. Available at: <a href="http://www.energyfuturecoalition.org/files/webfmuploads/Repetto%20Paper%20Massachusetts.pdf">http://www.energyfuturecoalition.org/files/webfmuploads/Repetto%20Paper%20Massachusetts.pdf</a> ] [Repetto, R., 2012d: New Mexico's Rising Climate Risks, UN Foundation, New York, NY. Available at: <a href="http://www.energyfuturecoalition.org/files/webfmuploads/04-18-12%20Repetto%20Paper%20New%20Mexico.pdf">http://www.energyfuturecoalition.org/files/webfmuploads/04-18-12%20Repetto%20Paper%20New%20Mexico.pdf</a> ] (George Backus, Sandia National Laboratories)	Reference is more relevant to Chapter 08 so forward to chapter 8 team
118	44731	10	18	15	18	16	Comment 1: This is a too strict sentence. I would suggest it is changed to: "Unfortunately, there are only a few studies that quantifies-----". Comment 2: Suggest to include: "For example Moiseyev et al. (2011) use the global partial equilibrium model EFI-GTM to estimate the economic impacts of the IPCC scenarios A1 and B2 on the EU forest industries, for various prices of wood for bioenergy. The study shows, among other things, that assumptions regarding international trade are very important for the results, in particular wood imports from Russia and tropical forest plantations. (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)	Comment 1: Accepted. Comments 2: Reference included.
119	37972	10	18	21	18	38	References are completely missing here. If they do not exist, this should be clearly mentioned in order to highlight a gap of knowledge. (Elena Georgopoulou, National Observatory of Athens)	Text now contains references to relevant literature.
120	37056	10	18	41	0	0	It would be worthwhile to include a brief discussion on observed impacts and their (non)attribution to climate change, even if this boils down to acknowledging the apparent lack of literature discussing those (opposed to quite some work on future potential impacts). The discussion of the different approaches to temperature-relation of tourism patterns is very interesting in this context! (Gerrit Hansen, Potsdam Institute for Climate Impact Research)	It would indeed. However, there are no detection and attribution studies in tourism.
121	52857	10	18	41	0	0	Section 10.6 Recreation and Tourism Following reference (synthesis and case studies) highly relevant: Climate Change and Tourism: From Policy to Practice, By Susanne Becken and John Hay; Published June 14th 2012 by Taylor and Francis/Routledge - 280 pages (John Hay, University of the South Pacific)	There is sufficient evidence in journal literature. No need to refer to gray literature.
122	41820	10	18	41	22	36	section 10.6 - While much literature is synthesized in this section, it is not comprehensive of the literature. Discussion related to climate change-induced environmental change in particular needs further attention. The discussion related to the construction of 'climate indices for tourism' is irrelevant for the purposes of the IPCC and this can be removed to conserve text for reporting on empirical results of many studies that are not discussed in this FOD. Recent comprehensive reviews of the climate change and tourism literature have been completed (see below) and these citation rich resources may prove useful to the author(s) responsible for this section: Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232) and the much more comprehensive book that this summary review is based on Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge. (Daniel Scott, University of Waterloo)	proposal to exclude relevant part of peer-reviewed literature. Fine suggestion on environmental change, but no references provided. Added WIREs paper. No need to refer to book in gray literature.
123	41821	10	18	41	22	36	section 10.6 - While the structure of this section (demand and supply sections) is intuitive, in some areas the text reads like a series of bullet points without logical structure. Understanding that this is a FOD, areas where this is particularly distracting have been identified. (Daniel Scott, University of Waterloo)	Announcement, no response needed.
124	41822	10	18	43	0	45	If the scale / salience of this economic sector is to be identified for IPCC readers, then provide some empirical measure of its contribution to global GDP or employment or other relevant indicators. Tourism indicators are available from organizations such as the UNWTO and WTTC for years as recent as 2010-11. While the economic value of recreation sector is more difficult to compile at this scale, illustrative examples do exist in countries like the US, Australia and perhaps members of the EU. (Daniel Scott, University of Waterloo)	Added WTTC stats for 2011.
125	41823	10	18	44	0	0	It is important to note here that while recreation and tourism are very important economic activities in rich (developed) countries, tourism as a proportion of GDP and employment is more important in some developing countries (especially SIDS) and is looked at as a development strategy by many more. It is in the countries where the greatest economic impact of changes in tourism are likely to be experienced (see discussion in: Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232); Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; Gössling, S., Scott, D., Hall, M. (2009) The Challenges of Tourism as a Development Strategy in an Era of Global Climate Change. In: Rethinking Development in a Carbon-Constrained World. Development Communication. Helsinki: Ministry of Foreign Affairs of Finland. 100-119. (Daniel Scott, University of Waterloo)	Repeat comment (#124)
126	41825	10	18	51	0	0	If the authors wish to provide readers with a link to a recent, comprehensive, citation rich resource for this 'large literature' they might consider either of the following: Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232); Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge (Daniel Scott, University of Waterloo)	Repeat comment (#122)

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
127	41824	10	18	53	0	0	tourist resorts' - This is more aptly considered to be 'tourism operators and destination communities'. Parks, marinas and other government or business tourism operations are not necessarily 'resorts'. (Daniel Scott, University of Waterloo)	Corrected.
128	41838	10	19	0	20	0	A number of the references in this section have been discussed in AR4 (some TAR). Other chapters have focused on post-AR4 literature, but observed where the findings are consistent with/support AR4 findings. This approach could assist in reducing the number of citations needed in this chapter as well. (Daniel Scott, University of Waterloo)	Removed older references where a statement is supported by older and newer references.
129	40592	10	19	12	19	44	A clear separation between recreation and leisure is needed. Fishery is not recreation but leisure (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	Clarified. Leisure at home, recreation away, tourism away + overnight
130	41826	10	19	14	0	0	Clarify this sentence. Do you mean there is no systematic analysis of the types of recreation people in different climatic zones typically participate in? There are regional analyses of recreation participation in the US and Sports Geography works that examine this to some extent. On a global scale, I would concur. (Daniel Scott, University of Waterloo)	Added "at large spatial scales"
131	37973	10	19	14	19	34	In line 15 it is said that "impact of climate change on recreation is therefore unknown", while in lines 20-34 a number of case studies are presented. This sounds inconsistent. Line 15 should say something like "Therefore, there is only partial knowledge on the impact of climate change on recreation". (Elena Georgopoulou, National Observatory of Athens)	Replaced "unknown" with "largely unknown"
132	41827	10	19	17	0	0	Shaw and Loomis is a conceptual/review paper. There is no empirical 'finding' of a probable increase. Instead they refer to some of the earlier work by Loomis, which is a more accurate citation here. Other studies have reached similar conclusions about a transference of recreation patterns from certain seasonal activities to others (see list below). It should also be noted that all of these studies are in temperate nations (largely the US and Canada) and there is no such evidence in sub-tropical or tropical regions. Other sources that examine potential shifts in recreation activities because of climate change include: Scott, D. and Jones, B. (2006) Climate Change and Seasonality in Canadian Outdoor Recreation and Tourism - Executive Summary. Report prepared for the Government of Canada Climate Change Action Fund. Waterloo, Ontario: University of Waterloo. p. 28. (now also translated into Chinese 2009); Scott, D. (2011) Climate Change and a Healthy, Sustainable Environment: An Opportunity for Recreation and Parks Leadership? Commissioned paper for the National Recreation Summit (Lake Louise, October 2011). Scott, D.J., C.J. Lemieux, D. Kirchoff and M. Melnik. (2011). Analysis of Socio-economic Impacts and Adaptation to Climate Change by Québec's Tourism Industry. Technical Report 1: Climate Change Impact Assessment: Risks and Opportunities. Interdisciplinary Centre on Climate Change (IC3), University of Waterloo and Consortium on Regional Climatology and Adaptation to Climate (Daniel Scott, University of Waterloo)	For Loomis, replaced "find" with "argue". For the rest of the comment: There is sufficient evidence in journal literature, so no need to refer to gray literature.
