INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

WMO UNEP

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

Expert Review of First Order Draft **(December 5, 2005)**

Specific Comments

Chapter 12

11 April 2006

Discussion of expert review comments and record keeping

IT IS RECOMMENDED THAT:

- AUTHORS BEGIN WORK ON THE COMMENTS IMMEDIATELY. SUBSTANTIVE COMMENTS NEED TO BE SEPARATED FROM NON-SUBSTANTIVE, AND THE TWO SHOULD BE TREATED DIFFERENTLY
- CONTACT IS MADE BETWEEN AUTHORS AND THEIR REVIEW EDITORS IN DECEMBER

Substantive comments

- The chapter writing team should discuss all substantive expert review comments, by email and/or at Merida.
- Substantive comments require full and proper consideration. The *Principles Governing IPCC Work* state that:
  - genuine controversies should be reflected adequately in the text of the Report and
  - it is the role of the Review Editors to advise the lead authors on how to handle contentious/controversial issues
- You must record the outcome of these discussions in this document, under the column 'Notes of the Writing Team'.

Non-substantive comments

- For non-substantive comments, a very brief entry should be made in the column 'Notes of the Writing Team'. The following terms are acceptable:
  - Addressed
  - Not applicable
  - Text removed
  - A tick to denote a comment has been addressed (somewhere on the document this should be stated)

General

- The record can be kept electronically, or with pen-and-paper.
- The document becomes part of the traceable account of the Working Group II Fourth Assessment. When completed to the satisfaction of the Review Editors, a copy should be returned to the TSU by the **28th February 2006**.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
12-0	A	0				**Co-chair and TSU comments** Length: this chapter is overlength by 3-4 pages, which isn't bad. A little careful editing should bring it in at the right length. The new Nature paper on the thermohaline circulation will be of interest to this chapter: Bryden et al., Nature 438 p. 655. The FOD for Chapter 12 is a considerable improvement over the ZOD. Most of the material is here - it isn't necessarily displayed to the best advanatge and the authors would do well to think about the organization of their material. Contributing Authors: There are 6 CAs, which is a small number. Moreover, it's clear that they haven't been picked to fill regional gaps - rather they tend to come from the same countries as the Lead Authors. The authors need to increase the number of CAs, and use this opportunity to ensure they have adequate regional representation and input. Very obvious gaps include northern Europe (Finland, Sweden and Norway) and central/eastern Europe - Poland, Czech Republic, Slovakia, Austria etc. Some summarizing/synthesising tables and figures could be added. Good examples are Ch 4 Table 4.5 (impacts for increments of global temperature change) and Ch 11 Table 11.11 (Impacts at future timeslices under different SRES scenarios). If Chapter 12 could do something like this, it would be great material for the SPM/TS, and would give the chapter much more punch. For examples of the kind of figures we are looking for, I would refer you to Chapter 4 Fig. 4.9 (map of global impacts for three different temperature changes) and 4.10. Fig 4.10 is a sectoral burning embers diagram, but could be easily adapted for the regional case. **(Jean Palutikof)**	Number of CAs greatly increased. Addressed
12-1	A	0	0			The authors are encouraged to review the consistency between the sections of 12.4 and those of 12.5 with the following question in mind "Can impacts identified in a	Addressed

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						section describing a receptor in chapter 12.4 be associated with adaptation in the section describing the same receptor in chapter 12.5". The reason is that it is difficult to otherwise avoid duplication between the description of some (or all) impacts in chapter 12.4 and adaptation to some (or all) impacts in chapter 12.5. While very demanding, this effort could be alleviated once impacts have been summarized in tables as suggested hereabove. (Jean-Paul Hettelingh, National Institute of Public Health and the Environment-MNP)	
12-2	A	0	0			Considering the huge amount of material to be reflected in chapter 12 the authors succeeded in giving a careful overview of the European issues at stake under climate change. My first general comment is about the structure and consistency of this information, with particular attention for (a) the manner in which three time slices i.e. 2030, 2050 and 2080 are considered in each of the sections, and (b) the extent to which the agreed set of scenarios are addressed. It is recommended that the authors review possibilities to improve consistent reporting on these two elements. A suggestion is to summarize information on impacts and time slices in each or many of the sections following a tabular format such as Table 12.2. Similarly, information regarding scenarios could be summarized according to Table 12.5 in which "annual expected damage" is replaced by key impacts. This will increase consistency in places where in the current structure only SRES scenarios (e.g.12.4.1; 12.4.6; 12.4.8.2), A2 and B2 (e.g. 12.3.1.1), A2 (e.g. 12.3.1.2), A1 and A2 (e.g. 12.4.4) are mentioned. (Jean-Paul Hettelingh, National Institute of Public Health and the Environment-MNP)	Propose new diagrams
12-3	A	0				I had finally less time I supposed in order to review the report and I had to concentrate in those aspects more interesting to me. I apologize for that. My general opinion about the structure and content (Chapters 1 and 12) is very good and I think the authors did a good job. (Sergio Alonso, Universitat de les Illes Balears (University of the Balearic Islands))	Accepted
12-4	A	0				I can not make comments about marine ecosystems and fisheries in Europe on Chapter 12 because these aspects are not INCLUDED yet in the present draft (Ricardo Anadon, University of Oviedo)	Accepted
12-5	A	0				Inconsistency in usage of different units in the given and other chapters: e.g. /year ; yr**-1 ; /a some uniformity SI system where applicable wouold be necessary (Gábor BÁLINT, VITUKI Environmental Protection and Water Management Research Institute)	CLA's
12-6	A	0				Basically, extremes can be defined in terms of their degree of substantial impact	Accepted

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						(economical and otherwise) and/or in terms of the climatological rareness. Somewhere in AR4, I am sure, the definition of extremes will have to be discussed and established. It will be useful to make explicit reference to this discussion somewhere in the introduction of Ch12. (Lars Bärring, Lund University)	
12-7	A	0				There isa very active group of researchers in the field of climate change and tourism. I would suggest to give the tourism chapters to some more of these experts in europe: David Viner, at Univ. of East Anglia or to people at the World Tourism Organisation (e.g. Gabor Vereczi). They are probably authors or revievers in other chapters of the Fourth Assessment Report. (Rolf Buerki, PHS - College of Secondary Education of St. Gallen)	Agreed
12-8	A	0				I think that this chapter is generally in good shape, with no major changes required at the level of the overall contents. However, I have a number of comments regarding specific portions of text (see below). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	NC
12-9	A	0				In order to streamline the regional references, it might be useful to refer to EU-15, EU-25 and CEE) as shorthand throughout the text, after defining these terms up front. A lot of references cited here are pre-TAR. While a few of these are necessary for context and continuity, many are not needed, especially considering the copious new studies covering most of the topics discussed. There is some review-like material on climate change impacts and adaptation for all the major sectors in Finland in the Finnish National Adaptation Strategy (Marttila, V., Granholm, H., Laanikari, J., Yrjölä, T., Aalto, A., Heikinheimo, P., Honkatuki, J., Järvinen, H., Liski, J., Merivirta, R. and Paunio, M. (eds) 2005. Finland's National Strategy for Adaptation to Climate Change, Ministry of Agriculture and Forestry, Helsinki, 280 pp. http://www.mmm.fi/sopeutumisstrategia/ A set of reports on adaptation to climate change in Finland (different sectors and some cross-sectoral studies) will be released in December 2005, in time for their possible inclusion in the SOD. These are the results from the FINADAPT project: http://www.environment.fi/syke/finadapt The length of this chapter is about right, and I found it fairly easy to read (compared to the majority of IPCC chapters!) Now the references need to be consolidated to account for missing material, and I would like to see more attention paid in the concluding section to adaptation research. There has been a lot of impact research conducted in Europe, but adaptation responses need much more attention, especially in those regions and sectors identified as most vulnerable to climate	Footnotes for geographic terms used in text Ask TSU for definitions of “northern, southern”, etc. --- Delete references? If we have room. Need table on adaptation

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						change. (Timothy Carter, Finnish Environment Institute)	
12-10	A	0				The first 5 points of the executive summary do, in general, refer to results pertaining to the physical climate system and are therefore better dealt with by WG1. While I see the need to "set the scene" in terms of the past and future physical changes before going on to discuss impacts, these points need not form part of the executive summary. The real danger is that WG1 and WG2 will contradict each other, leaving the IPCC process open to criticism. Where results do pertain to the physical climate system, they need to be carefully cross-referenced with relevant parts of the WG1 draft. Having briefly looked at the relevant WG1 chapters I can see that the points made are broadly correct, but of course the WG1 report is also still at the FOD stage and things could change. Could one of the lead authors be responsible for cross checking? (Matthew Collins, Hadley Centre for Climate Prediction and Research)	1. We need to include some of this information because it sets the stage for impacts. 2. But, this material from WG I will be reduced in the Executive Summary. 3. Impacts evaluated in this chapter should be consistent with WG I since the impact studies are largely based on the SRES scenarios which are also used in WG I.
12-11	A	0				This consideration of biodiversity in this chapter is woefully inadequate. It should be considered more integrally within every section of the chapter. For example, the tundra is of key importance for huge populations of birds that then migrate south and west to coastal wintering grounds. This is a key European resource that needs careful consideration. Not only does climate change threaten the existence of their breeding grounds, but also, through sea-level rise, key stop-over and wintering grounds. There are such a huge range of potential and actual impacts that should be considered with respect to biodiversity in Europe. It can't be left to Chapter 4 as this is more global in scope. A useful major new review with respect to migratory wildlife in general is found in Robinson, R.A., Learmonth, J.A., Hutson, A.M., Macleod, C.D., Sparks, T.H., Leech, D.I., Pierce, G.J., Rehfisch, M.M. & Crick, H.Q.P. (2005) Climate Change and Migratory Species. BTO Research Report No. 414. Defra, London. (available from http://www.defra.gov.uk/wildlife-countryside/resprog/findings/climatechange-migratory/index.htm) (Humphrey Crick, British Trust for Ornithology)	Addressed
12-12	A	0				I prefer to do only a general comment about the entire document or chapter, because I consider that the formal characteristics of this draft are good; a lot of references are included and the different chapters are balanced, in spite that one of them (Fisheries) is incomplete. But this is not the problem…; the Report for me fails of scientific basement. This kind of Report, in general, tends to confuse the (Geologic) climatic change and the terrestrial warming. As it is known, climate has changed during all the Geological times. Only during	Comments noted The problems of dealing with an uncertain future are addressed in many places in the AR4 reports.