133	41835	10	19	20	0	40	Another point related to this discussion about changes in outdoor recreation seasons, specifically lengthening of warm-weather recreation seasons in temperate nations, is that this change would provide additional opportunities for outdoor physical activity. Adverse weather has been identified in the literature as a salient barrier to physical activity in temperate countries, including youth, and assuming these opportunities are utilized there would be attendant public health benefits. This recreation-health connection has been overlooked by the climate change and health literature as far as I can determine. For a discussion of this issue and related literature on weather and physical activity, see: Scott, D. (2011) Climate Change and a Healthy, Sustainable Environment: An Opportunity for Recreation and Parks Leadership? Commissioned paper for the National Recreation Summit (Lake Louise, October 2011). (Daniel Scott, University of Waterloo)	There is sufficient evidence in journal literature. No need to refer to gray literature.
134	41828	10	19	20	0	44	These two paragraphs need an improved structure. Perhaps organized along the lines of the discussion in the previous paragraph about declines in winter recreation and enhanced opportunities for warm-weather recreation. (Daniel Scott, University of Waterloo)	Reorganized, shortened and simplified the first paragraph. Kept it separate from second paragraph which is about methodological issues.
135	41830	10	19	20	0	44	There are other studies that examine the implications of climate change for recreation patterns related to park use (urban and national/provincial-state parks, theme parks/zoos, etc) that could be incorporated into this section to strengthen its overall points. (Daniel Scott, University of Waterloo)	No references provided.
136	41829	10	19	33	0	0	The point that none of these studies accounts for budget constraints or changes in time available for recreation is a fair one, but the same point related to time and holiday patterns can be made of econometric studies of global tourism demand on page 20. (Daniel Scott, University of Waterloo)	The offending clause was dropped in response to comment #134.
137	41831	10	19	36	0	37	This point that 'some studies incorrectly claim to assess the impact of climate change ... confuse weather and climate' needs to be reexamined. One of the studies listed as 'confusing' weather and climate, used observed park visitation data and weather data to build statistical relationships between visitation and weather conditions and then re-run the statistical model with 30 year downscaled future climate change scenarios to examine how visitation could change. This is exactly the same approach used by several studies in the preceding paragraph (e.g., Shih et al - who use daily weather and lift ticket sales, Scott and Jones - who use daily weather and golf rounds played) and is the same statistical approach as other demand modeling, such as Maddison who builds statistical relationships between monthly temperatures and British visits to Greece (only the scale of weather data - daily, weekly, monthly varies and it needs to in order to capture the salient impact of precipitation or strong wind). Furthermore, the same principles apply to crop models and other models that use daily weather as inputs, but assess the implications of climate change. So how is it that these studies are different and somehow confuse what is weather and climate? (Daniel Scott, University of Waterloo)	Deleted editorializing.
138	54210	10	19	36	19	44	It is not completely clear why some tourism studies are included here in the recreation section. (Michael Mastrandrea, IPCC WGII TSU)	Moved.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
139	41832	10	19	39	0	0	The discussion of the potential impact of climate change-induced environmental change in these mountain parks should be organized together with a broader discussion of evidence about how climate change-induced environmental change could impact tourism demand. See the following for a critical review of this broader literature as it relates to environmental change in a range of ecosystems (glaciers and mountain landscapes, forest condition - temperate and tropical, coral reefs and dive tourism, beaches and coastal tourism, and biodiversity such as fish species, polar bears, etc): Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232; Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; (Daniel Scott, University of Waterloo)	Repeat comment (#122)
140	41833	10	19	41	0	42	Other studies are available on the impact of anomalously warm (or cool) weather on tourism spending. See the following for a summary of available studies: Scott, D., Lemieux, C. (2010) Weather and climate information for tourism. <i>Procedia Environmental Sciences</i> , 1, 146-183. (Daniel Scott, University of Waterloo)	There is sufficient evidence in journal literature. No need to refer to gray literature.
141	41834	10	19	42	0	44	Agree on the selection bias of these studies, which is a problem common to in situ surveys. Those who find the conditions objectionable / unsuitable are not there to be surveyed. Therefore, why even include these studies in this section? The point related to these references is not germane for this section. (Daniel Scott, University of Waterloo)	Moved in response to comment #138.
142	39519	10	19	47	0	0	Section 10.6.1.2: For some travelling choices weather/climate does not play a large role, see e.g. city tourism, where other factors dominate. This is reflected in books like "Analysing International City Tourism", edited by Josef A. Mazanec and Karl W. Wöber (2011). (Sven Schulze, Hamburgisches WeltWirtschaftsinstitut (HWWI))	There is sufficient evidence in journal literature. No need to refer to gray literature.
143	45811	10	19	47	0	0	The article of Amelung and Moreno (2012) on tourism impacts in Europe could be considered in this section. Those authors make an interesting assessment of summer tourism flows under future climate scenarios, based on a statistical analysis between bed nights and climate determinants with a seasonal frequency. The results include the influence of alternative adaptation options. Amelung, B. and A. Moreno, 2012: Costing the impact of climate change on tourism in Europe: Results of the PESETA project. <i>Climatic Change</i> , 112, 83-100. (Juan-Carlos Ciscar, European Commission)	Study added to list of other marginal papers.
144	40593	10	19	47	20	22	To much studies before 2006 (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	Older references were removed.
145	41836	10	19	49	0	52	This long list of references for this well known point is not necessary. If a reference is desired to support this point, suggest a summary/review article reference instead. The following white paper for the sector for WCC-3 is a recent example, but others would suffice as well: Scott, D., Lemieux, C. (2010) Weather and climate information for tourism. <i>Procedia Environmental Sciences</i> , 1, 146-183. (Daniel Scott, University of Waterloo)	Older references were removed.
146	35464	10	19	52	19	52	To add after of the first 2010) the following reference: (... 2010; Garza et al., 2011). (M. Dolores Garza-Gil, University of Vigo)	There is sufficient evidence in journal literature. No need to refer to gray literature.
147	41837	10	19	53	0	54	There is now a growing literature on 'last chance tourism'. See papers by Lemelin et al 2010 and a new book from Routledge (Lemelin et al. 2012). The examples of LCT are all related to environmental change (mostly climate change induced, but not all) and are not directly 'last chances' of climate or weather that this paragraph starts out discussing. Therefore need to restructure this paragraph. A critique of LCT is offered by the following that shows that beyond the destination scale there is rarely any 'last chance' for such tourism products, they are still offered elsewhere in the tourism system: Scott, D., Gössling, S., Hall, C.M. (2012) <i>Climate Change and Tourism: Impacts, Adaptation and Mitigation</i> . London: Routledge; (Daniel Scott, University of Waterloo)	There is sufficient evidence in journal literature. No need to refer to gray literature.
148	41840	10	20	3	0	4	How is it known that tourists prefer the climates of specific regions in these three European countries? The three preceding references provided all use country level data, so how is this regional specification determined? Is it the climate that tourists seek in these countries or culture/cuisine? The climates available in these regions are available elsewhere in the world, but international tourists only chose these regions - why? Or perhaps it is the nature of the data, that European travellers are considered 'international' tourists as they travel in the EU, while the millions of Americans or Chinese that travel to southern/warmer regions in their countries are not counted in such statistics? (Daniel Scott, University of Waterloo)	Climate is a continuous variable allowing for higher granularity. Added that the regressions have many controls, and data are limited to international travellers.
149	41839	10	20	4	0	5	people from hot climate care more about where they spend holidays ...' - What is the evidence to support such a claim? The greatest regional tourism flows are from central-northern Europe to the Med, northern US-Canada to Gulf of Mexico-Caribbean, etc, all signifying that tourists from cooler climates care where they go (especially the hundreds of millions that take annual 'winter escape' holidays to warm locations). Tourism studies has a substantive destination choice literature and to my knowledge does not make any similar claim. (Daniel Scott, University of Waterloo)	Evidence is in the cited paper.
150	54211	10	20	4	20	5	Can the factors that people from hot climates care more about be specified? (Michael Mastrandrea, IPCC WGII TSU)	Clarified.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
151	41841	10	20	7	0	8	While Scott et al 2008 (and others - see below) do find differences in the importance rankings of climatic variables and some demographic differences (e.g., seniors versus youth), the preferences for temperature (which is the only climatic variable that Bigano et al 2006 include) are rather consistent and similar to some of the 'optimal temperatures' identified by econometric studies (though these vary substantially - e.g., Lyons et al. 2009 finds optimal temperatures to be 40C+). So I actually don't see these as that much of a contrast, rather the stated tourist climate preferences approach provides a method that can explore these climatic preferences in more detail than revealed preferences approaches can (unless daily weather data is used in a revealed study along with detail market segmentation data that is rarely available). Perhaps a more important contrast to point out is that the revealed preference studies cited must deal with tourism as a whole because of the nature of the data available, while stated preference approaches can examine preferences for specific types of destinations/major activity types (e.g., coastal/beach, urban/sightseeing-shopping, mountain/adventure) and differences among market segments (seniors vs youth). Here important differences are found. Other stated preference studies that should be cited include: Ruttu M, Scott D. Will the Mediterranean become "too hot" for tourism?: a reassessment. Tourism Hospit Plann Dev 2010, 7:267 – 281. Moreno A. Mediterranean tourism and climate (change): a survey-based study. Tourism Hospit Plann Dev 2010, 7:253 – 265. Credoc (2009). Climat, meteorologie et frequentation touristique, rapport final. Rapport final, juillet 29, Meie/Meeddat/Diact, p 1-93. (Daniel Scott, University of Waterloo)	Bigano et al. finding was confirmed by Tol & Walsh and Rosello et al. (both in review). Lyons et al. did something else. Scott et al. 2008 look at three countries only. Ruttu & Scott is on a different subject. Credoc is gray. Added Moreno as a third example of sampling bias.
152	37974	10	20	20	20	20	Why the total number of international tourists falls? More discussion is needed here. In fact, there will be also new tourists from China and other Asian countries (see the findings of Hamilton and Tol, 2007). An important point is whether, even under the worst (for Southern Europe) scenario (i.e. a scenario where the number of European tourists in southern Europe decreases as a result of climate change), the overall number of international tourists in southern Europe remains stable or increases due to economic growth which brings in new tourists (mainly from Asia). In other words, does economic growth dominate climate change when examining the impacts on tourism? As it stands now, the section gives the impression that the overall size of tourism demand in Europe will remain stable and will only be split in a different way than at present between north and south, which may not be true. (Elena Georgopoulou, National Observatory of Athens)	Fall is relative to baseline without climate change.
153	41842	10	20	22	0	0	Based on available evidence, recent reviews (listed below) have concurred with this statement that climatic change would redistribute (spatially and temporally) international and domestic tourism, but not negatively affect net tourism activity, and could actually enhance total tourism activity. The challenge relates to measuring 'tourism activity', as indicators such as spending (related to transport), distance travelled, even international trips could be lower for those in temperate countries as they are projected to stay closer to home. See discussion in: Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; (Daniel Scott, University of Waterloo)	WIREs paper was added.
154	40594	10	20	25	20	50	The approach of the used index has to be more clear and detailed. Most studies use TCI of Mieczkowski (1984), which is a combination of several parameters and factors. Nowadays the quantification of climate in tourism is based on facets (thermal, aesthetic and physical). The here described index is only for the thermal component. In the studies mentioned by Endler and Matzarakis and Endler et al. is included an integral scheme which includes all three facets. The Schme (CTIS) combines based on thresholds and the most relevant climate factors for tourism. CTIS is described in the studies: a) Lin, T.-P., Matzarakis, A., 2008: Tourism climate and thermal comfort in Sun Moon Lake, Taiwan. International Journal of Biometeorology 52, 281-290 and b) Zaninovic, K., Matzarakis, A., 2009: The Biometeorological Leaflet as a means conveying climatological information to tourists and the tourism industry. International Journal of Biometeorology 53, 369-374. (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	References added.
155	40595	10	20	25	20	50	The other studies use the TCI mentioned above. (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	Space limits do not allow us to spell out which study uses what index, so we made that text less specific.
156	40597	10	20	25	22	21	Tourism industry and tourist love the variety of offers and possibilities. A separation of winter and summer tourism is of relevance but can mislead. In my opinion it has to be included a whole year tourism assessment including the most relevant kinds of tourism and climate parameters/factors. see: Matzarakis, A., Hämmerle, M., Endler, Ch., Muthers, S., Koch, E., 2012: Assessment of tourism and recreation destinations under climate change conditions in Austria. Meteorologische Zeitschrift 21, 157-165 (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	Added.
157	40598	10	20	25	22	21	This part has to be harmonized with the part of tourism i.e. chapter Europe (23) etc. (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	Discussion with Chapter 23 is ongoing.
158	40599	10	20	25	22	21	Tourism depends from weather and climate. Of interest is the effect of climate change and his implications. But tourism suffers more from extreme events like heat waves (link to health) and storms (damage of infrastructure). See: Scott, D., C.R. de Freitas, Matzarakis, A., 2009: Adaptation in the tourism and recreation sector. In: G. R. McGregor, I. Burton, K. Ebi (Eds.), Biometeorology for Adaptation to Climate Variability and Change. Springer, 171-194. (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	There is sufficient evidence in journal literature. No need to refer to gray literature.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
159	41849	10	20	25	22	21	Section 10.6.2 misses one aspect of climate change and tourism, that of inter-annual variability or 'seasonality'. This is most important when considering the effects of climate/weather induced extreme events that happen to strike during key season-specific tourism at the destination level. Some suggestions for literature that specifically talk about tourism and seasonality in this context include: (1) Roman, C.E., Lynch, A.H., & Dominey-Howes, D. (2011). "What is the goal? Framing the climate change adaptation question through a problem-oriented approach". American Meteorological Society's Weather, Climate & Society, 3(1): 16-30; (2) Roman, C.E., Lynch, A.H., & Dominey-Howes, D. (2010). "Uncovering the Essence of the Climate Adaptation Problem - a Case Study of the Tourism Sector at Alpine Shire, Victoria, Australia". Tourism and Hospitality Planning & Development, 7(3): 237-252; and (3) Roman, C., & McEvoy, D. (2011). Kailash Sacred Landscape Conservation Initiative (KSLCI) Strengthening Project - Nepal. Climate Change and Tourism - Final Report. Melbourne: Climate Change Adaptation Program, Global Cities Research Institute, Royal Melbourne Institute of Technology (RMIT) University (available from <a href="http://global-cities.info/wp-content/uploads/2011/10/KSL_tourism-Nepal_FINAL_report.pdf">http://global-cities.info/wp-content/uploads/2011/10/KSL_tourism-Nepal_FINAL_report.pdf</a> ). (Carolina Adler, Swiss Federal Institute of Technology (ETH) Zurich)	These papers are not about seasonality.