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						the Quaternary four o five glaciations have occurred. During the last 100,000 years, warm and cold periods have alternated without a defined, well-known origin. A warm period has occurred during the Roman times and a cold period at the end of the Medieval times. Obviously the cause (or driving forces) of all these changes are unknown and it is impossible to attribute to the increase of CO2. Then, first at all, it is obligatory to know (outside an increment of the atmospheric-CO2 content) if the Geological-climate trend progresses to either a warming or a cooling period. This is truly the key point! Because if the Earth progresses to a cold period, the supposed warming provoked by the atmospheric-CO2 increases could reduce this negative effect; but, if the Earth progresses to a warm period, we have a double warming effect: Only in this circumstances, the evaluated Report could have a valuable credit. For that, the Report needs a first chapter considering all the literature on this Geological issue: If we do not consider the evident increase of the atmospheric-CO2 content, is the Earth in either a cooling or a warming process? The response to the question is basic not only from the scientific point of view; it is also basic for the information to be given to the policymakers. In the first case (geological cooling process) we need to adapt our world to an increase of demand of energy for heating and to a stabilisation of the situation of the coastlines, as examples. In the second case (geological warming process) we need to face up to a very serious and relatively quick warming process, where the coast lines could move rapidly, as examples. If these facts are not considered, the entire document has a limited value. Probably if the warming process is considered motived only by the atmospheric-CO2 increase (confusing Geological climatic-change with warming process), the validity of this revised document would be more or less equal to a document that shows that the warming process from the XV Century has been provoked by the decline of the original Indian population and the increase of the citizens of European origin (because there is a relationship: Try it!). A modelisation or simulation of the climate changes from the last 100,000 years is more that convenient, explaining the driving forces that could be implied. As scientist, I can not accept sentences as "model calculations demonstrated that would be a…"; or a document that almost all the sentences are written in conditional (would, may, could, etc.). Even more, frequently the applied models have contradictory results, obviously motived because the Nature is multi-factorial and a lot of factors escape to be included in the models. This is not a scientific document, for me this is merely a nice fiction-story.	

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						In addition, socio-economical forces and technologies are unpredictable as factors. The generalised use of computers or the e-mails as essential tools today was unforeseen only 25 years ago, even the intense activities of the occidental citizens after 65-years old because the improving on health care; most of them have doing strong pressures on the sea banks for getting a holidays house. The reforestation of Europe countries (mostly Mediterranean ones) motived because of the land abandonment is another fact unforeseen few decades ago. Finally, some assertions are exaggerated; as an example, I doubt that an increase of one or two degrees of the running waters could have significant impact on the thermal power-plant efficiency; these differences exist usually in the inter-annual variations in the Mediterranean area. As a conclusion, it is evident that the citizens must cope to a climatic change, as usual in the past, when the men, migrating from the Tropical savannas, took refuge in the caves during the glaciation periods and after this was forced to an adaptation to temperate forests or savannas. But if the future adaptation should be to either a quick or slow change, either a warming or a cooling processes, is with the actual knowledge unforeseeable. (Juan Gallardo Lancho, CSIC)	
12-13	A	0				Should be better coordinated with Chapter 10. (Alexander Golub, Environmental Defense)	Addressed
12-14	A	0				Generally this is hugely improved from the ZOD. Much better balanced in terms of length and style between sections, for example. The sections on adaptation are still the weakest part. Probably this is inevitable, as less work has been done on these issues. But some effort should be made to include some specific European examples. Some impact sectors are still not considered, in particular, the built environment (buildings, urban areas) and transport. This is probably a reflection of the general lack of published work in these sectors. But there should be some grey literature at least, e.g., from the UKCIP/EPSRC Building Knowledge for a Changing Climate programme http://www.ukcip.org.uk/resources/sector/projectsdets.asp?sector=1&project_ref=5. Related to this, there is the UKCIP/ARUP 2005 report on 'Beating the heat: keeping UK buildings cool in a warming climate' http://www.ukcip.org.uk/resources/sector/ci_sector_newsdets.asp?sector=1&news_id=35 (Clare Goodess, University of East Anglia)	Addressed in appropriate sections
12-15	A	0				More information on air quality aspects in connection to energy production,	

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						industry and transportation should be involved, both in the introductory non-climate factors and trends sections (12.2.2 and 12.3.2). More stress of this issues in impact and adaptation sections, where even separate sections dealing with that could be involved, or atleast the sections of human health could read Human health and air quality or something like that, with more discussion there. (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	
12-16	A	0				This chapter has improved substantially since the ZOD and now has a clear structure and concise text which is mostly well supported by recent references (Paula Harrison, University of Oxford)	Noted
12-17	A	0				Need for more consistent treatment of extremes, uncertainty and policy interactions within each of the impact sectors. Would benefit from some standardisation of the spatial references (eg northern Europe, north western Europe etc) northern Europe is often used to refer to Scandinavian countries but other times NW is used. There needs to be some mention of local variation within the broad regional patterns that are described (Northern Europe getting wetter but there are potential drought issues for SE England). I feel there is not enough synthesis of the results and the reader is left to a lot of the work to summarise the effects and particularly to relate impacts in one sector at a location with impacts in another sector. Need consistent use of either winter/summer or Dec-Jan-Feb/Jun-Jly-Aug - Would be simpler to use former with single definition on first use. (Jo Hossell, ADAS)	Chapter has been re-written to increase the level of consistency.
12-18	A	0				General: I am completely aware that to summarize all the info is a tedious task, I believe that this first draft is a quite reasonable attempt (I am impressed), so please interprete my comments as positive. (Kwadijk Jaap, WL Delfthydraulics)	Noted
12-19	A	0				FOD shows an obvious improvement compared to ZOD. The balance between the sections is now reasonable. As expected in my ZOD Ch.12 review, there is an inconsistency between WG2 and WG1 reports in using future climate scenarios based on GCM projections. It is worth noting that some WG2 Chapters (e.g. Chapter 15) have included results from the most recent generation of GCMs considered in the "modelling" chapters of the WG1 report. Chapter 12 is generally based on the projections obtained with few RCMs driven with the TAR (i.e. late 1990s) generation of GCMs, which are not state-of-the-art ones. (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	Noted

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12-20	A	0				General comment. The scenarios are specified as e.g. A2 or B2. I suggest to mention full scenario name where possible (e.g., A2a). (Andrei Kirilenko, Purdue University)	Noted
12-21	A	0				Comment: It is worthwhile to check how the definition of Europe given on p 5 (lines 5-7) is used in the rest of the chapter. It seems to be different, one example are Figs 12.3-12.6 that does not show the easternmost parts. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	In new draft definitions of European regions have been standardized.
12-22	A	0				Drought in Bulgaria, A Contemporary Analog for Climate Change (2004; eds. C. G. Knight, I. Raev, M. P. Staneva), Aldershot, UK: Ashgate) may be useful to the authors as an example of using a contemporary period of drought to suggest concerns about plausible future climate impacts, especially on water, but in sectors from agriculture and forestry through human health, economy etc. (C. Gregory Knight, Pennsylvania State University)	Will consult
12-23	A	0				Generally, this is a well-written and concise chapter, with good coverage of key issues. However, it is clearly beyond the desired page limit. Shortening of the text should not be too difficult: much can be achieved by paying attention to technical aspects, whereas in some places, focusing is clearly needed. If I understood correctly, the Fourth Assessment Report should largely complement the TAR by introducing new and up-dated information. This means that some nicely-written sections giving background to the issues dealt with should, unfortunately, be left out. I show some examples for technical shortening in the following. (Raija Laiho, University of Helsinki)	Noted
12-24	A	0				A general comment concerning clarity and ease of reading is the use of abbreviations. For instance, on page 5, lines 21 and 25, first NAO is introduced and spelled out, and later, ENSO is introduced and not spelled out. On page 38, SST is given as an abbreviation but not used later on. Abbreviations save space but if there are too many, the text becomes very awkward. A consistent practise should be introduced. Apparently, there are going to be abbreviations that can be used all over the report, so it might be a good idea to present an overall explanation list for abbreviations in the beginning or in the end, and then refrain to the use of those abbreviations only in all chapters. Then there would be no need to worry about which abbreviations to spell out and where within the text. (Raija Laiho, University of Helsinki)	Corrected
12-25	A	0				I recognized, that information from Slovakia is completely missing in the Assessment Report (except three citations from Hydrology). So that is why I included another 3 references. (Milan Lapin, Comenius University)	Noted

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12-26	A	0				This chapter presents a rather comprehensive and well-balanced synthesis of climate change impacts and vulnerabilities for Europe. I have only a few minor comments, presented below in linear order. My only generic concern relates to the use of citations of studies that were conducted elsewhere than in Europe, and especially in North America. It would be preferable to restrict the literature basis to actual data or models for Europe. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	Noted
12-27	A	0				The authors have done an admirable job in bringing together an extensive body of literature which represents the current state of knowledge concerning the potential impacts of climate change in Europe. As a first-order draft I am surprised by the number of typos and inconsitent use of punctuation. The chapter currently still reads like it has been written by numerous authors and then stitched together (e.g. tenses change between paragraphs, use of American and UK spelling). The references are incomplete and contain errors (e.g. Moreno (2005a) and Moreno (2005b) appear to be the same publication with different co-authors which is cited several times in the text as Moreno (2005)). There are many instances throughout the chapter where the word count has been inflated by unnecessary repetition and poorly structured sentences and paragraphs. I would, therefore, recommend that this draft is passed to an English language editor. I am little concerned by the amount of literature cited in this chapter which is either "in prep" or "to be submitted". Some of the most important findings in this chapter are based on such work that may or may not stand up to peer review. (Matthew Livermore, University of East Anglia)	Corrected
12-28	A	0				These are issues that would seem to merit greater consideration and inclusion throughout the chapter, and are explicitly raised here. I would ask that the comments here and in the spreadsheets also be considered for other chapters of the IPCC where relevant, particularly Chapter 12 on Europe. Acidification There is a significant absence of any consideration of and reference to acidification, despite its crucial importance for reefs, biodiversity within the oceans, and unknown range of impacts for coastal and marine waters. These are changes to a fundamental part of the ocean carbon cycle, far outside the range of natural variability, that are irreversible and will last for thousands of years. In June 2005, the Royal Society issued a summary report on the effects of CO2 on the pH	Noted

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						chemistry of seawater and aquatic organisms and ecosystems. In addition to its pivotal role in the atmosphere in the regulation of global climate, CO2 and its sister chemical species, HCO3- and CO32- comprise the carbonate buffer system which regulates the pH of seawater. Acidifying the ocean is detrimental to organisms that secrete shell material made of CaCO3, such as coral reefs and a type of phytoplankton called coccolithophorids [Kleypas et al., 1999]. Because the fossil fuel CO2 rise is faster than natural CO2 increases in the past, the ocean will be acidified to a much greater extent than has occurred naturally in at least the past 800,000 years [Caldeira and Wicket, 2003]. Royal Society, Ocean Acidification due to Increasing Atmospheric Carbon Dioxide, June 2005. http://www.royalsoc.ac.uk/document.asp?id=3249 Caldeira, K., and Wickett, M.E. Anthropogenic carbon and ocean pH. Nature: 425, 365, 2003. Hoegh-Guldberg, O. Climate change, coral bleaching and the future of the world's coral reefs. Mar. Freshwater Res.: 50, 839-8–66, 1999. Kleypas, J., R.W. Buddemeier, D. Archer, J.-P. Gattuso, C. Langdon, and B. Opdyke (1999) Geochemical consequences of increased atmospheric CO2 on coral reefs. Science 284: 118-120. Climate change and biodiversity There needs to be further and explicit consideration of the interaction between climate change and biodiversity in coastal and marine areas in all aspects of Chapter 12, both because of the value of biodiversity itself, and to support all the ecosystem goods and services that it delivers to local communities, nations and regions. Given the management approach of aspects of this chapter, it is also very important to in some way address the integration of the related obligations and impacts under the Climate Change Convention and the Convention on Biological Diversity. Deltas are not the only vulnerable ecosystem. It is also relevant to focus on estuaries, lagoons, enclosed seas, and arctic coasts, which are other examples of particularly vulnerable coastal systems. It is suggest that the chapter refer to all these types of coastal systems when analyzing the impacts of climate change. Some European examples that have been raised in comments are the London and the Thames Estuary, Venice and the Venice laguna, and the enclosed seas of the Adriatic, Mediterrean and Baltic Seas. The Arabian Sea is also another mostly enclosed sea dealing with temperature and salinity increases. It is also suggested that representative examples of these vulnerable coastal ecosystems be used as indicators of climate change, and to further understand	