160	41843	10	20	27	0	0	so-called biometeorological studies' - Why 'so-called'? Is this meant as an insult to these types of studies or that the author(s) are not sure what to call this type of index based research? I would contend the 'biometeorological' is not a useful term, as many academic disciplines have contributed to this work, and most would not call themselves 'biometeorologists'. The more state of the art indices available that are to some extent validated with tourists perceptions of weather/climate are informed as much by psychology as biometeorology. (Daniel Scott, University of Waterloo)	"so-called" dropped
161	41844	10	20	27	0	50	This discussion of the use of climate indices to explore how climate resources for tourism have changed or are projected to change as a result of climate change needs to be better organized and perhaps more critical (see subsequent points and further discussion in Scott et al. 2012), although some of that is incorporated in the following paragraph. The work on how climate resources in some destination has changed over the last 50 years could logically come first, followed by literature that looks at the potential longer term evolution of climate resources (including spatial and temporal patterns). Some of what is discussed here was discussed in AR4 and could be made more consistent with 'consistent with AR4 ...'. (Daniel Scott, University of Waterloo)	Thematic organization better than chronological one.
162	41845	10	20	32	0	0	Scott et al. 2004 did not say Florida and Arizona 'would lose market share' as their work is not a demand model. They indicated the climate resources in these destinations (as well as Mexico) would have new competition from other coastal states with improved climatic conditions over some key 'winter getaway' holiday months. (Daniel Scott, University of Waterloo)	Paper's conclusion consistently rephrased.
163	41846	10	20	33	0	0	Perry (2006) only speculates (not 'notes) as he has no empirical data to support this claim that the heat wave of 2003 negatively impacted the Med region. Those who have compiled anecdotal evidence about visitation patterns and spending in France argue the opposite, that coastal areas benefitted from the 2003 heat wave as more people desired to escape the affected cities. See discussion on the impact of extremes in: Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; (Daniel Scott, University of Waterloo)	Changed as proposed.
164	41847	10	20	33	0	39	These sentences on the work of Enderl and Matzarakis provide no insight into the potential impacts of climate change for tourism and should be deleted. This biometeorological work has little relevance to tourism and has never been published in tourism journals. (Daniel Scott, University of Waterloo)	This is a respectable branch of literature published in reputable journals.
165	41848	10	20	39	0	42	Again is there a need to distinguish what has been included in AR4 versus newer work, which I concur largely reinforces previous findings, but with the benefit of having addressed some of the criticisms and alarmist statements related to the work of Amelung and Viner 2006). The following have also pointed out that these index works do not adequately consider the micro-climate aspects of coastal tourism destinations/resorts (i.e., moderating coastal breezes) and when these are factored in, the claims about the Med region as a single destination becoming 'too hot' in summer are incorrect. It is the coastal urban areas that are most at risk (where tourists seek cooler thermal conditions than for beach tourism and where urban heat islands occur), but some are already 'too hot' and tourists still frequent these destinations. This provides an additional interpretation of local scale impacts to that of Giannakopoulos et al. (and somewhat contradictory). See the following for empirical analysis of impact of microclimate coastal breezes (and the basis for coastal cooling estimates from comparisons of coastal and inland stations in Italy and Greece): Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; (Daniel Scott, University of Waterloo)	AR4 barely mentioned tourism. There is sufficient evidence in journal literature. No need to refer to gray literature.
166	41849	10	20	45	0	0	sunbathers like it hot' - This is supported by the stated preference work cited in the previous section, including: Scott et al. 2008; Ruttly M, Scott D. Will the Mediterranean become "too hot" for tourism?: a reassessment. Tourism Hospit Plann Dev 2010, 7:267 – 281. Moreno A. Mediterranean tourism and climate (change): a survey-based study. Tourism Hospit Plann Dev 2010, 7:253 – 265. Credoc (2009). Climat, meteorologie et frequentation touristique, rapport final. Rapport final, juillet 29, Meie/Meeddat/Diact, p 1-93. (Daniel Scott, University of Waterloo)	White references added.
167	41850	10	20	47	0	50	Perch-Nielsen 2010 uses more than meteorological indicators, but attempts to incorporate sea level rise and other indicators as well (to the extent these are possible at a country scale). (Daniel Scott, University of Waterloo)	Accurate interpretation of original text.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
168	41851	10	20	52	21	3	For an updated critique of index based studies (rather than biometeorological studies) see: Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge. Again, I do not see the AR5 as the place to discuss the details of the critique of this literature (any more than for the econometric modeling approaches). These discussions need to take place elsewhere where sufficient depth is permitted. In AR5 a synthesis and comparison of their respective agreed upon findings should be the objective. As indicated, it is my view that they largely arrive at similar broad scale conclusions that support the statement on pg3-ln37-38, with varied nuances about seasonal patterns of impact and details on which market segments/destinations types are most at risk. (Daniel Scott, University of Waterloo)	There is sufficient evidence in journal literature. No need to refer to gray literature.
169	41852	10	20	54	21	3	These stated preference (survey based) as well as revealed preference (web cam images) studies of weather preferences should be mentioned in the previous section together with the work of Scott et al. 2008 (and the other similar studies identified) with regard to our understanding of preferred climatic conditions and critical thresholds of unacceptability. These should inform the construction of indices to rate climate resources for tourism and do in some cases (de Freitas et al 2008 and newer work by some of these authors), but not others (Ender and Matzarakis). (Daniel Scott, University of Waterloo)	Current structure separates results from critique to highlight latter
170	41867	10	21	0	22	0	The discussion of tourism operator/stakeholder perceptions of climate change risks and adaptation action (taken/planned) is disbursed on these pages (see previous point on Beck and Belle and Bramwell based sentence). Suggest they be organized into one discussion/paragraph. See the following for a review of the broader available literature: 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)	Separation of impacts and adaptation is inappropriate, as is separation of planned and actual adaptation.
171	54212	10	21	2	21	3	This point could be clarified further. (Michael Mastrandrea, IPCC WGII TSU)	Space constraints prevent elaboration.
172	41854	10	21	5	0	0	Actually the earliest papers on climate change and skiing were published in the mid-late 1980s by Wall and McBoyle. For a critical review of the climate change and ski tourism literature (as of 2011) see: Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; a more concise (and somewhat updated) review is available in 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)	Older references to be cut not added.
173	41853	10	21	5	0	34	This paragraph related to impacts on winter sports tourism (mainly skiing and snowmobiling) needs restructuring (separate snowmobiling out - put at the end - as the impacts to it are qualitatively different than skiing and it is only a North American tourism market). As elsewhere in this section, some further consideration about the necessary inclusion of pre-AR4 references (especially for very generic statements such as the opening sentence) is required in my view. (Daniel Scott, University of Waterloo)	Given the space constraints, we cannot separately assess the components of ski tourism.
174	40596	10	21	5	21	34	In the ski tourism hilly and lower lying mountainous areas should be included. For black forest and artificial snow making will not be relevant after 20-30 years and should be communicated. See: Schmidt, P., Steiger, R., Matzarakis, A., 2012: Artificial snowmaking possibilities and climate change based on regional climate modeling in the Southern Black Forest. Meteorologische Zeitschrift 21, 167-172 (Andreas Matzarakis, Albert-Ludwigs-University Freiburg)	Added.
175	41855	10	21	7	0	0	cannot fully offset' - Elsasser and Burki 2002 speculate this, but offer no empirical analysis of this. In contrast, a number of newer works that focus on potential snowmaking opportunities and more credibly, studies with physical-based snow models that assess available natural snow and required snowmaking (and whether it can be made climatically) arrive at similar conclusions for low-lying ski areas in the European Alps (that distinction is important!). See the work of Steiger 2010 and 2011 in Tyrol in particular. Hamilton et al. 2007 does not reach a similar conclusion in New England, because again they do not utilized a physically based snow model. Their study examines natural snow cover (not with snowmaking) and ski visits and provides not insight into the capacity of ski areas to make sufficient snow. That said there are a number of studies in New England that do utilize a physically based snow model or analogue winters to assess the impact on season lengths and snowmaking requirements: Scott, D., Dawson, J. and Jones, B. (2008) Climate change vulnerability of the Northeast US winter tourism sector. Mitigation and Adaptation Strategies to Global Change, 13 (5-6), 577-596. Dawson, J, Scott, D, McBoyle, G. (2009) Analogue Analysis of Climate Change Vulnerability in the US Northeast Ski Tourism. Climate Research, 39 (1), 1-9. Dawson, J. and Scott, D. (2012) Managing for Climate Change in the Alpine Ski Sector. Tourism Management. (Daniel Scott, University of Waterloo)	Changed "point out" to "argue". Ref to Hamilton rephrased. See comment #174.