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						approaches to and effectiveness of adaptation and mitigation strategies for climate change. Other matters It is suggested that there be greater inclusion and discussion of interactions between salinity and temperature, eutrophication, fisheries and climate change in Chapter 12. For salinity and temperature changes, these are factors that need to be considered in addition to sea level rise and extreme weather events. For eutrophication, in addition to the carbon, there is scope for a consideration of the nitrogen cycle and how climatic changes might affect it. The suseptability of shelf seas to eutrophic response must increase with increasing temperature (leading to more sustained stratification) and increasing freshwater input (delivering more nutrients and leading to more sustained stratification). For fisheries, there are the impacts of temperature and habitat change, some of which might be predicted from physical changes. However, there are more subtle interactions with plants, and impacts of fish species and habitats such as a delta, estuary, lagoon, enclosed sea etc. (Magdalena Ariadne Kim Muir, Arctic Institute of North America (AINA), and EUCC-Coastal Union)	
12-29	A	0				In the review I have used the following points from the review guidelines: (i) to identify a comprehensive and insightful assessment of the state of knowledge on climate change impacts, adaptation and vulnerability; (ii) in the assessment add value added by drawing conclusions with general applicability; and (iii) to identify omissions and major gaps in the literature coverage. I do not think that the chapter is satisfasctory with respect to the first two items and I will try to illustrate why. The authors have defined Europe as extending fromthe Atlantic Ocean to the Ural mountains. Except for forests the report is to a dominating part dealing with Western and Eastern Europe and is omitting European Russia. In order to get a comprehensive and insightful assessment of climate change impact for Europe, as defined, this is not satisfactory. To get a comprehensive and insightful assessment there is a need for substantial value added contributions by the authors. This value added has to be done in combination of non-climate factors and trends with climate impacts. This is needed in order to get a insightful assessment of the impacts of climate change. Currently, the climate impacts are treated in isolation from the other development trends. Examples of these other development trends are: (a) demographics; decreased and aging population in Europe; (b) technological	Noted

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						development; productivity development; (c) economic growth; (d) globalization and increased trade; (e) energy consumption; (f) agriculture land; decreased demand caused by demographic changes and productivity increases; (g) policy development; etc. If the reported direct climate impacts are not put into the perspective of the non-climate development trends, it is very difficult to claim a comprehensive and insightful assessment of climate change. In many cases the non-climate development trends overshadow the climate impacts. If I take Section 12.8 (which I found excellent) into account I wonder how many of the conclusion made earlier in the report are really justifiable. (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	
12-30	A	0				The overall comment on this chapter is that it is very good and it seems as though the authors have worked together to produce a synthesis of the effects of climate change for Europe. I see little need for major changes before this can be accepted for a final version. One comment would be that the authors have to state clearly which climate change (eg. SRES) scenarios have been used to generate the impact studies. I have restricted my comments to those sections of the chapter in which i feel competent to comment. (John R Porter, KVL)	Noted
12-31	A	0				In general this chapter is very good and needs a relatively small amount of work to complete it. Congratualtions to the authors!!! A general point about the chapter is that changes in tundra area are potentially very serious for climate change and are an important new feature and impact that has become clearer since the TAR. I think you need to make much more of this and include reports of the effects of a melting tundra on things such as CH4 emissions and a runaway greenhouse effect. This has to be one of the big issues in chapter 12. Stylistic chapter point: when you use north (or east, west or south) as an adjective it starts with a lower case n -as in north western. When is it a noun it starts with upper case. (John R Porter, KVL)	Noted
12-32	A	0				Very much improved in comparison with the ZOD! There are only very few (and small) paragraphs missing. Also the size is approaching (from above) the allowed maximum … (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Noted
12-33	A	0				General comment: the text is shorter and more concise than the zero order draft. Generally, the balance is about right, except that I should like to have seen more consideration of the effects of sea level rise and storminess at the coast. In particular, there is no mention of spatial variations in the rate of sea level rise, and	Noted

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						of the relative effects of differing movements of the land, both from isostatic and tectonic effects. On a smaller point, I do not like the quotation of papers "in prep". We do not know if these accounts have passed the scrutiny of peers and indeed whether they will actually appear. This is unscientific. I see that some are "accepted". If so, they are "in press" items, and quotation should be adjusted accordingly. (David Smith, University of Oxford)	
12-34	A	1	1	58	46	i) the text needs an accurate editing to make it more homogeneous; ii) some chapter should be shortened; iii) references are redundant, some of them could be eliminated, and in many cases authors cited in the text are not quoted; iv) no reference is done to the impact of climatic change on cultural heritage and this is, I believe, a heavy fault (Michele Colacino, ISAC-CNR)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-35	A	1	1	58	51	Authors of the Chapter 12 have done a good job extracting material on climate change in Europe and its influence on ecosystems, sectors and human health from published scientific literature.However, material in the Chapter is geographicaly unbalanced, Eastern part of Europe got less attention. There are a lot of relevant publications authors may want to analyse and to include into the Chapter to equalize its content. Some of them are indicated in specific comments to the Sections. (Gregory Insarov, Institute of Global Climate and Ecology)	Eastern European writing team members have done their best to bring in literature from the region.
12-36	A	1	8	1	8	I seem to remember that the first name of the first CLA is 'Joseph' (not 'Joshep') (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Good observation
12-37	A	1		58		Major emphasis is on the EU. Eastern Europe, especially FSU are presented insufficiently, partly, due to the lack of peer reviewed publications, but partly because some sources were not covered. For example, some sources that describe impact on human health were cited in chapter 10. (Alexander Golub, Environmental Defense)	Eastern European writing team members have done their best to bring in literature from the region.
12-38	A	2	11	2	46	In my opinion all of the sentences in this part should be written in past or/and potential tenses because they are referred to knowledge or/and projections established in TAR. (Sergio Alonso, Universitat de les Illes Balears (University of the Balearic Islands))	Noted
12-39	A	3	0	4		Why are the uncertainties, as mentioned in 12.8 mentioned in the summary. E.g. (3) (Kwadijk Jaap, WL Delfthydraulics)	Because it is a summary
12-40	A	3	0	4		Add in the Executive summary more from 12.4.12 Spatial variability, this is very informative as overview	Noted

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Kwadijk Jaap, WL Delfthydraulics)	
12-41	A	3	1			Very much climate talk - nothing about sea level changes. (Nils-Axel Mörner, Paleogeophysics & Geodynamics)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-42	A	3	1			Executive Summary:Very general. Needs clear concise statements regarding (i) What are the key headline statements and (ii) what is new since the TAR. There is nothing here for decision-makers about what are the key impacts for Europe, under what scenarios, which parts of Europe will be worst affected, what is the potential for adaptation. Although you are not specifically asked about costs, any information you can supply would be useful. (Jean Palutikof, Hadley Centre)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-43	A	3	3	3	5	It may be worth while to also mention the particularly large warming that was measured in the European mountains, particularly in the Alps (cf. the work by Beniston & Rebetez). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-44	A	3	3	7	10	This point about the NAO is not a new result since the TAR, it has been generally known since the work of Hurrell (1995) and Hurrell and van Loon (1997) that the NAO is correlated with European weather and climate. In any case, this statement refers to a natural climate phenomena not to climate change, so it is somewhat off-topic. While some studies have been concerned with the potential impact of climate change on the NAO (and vice versa), there is a large degree of uncertainty and this is better handled by WG1. Hurrel, J. W., 1995: Decadal trends in the North Atlantic Oscillation: regional temperatures and precipitation. Science, 269, 676-679. Hurrel, J. W. and H. van Loon, 1997: Decadal variations in climate associated with the North Atlantic Oscillation. Clim. Change, 36, 301-326. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-45	A	3	3	3	5	Should this point be kept, it must be carefully cross-referenced with the relevant WG1 chapter. It is also rather qualitative in nature, in contrast with the corresponding TAR statement on page 4, 10-16. Stratifying the comment about precipitation by season would better link it with point 4, lines 18-20. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-46	A	3	7	3	10	NAO is of course a major factor in (winter) temperature. This need to be mentioned. (Lars Bärring, Lund University)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-47	A	3	7	3	8	This sentence should be rephrased as: 'New research results have established a clear	Entire Executive Summary has been

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						connection between different teleconnection patterns, such as the North Atlantic Oscillation (NAO) and European climate'. (Ricardo García-Herrera, Universidad Complutense de Madrid)	completely re-written to address these and the other comments.
12-48	A	3	7			A clear connection between the NAO and European climate has been known about for years e.g. Hurrell (1984). Furthermore, the sign of the NAO index affects near-surface air temperatures as well as rainfall. (Matthew Livermore, University of East Anglia)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-49	A	3	7	3	8	Assertion maybe too bold - the strenght and maybe sometimes even signal of this coupling seems to be changing, check Rodó X., Baert E., Comin F.A. 1997. Variations in seasonal rainfall in southern Europe during the present century: relationships with the North Atlantic oscillation and the El Niño–southern oscillation. Climate Dynamics 13: 275–284. (Filipe Santos, University of Lisbon)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-50	A	3	15	3	16	RCMs certainly do have their uncertainities, but so does GCMs and other climatological/scientific methods. So, this wording is unfortunate, because it specifically singles out RCMs, and one may then ask why RCMs are used at all. The sentence need to convey that RCMs, while adding to the general modelling uncertainty, also substantially reduces the 'uncertainty' caused by the lack of regional precision and physiographic coarseness if/when GCM output is used directly. (Lars Bärring, Lund University)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-51	A	3	18	3	23	If included these results should be cross-referenced with the corresponding WG1 chapters (10 and 11 in this case). The phrase “substantial decrease in summer precipitation” should be quantified in terms of e.g. a percentage. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-52	A	3	18			No summary for temperature change? (Paula Harrison, University of Oxford)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-53	A	3	18			Do they all agree - this seems a strong statement given all the uncertainties cited in Section 12.8, or does this only apply to those models in PRUDENCE? (Paula Harrison, University of Oxford)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-54	A	3	18		23	According to 12.8 half of the CC scenarios suggest dryer and half suggest wetter conditions by 2025 in S.Europe. In the current text it is suggested that climate models all agree on the trend to dryer conditions in the South. Basically this is suggested by the ECHAM4 and the HADAm3H model experiments + LAM (Kwadijk Jaap, WL Delfthydraulics)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-55	A	3	18	3	23	Comment: There is no information on changes in temperature in this section. This	Entire Executive Summary has been