176	41856	10	21	9	0	0	backyard snow' - Others have referred to this phenomena as well (in the European Alps and Eastern Canada), but more importantly, this needs to be explained if it is deemed important enough to include in AR5 (I don't think so personally). It is the presence of snow cover in urban markets (the suburbs of Boston, Montreal, Denver, etc) that is thought to inspire demand for skiing and even if snow is present at the ski areas in the mountains, if it is not also in the cities, demand will be depressed. Interestingly, while ski area management have alluded to this effect, a study of snow conditions at ski areas and in Montreal could not demonstrate this effect statistically with daily or weekly skier visits at 5 nearby ski areas: Scott, D.J., C.J. Lemieux, D. Kirchoff and M. Melnik. (2011). Analysis of Socio-economic Impacts and Adaptation to Climate Change by Québec's Tourism Industry. Technical Report 1: Climate Change Impact Assessment: Risks and Opportunities. Interdisciplinary Centre on Climate Change (IC3), University of Waterloo and Consortium on Regional Climatology and Adaptation to Climate (Daniel Scott, University of Waterloo)	There is sufficient evidence in journal literature. No need to refer to gray literature.
177	41861	10	21	10	0	0	For additional perspectives on the climate change risk perceptions and adaptation plans of ski area managers, see also: Wolfsegger, C., Gössling, S., Scott, D. (2008) Climate change risk appraisal in the Austrian ski industry. Tourism Review International, 12 (1), 13-25. (Daniel Scott, University of Waterloo)	Added.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
178	41858	10	21	15	0	19	For a summary of newer work on the potential impact on US and Canada ski tourism markets see: Scott, D. and Steiger, R. (2012) Climate Vulnerability of the Ski Industry. In: Climate Vulnerability. (Eds) Roger Pielke Sr.. Elsevier, San Diego. Scott, D., McBoyle, G., Minogue, A. (2007) The implications of climate change for the Québec ski industry, Global Environmental Change, 17, 181-190. Scott, D., Dawson, J. and Jones, B. (2008) Climate change vulnerability of the Northeast US winter tourism sector. Mitigation and Adaptation Strategies to Global Change, 13 (5-6), 577-596. Dawson, J, Scott, D, McBoyle, G. (2009) Analogue Analysis of Climate Change Vulnerability in the US Northeast Ski Tourism. Climate Research, 39 (1), 1-9. Dawson, J. and Scott, D. (2012-accepted) Managing for Climate Change in the Alpine Ski Sector. Tourism Management. This body of literature and ski tourism globally is also critically reviewed in: 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)	newest paper: There is sufficient evidence in journal literature. No need to refer to gray literature. Other papers not new.
179	50614	10	21	15	21	30	For these statements, the author team should specify the relevant climate/socio-economic scenarios as supported by the literature. (Katharine Mach, IPCC WGII TSU)	Assessment was drafted as an example of robust findings across scenarios, and details of specific scenarios are not relevant.
180	41859	10	21	19	0	0	Dawson et al analogue study found that the smallest and 'low lying' ski areas were the hardest hit by recent record warm winters. This finding is corroborated by analogue study in Tyrol by Steiger (2011). (Daniel Scott, University of Waterloo)	Added.
181	41857	10	21	19	0	20	Further to this discussion of the impact on snowmobiling, see the following study that focuses on regions of Canada and further explains why this winter sports market is far more vulnerable (snowmaking over thousands of km of trails is technically and economically not practical): McBoyle, G., Scott, D., Jones, B. (2007) Climate change and the future of snowmobiling in non-mountainous regions of Canada. Managing Leisure, 12 (4), 237-250. (Daniel Scott, University of Waterloo)	Reference added.
182	41860	10	21	27	0	0	The work of Moen and Fredman (and some others in this field) are unsound methodologically (see critical reviews of this field by Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232) and should not be included in AR5. At least not without important caveats, which typically space is not available for. (Daniel Scott, University of Waterloo)	Published in reputable journal.
183	41862	10	21	30	0	34	The climatic opportunities provided to mountain destinations in warm-weather months is important (and is also discussed in some of the climate index work as well as the mountain park work of Scott et al 2008 as well as Richardson and Loomis). However, tourism stakeholders in the Alps have made it clear that they do not see this as an equal replacement for the potential loss of ski tourism. See discussion by Steiger (2010, 2011) and stakeholder quotes from forthcoming publications in Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; (Daniel Scott, University of Waterloo)	Added.
184	41863	10	21	36	0	0	Phillips and Jones 2006 point out the obvious potential impacts of climate change/sea level rise for coastal tourism (as did Wall in the early 1990s and Gable in the late 1980s/early 1990s), but provide no insight into the magnitude, timing or geography of potential impacts. For a review of the available literature that provides insight into the potential impacts of sea level rise on coastal tourism, see the review in 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)	Agreed, and older reference at that: Removed
185	41864	10	21	41	0	43	This sentence on the work of Becken and Belle and Bramwell is a different topic. For a broader literature about how tourism operators and officials worldwide see the risk of climate change and the need for/plans for adaptation, see the reviews of: Scott, D., Gössling, S., Hall. (2012) International Tourism and Climate Change. Wiley Interdisciplinary Reviews – Climate Change, 3 (3), 213-232); and Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; (Daniel Scott, University of Waterloo)	Becken sentence is paraphrased from her abstract. Ditto for Belle and Bramwell.
186	41865	10	21	46	0	47	official preconceptions' - please elaborate on what is meant by this. Buckley (2008) discusses how speculation on sea level rise impacts has been misused by town councils in Australia, which may be the point being made here. (Daniel Scott, University of Waterloo)	Revised
187	41866	10	21	46	0	47	are not deterred by environmental change' - While I agree that tourists are far more robust to environmental change (evidence from multiple ecosystems - as summarized in Scott et al. (2012) - WIRE - Climate Change), that is a debatable interpretation from the citations provide. The studies cited found 3 groups of tourist responses, those that felt cheated by marketing, those who were largely indifferent, and those who understood and accepted the adaptive responses of resorts to stop further erosion despite the aesthetic impact. They do NOT know what proportion these three groups represent and the beach was still more than 50% pre-hurricane impact, which will not be the case after prolonged erosion from sea level rise. Furthermore, in this same study area (but perhaps not discussed in these papers), tour operators demanded immediate discounts to send tourists there (30% I was told), which changes the economics of these resorts (no longer profitable in some cases), there were criminal cases filed for illegal sand mining to try to repair the beach, and Cancun eventually invested over \$80million to nourish the beach. These are hardly trivial impacts. I suggest the author(s) of this section also see the discussion on studies on the impact of SLR on beaches in California and North Carolina as but two other studies that reinforce this point (all are discussed in the coastal tourism section of the review paper 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)	Rephrased. Response is mixed.
188	41868	10	22	1	0	0	For further discussion of the literature on the response of dive tourists and diver tourism operators to coral bleaching see 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)	Overview paper is inappropriate reference for such a specific point.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
189	37975	10	22	7	22	21	What makes these case studies presented in this para is the fact that (a) they deal with a whole country or (b) that they also look at all forms of tourism and thus can assess the impacts of climate change during the whole annual cycle? In my view, it is (b) and in fact a combination of both (a) and (b) that is needed and should be highlighted here. In addition, what are the main assumptions made in the case studies that examine potential shifts of tourist activities in a region as a result of climate change? These assumptions should be clearly mentioned here. (Elena Georgopoulou, National Observatory of Athens)	Assessment was drafted as an example of robust findings across scenarios, and details of specific scenarios are not relevant.
190	41869	10	22	26	0	28	While fully appreciate the effort to integrate supply and demand response to climate change in this sector, and encourage further collaborative work in this area, it needs to be acknowledged that at the country scale, such models are not able to adequately articulate destination level impacts (particularly climate change induced environmental changes). Innovative approaches to better understand system level impacts on tourism have been strongly encouraged by a number of authors, but see the following for one recent example: 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)	Added "rather stylized" to first sentence.
191	41870	10	22	33	0	0	sufficiently valuable' - This is context specific (a row of major resorts vs stand alone, isolated resort). See also the discussion on the special circumstances of coastal tourism and coastal protection versus beach nourishment in the references below. Protection may preserve resort infrastructure, but coastal squeeze will result in eventual loss of highly valuable beach asset and the economic impact of the loss of beach is clear when coastal vs inland resorts or even ocean view vs inland views are considered. This aesthetic perspectives are also discussed in the references below: Hamilton J. Coastal landscape and the hedonic price of accommodation. Ecol Econ 2007, 62:594 – 602. Scott, D. Sim, R., Simpson, M. (2012) Sea Level Rise Impacts on Coastal Resorts in the Caribbean. Journal of Sustainable Tourism. 20 (6). 883-898 Scott, D., Gössling, S., Hall, C.M. (2012) Climate Change and Tourism: Impacts, Adaptation and Mitigation. London: Routledge; (Daniel Scott, University of Waterloo)	Added "typically". Hamilton already referred to above. Added ref to Scott et al. in JOST.
192	42760	10	23	1	23	20	Section 10.7.2: This section focuses on the compensatory role of insurance. But it should also provide context and analysis about the role of insurance in providing ex ante incentives for reducing vulnerability, since the insurance sector has been identified as playing a potentially crucial role in providing incentives to reduce vulnerability. Kunreuther has written extensively about this in many publications, and Hecht (2008) provides analysis as well. The discussion in the Chapter 17 draft has some of this analysis, but it bears including in this section as well. (Sean Hecht, UCLA)	Role of insurance (ex ante) in providing incentives for reducing vulnerability is clearly discussed in 10.7.5 and further exemplified in table 10-7. As 10.7.2 serves as a short introductory description of the basic role of insurance for societies, it has to capture the underlying risk sharing function and its boundary conditions.
193	48296	10	23	2	23	20	A small writeup on role of institutions in coverage of disasters (Malini Nair, Indian Institute of Science)	The focus here is on insurance. A more general assessment of the literature on the role of institutions in the coverage of disasters is expected to show up within the adaptation chapters of WG 2.
194	45886	10	23	9	23	26	This study on changes in projected loss of life from flooding could be included as example of non-market impacts: Maaskant, B., Jonkman, S.N., & Bouwer, L.M. (2009). Future risk of flooding: an analysis of changes in potential loss of life in South Holland (The Netherlands). Environmental Science & Policy, 12(2), 157-169. (Laurens Bouwer, Vrije Universiteit Amsterdam)	Agreed. Studies on mortality risk involved with climate events as the one by Maaskant et al. (2009) via referencing SREX 4.5.4.2., or by Peduzzi et al. (2012) on tropical cyclones, have been included, but not in the perspective of non-market impacts.
195	45885	10	23	13	23	15	These references seems rather old, and more generally, what do current studies indicate in terms of non-market costs related to climate change impacts? (Laurens Bouwer, Vrije Universiteit Amsterdam)	. As the paragraph focusses on the role of insurance within societies, we cover market impacts in this context. We do not aim at a general discussion of weather disaster impact measures. Recent papers have been included, following the comment's recommendation.
196	50615	10	23	27	23	28	In addition to providing the average increase in losses each year, it may be helpful to indicate the variability in this trend. (Katharine Mach, IPCC WGII TSU)	Rephrased according to the comment's suggestion: "Substantially fluctuating global insured weather-related losses in the period 1980-2008 increased by US\$20081.4bn per year on average."
197	50616	10	23	33	23	33	It would be beneficial to specify further what aspects are accounted for through the described normalization. (Katharine Mach, IPCC WGII TSU)	Rephrased according to the comment's suggestion by adding the extension: "... by normalizing to current levels of destructible wealth."
198	45887	10	24	4	24	13	Excellent section, but may need coordination with Chapter 23 on Europe, that discusses same literature. (Laurens Bouwer, Vrije Universiteit Amsterdam)	Agreed. Chapter 10 is viewed as the place for the general overview on projected trends within the insurance sector.
199	50617	10	24	18	24	18	For this statement, the author team should consider indicating the importance of climate change versus other socio-economic factors. (Katharine Mach, IPCC WGII TSU)	Rephrased. The following extension has been added "...in the absence of adequate adaptation (...)." Also within the preceding discussion on observed changes, there is a new text passage exemplifying the substantial leverage of flood control systems on flood losses.
200	45888	10	24	36	24	36	Inflation correction is never included in projection studies, and should also not be included in projections, as these always compare deflated values. Please cut the words "and inflation". (Laurens Bouwer, Vrije Universiteit Amsterdam)	Changed accordingly. i.e. the phrase "and inflation" has been removed. Note: existing studies on projections of insured losses do not deflate the loss figures, but keep values and price levels unchanged.



#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
201	37696	10	25	18	0	0	Comment 1: There is no discussion of resilience and how it relates to insurance risks. Add(?): U.S Department of Homeland Security concerns for infrastructure resilience to natural and manmade disasters has resulted in methods to determine the cost, characterization, timing, and benefits of resilience (Vugrin et al 2011, Vugrin and Camphouse, 2011). Extensions of this work include the estimation of the resilience costs and benefits under uncertainty such as that associated with climate change (Vugrin and Turnquist, 2012). Estimates of the uncertainty and cost make the calculation of the insurance rates possible. The cost also provides industry a signal for trading-off investments with insurance premiums. A Sandia National Laboratories' risk assessment evaluated 70 interacting industries with the interconnected U.S. states for climate change-induced variations in water supply through 2050 (Backus et al., 2102). Estimated climate uncertainty (using a proxy distribution based on the AR4 ensemble of climate predictions) and cost impact for the variation in water availability, produce a cost estimate of the risk, indicating an equivalent insurance premium. (George Backus, Sandia National Laboratories)	. As a precondition for discussing the topic within 10.7 as required by the comment, there has to be climate change-related research literature available covering the topic raised by the comment in the context of insurance systems and insured risks. This is not the case, and none of the studies referenced in the comment has a focus on insurance systems or insured risks.
202	37697	10	25	18	0	0	Comment 2: The methods can be applied to climate impacts beyond those associated with water availability (Wilbanks et al., 2012). [Vugrin E.D., D.E. Warren, and M.A. Ehlen, 2011: A resilience assessment framework for infrastructure and economic systems: Quantitative and qualitative resilience analysis of petrochemical supply chains to a hurricane. Process Safety Progress, 30(3), 280–290 DOI: 10.1002/prs.10437] [Vugrin E.D., R.C. Camphouse, 2011. Infrastructure resilience assessment through control design. International Journal of Critical Infrastructures, 7(3)243 - 260. DOI: 10.1504/11.42994] [Vugrin, E. and M.A. Turnquist, 2012: Design for Resilience in Infrastructure Distribution Networks. Sandia National Laboratories. Report SAND2012-6050 Albuquerque, NM. Available at: <a href="http://www.sandia.gov/CasosEngineering/docs/Vugrin_resilient_design_2012_6050.pdf">http://www.sandia.gov/CasosEngineering/docs/Vugrin_resilient_design_2012_6050.pdf</a> ] (George Backus, Sandia National Laboratories)	Possible. But there is no such literature on insurance systems available.