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						should be the case. Temperature changes are simulated by the climate models with less uncertainty than changes in precipitation. The seasonal differences with largest changes in eastern and northern Europe in winter and in southern Europe in summer should be mentioned here. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	completely re-written to address these and the other comments.
12-56	A	3	18			The fact that results from regional and global climate models should not be overly stressed - RCMs rely on GCMs for boundary conditions so one would expect a certain degree of agreement, particularly when looking at temperature variables, and less so with precipitation and wind variables. (Matthew Livermore, University of East Anglia)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-57	A	3	19			Add in the Executive summary more from 12.4.12 Spatial variability, this is very informative as overview (Kwadijk Jaap, WL Delfthydraulics)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-58	A	3	21	3	21	Replace "could" by "would" – this changes the meaning of the sentence strongly; if the "could" is retained, this is a much fuzzier statement (which is not appropriate, I think). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-59	A	3	22	3	23	Decrease in water availability and unpredictable seasonality (Helena Freitas, University of Coimbra)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-60	A	3	23			The example of tourism reads oddly at the end of this sentence about precipitation changes. Aren't temperature changes as/more likely to cause tourism changes? (Clare Goodess, University of East Anglia)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-61	A	3	25	3	28	Some extremes may decrease. Clearly cold extremes will decrease in a warmer climate. I would imagine that it is particulalry important that the 'points' in the Executive Summary are careful and balanced so that they percieved as only focussing on negative aspects. (Lars Bärring, Lund University)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-62	A	3	25	3	28	Again, cross reference with WG1 if kept in. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-63	A	3	25			This statement about an increased frequency and/or intensity of extreme climate events displays more prudence than similar statements in other chapters. Apparently models do show different results in that respect. Why not introduce the same caveat elsewhere? Moreover, (non-validated) models can never provide proof of anything. (Hans H.J. Labohm, Netherlands Institute of International Relations 'Clingendael')	Entire Executive Summary has been completely re-written to address these and the other comments.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
12-64	A	3	25	3	34	There is a perception that storm and extreme event frequency has increased as a result of climate change. Nature 419, 821-824 (24 October 2002) | doi: 10.1038/nature01132 Millennial-scale storminess variability in the northeastern United States during the Holocene epoch Anders J. Noren1, Paul R. Bierman1, Eric J. Steig2, Andrea Lini1 and John Southon. Such papers point out that it is very difficult to detect the climate change signal in storminess and extreme events. This should be clearly acknowledged in the chapter and backed up by references. I remember that there was a recent paper in Nature or Science to suggest that strom frequency had not increased in Europe. Nature 425, 166-169 (11 September 2003) | doi: 10.1038/nature01928 No upward trends in the occurrence of extreme floods in central Europe Manfred Mudelsee1,3, Michael Börngen1, Gerd Tetzlaff1 and Uwe Grünewald. (John R Porter, KVL)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-65	A	3	25	3	25	"Some, but not all, …" Add the comment "This may anticipate the impact of climate change and require immediate action". (Filipe Santos, University of Lisbon)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-66	A	3	30	3	34	The very severe impact of the 'Case Studies' mentioned here is of course an effect of the society and environment not being adapted to such climatic events. In a future warmer climate, climatic events like to one discussed are projected to become more common. Consequently, society and the environment will in one way or another (more or less painstakingly) have been adapted, at least to some degree. It is therefore deceptive to suggest that this kind of climate extremes can be used as examples of the impact one may regularly experience. (Lars Bärring, Lund University)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-67	A	3	31	3	31	The Elbe and Donau rivers floods … (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-68	A	3	31	3	31	Please mention " Unprecedent floods of 2005 in Romania" after "wave of 2003" (Ileana Mares, ROMANIAN ACADEMY OF TECHNICAL SCIENCES)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-69	A	3	31	3	31	Elbe flood was only the consequence of Moldau (Vltava) flood days before due to haevy precipitations in triangel border Germany, Austria a Czech Republic (Jan Pretel, Czech Hydrometeorological Institute)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-70	A	3	31	3	31	… Iberian forest fires of 2003 and 2005 (Filipe Santos, University of Lisbon)	Entire Executive Summary has been completely re-written to address these and the other comments.
12-71	A	3	32	3	32	Iberian forest fires of 2003, 2004 and 2005	Entire Executive Summary has been