203	37698	10	25	18	0	0	Comment 3: [Backus, G., T. Lowry and D. Warren, 2012: The near-term risk of climate uncertainty among the U.S. states. Climatic Change, Online First 23 June 2012. Doi: 10.1007/s10584-012-0511-8] [Wilbanks, T., S. Fernandez, et al, 2012: Climate Change and Infrastructure, Urban Systems, and Vulnerabilities: Technical Report For The U.S. Department of Energy in Support of the National Climate Assessment. Oak Ridge National Laboratory, Oak Ridge, Tennessee. Available at: <a href="http://www.esd.ornl.gov/eess/Infrastructure.pdf">www.esd.ornl.gov/eess/Infrastructure.pdf</a> ] (George Backus, Sandia National Laboratories)	. As the studies and reports listed by this comment do not cover insurance systems and insured risks, they cannot be assessed within 10.7.
204	45889	10	25	51	25	51	Please explain that "weather coverage" in micro-insurance mostly implies crop insurance, such as index-based insurance, rather than buildings or home content. (Laurens Bouwer, Vrije Universiteit Amsterdam)	Rephrased accordingly. New phrasing: "Supply of property insurance suffers from correlated weather risks, although weather-related agricultural damages are covered. Such weather coverage is growing ...". Schemes of agricultural insurance, in particular index-based schemes, are outlined in 10.7.5.2.
205	48297	10	26	1	26	6	Please explain more about moral hazard and adverse selection (Malini Nair, Indian Institute of Science)	. Although these elements of asymmetric information are regarded as pitfalls for sustainable insurance markets, it should be sufficient to provide the reader with the fundamental idea here. The prominence of these issues is further stressed by sections 10.7.5.1., 10.7.5.2., 10.7.6.2. and (implicitly) table 10-6.
206	46760	10	26	13	26	23	This section is too positive on the vulnerability reducing incentives provided by insurance. There is some evidence, but it is very limited the main reason being that insurers find the transaction costs of providing premium discounts and offering other benefits when clients reduce risk often prohibitely large. Actually, many insurers and reinsurers do not see this as their core business, which would be worth mentioning. (Reinhard Mechler, INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS)	Agreed and modified. In order to clarify that the options for incentives to reduce vulnerability are far from playing a sufficient role, the wording of the fourth sentence has been changed into: "Theoretically, risk-based premiums incentivize policyholders to reduce their vulnerability...". Further on, the following text passage has been included "Risk-based premiums are often hampered by price regulation, subsidies, competitive pressures, bundling of perils in one policy, and availability of data ((Maynard and Ranger, 2012))."
207	42761	10	26	47	27	20	This last paragraph on page 26 of the draft is related directly to the following paragraphs, in the sense that catastrophe bonds are typically an index-based product. This should be made clear. There should also be discussion of basis risk in index-based products. Finally, it would be helpful to have a discussion of some of the potential pitfalls of these products, including the potential for market manipulation. (Sean Hecht, UCLA)	Agreed and rephrased - "For instance, a catastrophe bond assures the investor above-market returns as long as a parametric index (e.g., wind-based) does not exceed a threshold, but pays the insurer's loss otherwise." The basis risk and the cat bonds' performance in the context of the financial crises (that might be viewed as a potential pitfall of such products) are dealt with in table 10-7.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
208	45890	10	27	14	27	14	"currently indemnity based schemes play a major role", this sentence is unclear. In general, one would think that this is problematic, as it increases transaction costs. Is this major role a good thing or not? Is it an improvement? (Laurens Bouwer, Vrije Universiteit Amsterdam)	Phrasing changed - "For both indemnity-based and index-based trigger concepts application prospects are identified, depending on the insured's characteristics and the market setting..." With this wording, it is clarified that both trigger concepts have their appropriate application. Indemnity-based schemes that are prevalent in middle- and low-income countries (e.g., multiple peril crop insurance, that exists in Brazil, China, Kenya, among other countries) have advantages as well, i.e. they are free of basis risk (basis risk generates massive distrust and severe reputational problems, and is often underestimated within the academic discussion), and cover yield instead of specific perils (as weather index-based hedging does). Whereas weather index-based hedging products save loss adjustment costs, there are other contributing layers to the overall transaction costs that are roughly the same for index-based and indemnity-based products (e.g., marketing and policy administration costs). Further on, development costs are substantially higher for index products (data, choice of index and modelling, complex product design). Balancing the evidence, the choice of the most adequate product (indemnity-based or index-based) is a question that should be based on factors such as the farmer's or smallholder's situation, and the overall market setting, and what fits best the local needs (Swiss Re, Sigma No.1/2013; Herbold, 2013 (KfW publication: Finance for Food, to be published in 2013)). Due to limited space these aspects cannot be discussed in detail within the text.
209	42762	10	28	9	28	14	This section should include discussion of microinsurance products specifically, including advantages and potential pitfalls. The current version lacks any specifics about insurance products in less-developed countries. (Sean Hecht, UCLA)	. The place for more specific information on microinsurance products is 10.7.5.2 and table 10-7, where advantages, possible pitfalls, and possible improvements of index-based products are dealt with. A brief overview on microinsurance in general can be found in 10.7.4.2.
210	38313	10	28	30	0	0	Section 10.8.1. The reference to cultural heritage protection is insufficient: need to be emphasized the impact on surface recession, biological weathering as well as on EWE. Reference to Sabbioni et al. 2010 should be added: . Sabbioni, C., Brimblecombe, P., Cassar, M., 2010, Atlas of climate change impact on European Cultural Heritage, Anthem Press, (ISBN 9781843317982). A mention to Chapter 23, section 23.5.4 is also suggested. (CRISTINA SABBIONI, CONSIGLIO NAZIONALE DELLE RICERCHE)	cultural heritage is not an economic sector.
211	39520	10	28	38	0	0	Section 10.8.2: Also relevant: Alberini, A., Chiabai, A. (2005): Urban Environmental Health and Sensitive Populations: How Much are the Italians Willing to Pay to Reduce Their Risks?, Fondazione Eni Enrico Mattei ( <a href="http://www.feem.it/getpage.aspx?id=1452&amp;sez=Publications&amp;padre=73">http://www.feem.it/getpage.aspx?id=1452&amp;sez=Publications&amp;padre=73</a> ); Huebler, Klepper & Peterson, S. (2008) Costs of climate change - The effects of rising temperatures on health and productivity in Germany, Ecological Economics, 68 (1-2). pp. 381-393. (Sven Schulze, Hamburgisches WeltWirtschaftsinstitut (HWWI))	Thank you for suggesting additional references. The focus of the AR5 is on publications since 2006, so Alberini et al. was not included. Key findings from Huebler et al. were added.
212	45812	10	28	38	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, Climatic Change, 112, 101-126. (Juan-Carlos Ciscar, European Commission)	A paragraph describing the key findings from Watkiss and Hunt (2012) was included in the SOD.
213	50618	10	30	19	30	19	It would be beneficial to specify the range of cost estimates more precisely, in place of indicating only an approximate upper bound. (Katharine Mach, IPCC WGII TSU)	Additional information was added
214	45813	10	30	30	0	0	This subsection could give more emphasis to the value of carrying out a multi-sector, consistent integrated assessment, beyond the single impact assessment. (Juan-Carlos Ciscar, European Commission)	Added: Ignoring these effects would lead to biased estimates of the impacts of climate change.
215	44732	10	30	52	0	0	I suggest to add the following sentence: "Partial equilibrium models can be more detailed and realistic." (Birger Solberg, Norwegian University of Life Sciences)	Sentence added.
216	45814	10	31	22	0	0	The term 'of income' should be omitted. The results are in terms of welfare changes (percentages). (Juan-Carlos Ciscar, European Commission)	Income changed to welfare.
217	50619	10	31	25	31	34	The author team should consider characterizing its degree of certainty in these conclusions through use of calibrated uncertainty language per the guidelines for authors. (Katharine Mach, IPCC WGII TSU)	Reject: These are qualitative findings; no uncertainty assessment has been published.
218	45815	10	31	37	0	0	This section is highly relevant. In the conclusions possible lines of additional research in this area could be mentioned. (Juan-Carlos Ciscar, European Commission)	This is already done in Section 10.10.
219	50620	10	32	2	32	3	For this example, it would be helpful to specify the relevant climate/socio-economic scenario employed in the analysis. (Katharine Mach, IPCC WGII TSU)	Assessment was drafted as an example of robust findings across scenarios, and details of specific scenarios are not relevant.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
220	45816	10	32	20	0	0	The article of Barrios et al. (2010) on rainfall and growth could be considered. Barrios Salvador, Bertinelli Luisito and Eric Strobl, (2010), "Trends in Rainfall and Economic Growth in Africa: A Neglected Cause of the African Growth Tragedy", Review of Economics and Statistics 92(2):350-366, 2010. (Juan-Carlos Ciscar, European Commission)	Reference added.
221	50621	10	33	4	33	8	The author team should consider characterizing its degree of certainty in these conclusions through use of calibrated uncertainty language, especially summary terms for evidence and agreement. (Katharine Mach, IPCC WGII TSU)	Reject: These are qualitative findings; no uncertainty assessment has been published.
222	37976	10	33	37	33	41	An additional gap of knowledge which should be mentioned here is the definition of climate comfort on the basis of empirical studies and other research methodologies. (Elena Georgopoulou, National Observatory of Athens)	Noted. Chapter does address heating/cooling for comfort, but otherwise topic is not explicitly evaluated in literature
223	50622	10	34	8	0	0	Frequently Asked Questions -- The author team is strongly encouraged to diversify the form of questions posed. Ideally, a few questions reflecting a range of syntactical approaches will serve here to draw the reader in. (Katharine Mach, IPCC WGII TSU)	revised
224	37977	10	34	21	34	24	"Climate change may influence the integrity and reliability of pipelines and electricity grids": especially under more frequent and/or intense future extreme events. (Elena Georgopoulou, National Observatory of Athens)	OK, added.
225	37978	10	34	31	34	34	It may also degrade rail infrastructure during summer. Add also that more research is needed, especially regarding air and rail transport. (Elena Georgopoulou, National Observatory of Athens)	Revised.
226	37979	10	34	40	34	44	"Because of climate change, tourists are likely to spend their holidays at higher altitudes and latitudes": as mentioned in the relevant section, there are also studies which found that tourists like it hot, as well as other studies which show complex potential shift patterns even within large countries. Thus, "are likely to" does not reflect the whole picture. The same is true for beach tourism (mentioned in the next sentence of the paragraph). Regarding the economic implications, much more research is needed, involving the projection of the total future number of tourists and their potential regional split, the projection of accommodation capacities in the various destinations around the globe etc. As it stands, the para over-simplifies things and does not reflect the gaps for further research needed. (Elena Georgopoulou, National Observatory of Athens)	Revised
227	50623	10	34	42	0	0	"likely" -- The author team should avoid casual usage of this reserved likelihood term. (Katharine Mach, IPCC WGII TSU)	Revised
228	52858	10	40	0	0	0	References: National Communications are a rich source of information; this seems to have been overlooked (John Hay, University of the South Pacific)	noted
229	35465	10	47	11	47	11	To include the above reference: Garza-Gil, M.D., M.X. Vázquez-Rodríguez, A. Prada-Blanco, and M. Varela-Lafuente, 2011: Global warming and its economic effects on the anchovy fishery and tourism sector in North-Western Spain. In: Global Warming Impacts. Case Studies on the Economy, Human Health, And on Urban and Natural Environments. [Casalegno, S. (ed)]. Intech, Croatia, pp. 3-28. (M. Dolores Garza-Gil, University of Vigo)	referred to Europe chapter.
230	50624	10	59	0	0	0	Table 10-1. In the caption for the table, it would be helpful to clarify if all impacts characterized are projected impacts. Additionally, wherever possible, the author team should clarify the climate/socio-economic scenarios and time frames relevant to impacts characterized. Finally, traceability of the information would be enhanced if the author team inserted the sources after each relevant table subsection or example, perhaps through use of footnotes or bracketed numbers. (Katharine Mach, IPCC WGII TSU)	This is the synthesis of dozens of studies cited in the publications specified as sources of the table; hence it is not possible to indicate scenarios, etc. Table title changed to include 'projected' impacts; impacts column heading indicates 'possible' impacts.
231	37010	10	59	0	63	0	Table 10-1, 10-2, 10-3: Please explain abbreviations and shorten text in table 10-1. (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	Abbreviations explained. Text not shortened to keep all important impacts in the table.
232	45817	10	59	1	0	0	Table 10,1 and 10,3 deal only with impacts in the energy sector. Why so much emphasis on this area and not on other impact categories? (Juan-Carlos Ciscar, European Commission)	These are summary tables for the section on Energy. No change.
233	50625	10	61	0	0	0	Table 10-2. Traceability of information presented would be enhanced if the sources are provided in a way amore clearly connected to each example, perhaps through use of footnotes or bracketed numbers. (Katharine Mach, IPCC WGII TSU)	This is the synthesis of dozens of studies cited in the publications specified as sources of the table; hence it is not possible to indicate scenarios, etc. No change.
234	50626	10	62	0	0	0	Table 10-3. The author team may wish to consider ways to concisely present further specific information on the scenarios of climate change used in each study. (Katharine Mach, IPCC WGII TSU)	Done in the main text to the extent it is possible/practical. No need to repeat here in the summary table. No change.
235	54213	10	62	0	0	0	Table 10-3: It would be useful to specify in the caption that the regions indicated in the second to last column vary in size and are model-specific. For example, in some cases a greater number regions is listed for a study covering a smaller geographic area, which may not be intuitive to readers. (Michael Mastrandrea, IPCC WGII TSU)	Done.
236	50627	10	65	0	0	0	Table 10-5. For the 3rd and 4th columns in this table, the author team could consider ways to indicate the key drivers for ranges of outcomes presented (in particular, changes in climate versus socio-economic trends). (Katharine Mach, IPCC WGII TSU)	Agreed - but this was already clarified by the footnote inserted below the table applying to all entries within table 10-5 (indicated by the asterix): "Spatial distribution and damage susceptibility of insured values are assumed to be unchanged over time." In other words, insurance exposure and its vulnerability have not been projected but rather kept constant over time.
237	38576	10	70	0	0	0	Canada's temperature should be averaged over population rather than area. It wouldn't be so low. (Richard Wright, Retired, U.S. National Institute of Standards and Technology)	temperature data taken from standard climate data source. No change.
238	53934	10	70	0	0	0	Figure 10-1: An explanatory caption should be provided. Author team may wish to consider if your chapter remains to have only one figure. Also author team may want to decide if it is ok to have this particular one as the only figure in the chapter. As mentioned in adaptation chapters, visualization of complex concepts is often used (by authors, readers, and media alike) to summarize and/or provide the framework of discussion. I would like to invite the author team to develop figure(s) that could illustrate the main concepts of this chapter. (Yuka Estrada, IPCC WGII TSU)	Figure title added to 10.1. Other figures added to the chapter.

#	ID	Ch	From Page	From Line	To Page	To Line	Comment	Response
239	37012	10	70	0	70	0	Figure 10-1: Please explain abbreviations. What does "PPP" mean? (Joachim Rock, Johann Heinrich von Thuenen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries)	PPP explained.