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Helena Freitas, University of Coimbra)	completely re-written to address these and the other comments
12-72	A	3	39	3	40	The Portuguese heat wave warning system is country-wide (except Atlantic Is.) (Filipe Santos, University of Lisbon)	Entire Executive Summary has been completely re-written to address these and the other comments
12-73	A	3	40	3	40	The Spanish Ministry of Health has an active warning system for all the cities of the country, more than 50. This information has not been considered in the 12.5.11 section. Consequently, this sentence should written as: ' Examples of recent proactive measures include the adoption of heat warning systems in more than 15 european cities since the heat wave of 2003'. (Ricardo García-Herrera, Universidad Complutense de Madrid)	Entire Executive Summary has been completely re-written to address these and the other comments
12-74	A	3	40	3	42	Another example is improvement of forest fire prevention and warning systems, now extended even outside the traditional Summer 'fire' season. (Filipe Santos, University of Lisbon)	Entire Executive Summary has been completely re-written to address these and the other comments
12-75	A	3	41	3	41	… new river flood warning systems, building anti-flood barriers and incorporating …. (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Entire Executive Summary has been completely re-written to address these and the other comments
12-76	A	4	0			The executive summary states that the adaptation strategies are starting to take into account other physical and institutional changes in Europe. This is probably true, but the adaptation strategies should also take into account the "automatic" market and behavioural responses to climate change. For example, in agriculture new crops could become optimal and automatically become adopted by European farmers. The agricultural policies should try to take this shift into account. (Pasi Kuoppamäki, Sampo plc)	Entire Executive Summary has been completely re-written to address these and the other comments
12-77	A	4	0			Statement that more adverse impacts are expected in regions with lower economic development. The poor European areas (Balkans was mentioned) could well be much more developed in e.g. 2050 than they are today, and better equipped to deal with climate change. (Pasi Kuoppamäki, Sampo plc)	Entire Executive Summary has been completely re-written to address these and the other comments
12-78	A	4	0			Europé is a classical area for sea level studies with a number of benchmark paper, viz. Jelgeersma (1961), Mörner (1969), Tooley (1974) and van de Plasche (1982). We have a regioanl eustatic curve (Mörner, 1980) tested positively both by Shennan (1987) and Harff et al. (2001). We also have a regional eustatic solution for the last 300 years (Mörner, 1973) fitting well with recent tide gauge analyses. From 1840 to 1940 sea level rose 11 cm. This fits perfectly well with the recorded deceleration of the Earth's spinn rateequalling ~10 cm (Mörner, 1992, 2000). A synthetic analysis of the situation is done by me (Mörner 2000) in ICZM (autumn	Comments noted. Considerable information is included on sea level rise later in the chapter.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						issue, p. 31-36). Nothing of this material isdiscussed or referred to. And still, this is an ideal region to tackle the sea level probles (Mörner 2000). Instead the chapter is heavily devoted to climate modelling with little or no anchoring in solid field observations. The references speak for themselves - all very recent, most concerning modelling and originating from within the "IPCC-family". This is propaganda, not sound scientific analyses. It is a weak chapter. (Nils-Axel Mörner, Paleogeophysics & Geodynamics)	
12-79	A	4	4	4	5	Land abandonement has also demographic and socio-economic origins, it's not just, probably not even mainly, derived from EU agricultural policies. (Filipe Santos, University of Lisbon)	Noted
12-80	A	4	5	4	6	The abandoned land is also viewed as place for energy crops - cf. pp. 11, line 6 to 7- or/and even biological carbon sequestration. (Filipe Santos, University of Lisbon)	Noted
12-81	A	4	9			This section needs to be written in a slightly more analytical way that states TAR knowledge in anticipation of the new information to be presented later in the chapter. Obviously, the authors required a good appreciation of this new information before being able to refine the current section, but this step should now be feasible for the SOD on the basis of material in the FOD. (Timothy Carter, Finnish Environment Institute)	Addressed
12-82	A	4	13	4	13	Comment: There might be confusion with the phrase "and in winter rather than summer" since the sentence is refering to the climate change signal in both the Iberian Peninsula (IP) and in Russia. In IP the warming is most pronounced in summer. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed
12-83	A	4	15			Modify and Insert: "….and decrease in Southern Europe (up to 20% in some parts of Southern Europe), together with an increase of intense (>60mm/day) rainfall events (Alpert at al., 2002; Brunetti et al., 2004)". (Michele Colacino, ISAC-CNR)	This is a review of TAR. Specific references not appropriate.
12-84	A	4	15			This increase/decreas in north and south can – only? – be understood in terms of rotational changes and interchange of angular momentum (Mörner, e.g. 1995; GeoJournal, 37, 419-430). (Nils-Axel Mörner, Paleogeophysics & Geodynamics)	Too detailed for summary of TAR.
12-85	A	4	21	4	23	Comment: TAR also states that there is a simulated seasonality in the precipitation change in Europe (compare Fig 10.6 of TAR WGI).This should be mentioned here, not just that there is a seasonality in intense precipitation events. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed
12-86	A	4	25	4	26	Comment: What are these sensitivites? Sensitivity of the society? Ecosystems?	Defined elsewhere in AR4 report

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Erik Kjellström, Swedish Meteorological and Hydrological Institute)	
12-87	A	4	25	4	25	delete "current" - sensitivities to climate occure in several past decades (Jan Pretel, Czech Hydrometeorological Institute)	This sub-heading corresponds to a later heading “Current sensitivity”.
12-88	A	4	28			multi-season droughts? (Allen Perry, University of Wales Swansea)	Not highlighted in TAR
12-89	A	4	29	4	29	A 'coastal squeeze' can mean many things (!) it is jargon and should be removed. (John R Porter, KVL)	Addressed
12-90	A	4	34	4	34	… different impacts on different social groups … (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Addressed
12-91	A	4	34	4	35	To say something is different in fact says nothing. You always need to say how it is different if it is to be meaningful - this is a general comment for the chapter and the whole FAR. (John R Porter, KVL)	Addressed
12-92	A	4	34	4	34	"on different on different" - misprint (Filipe Santos, University of Lisbon)	Addressed
12-93	A	4	34	4	34	The word "on different" has been repeated twice. Please remove one of them. (Serhat Sensoy, Turkish State Meteorological Service)	Addressed
12-94	A	4	35	4	35	Do not agree that climate change can be a gender related issue anywhere in Europe (Gábor BÁLINT, VITUKI Environmental Protection and Water Management Research Institute)	Addressed
12-95	A	4	37	4	46	When discussing economic effects it is important to include the energy sector. Global warming affects both demand and production. There is also a safety aspect of changed frequency of extreme floods, related to dam safety of the hydropower systems of Europe.Warming will definitely decrease the heating demand in the Nordic area, where a lot of the houses are heated by electricity. (Sten Bergström, Swedish Meteorological and Hydrological Institute)	Energy sector is covered later in chapter
12-96	A	4	37	4	37	Comment: I suspect that it should read "many climate change impacts" (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed
12-97	A	4	38	4	38	Comment: I suggest to change "These industries …" into "Some of these industries …" (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed
12-98	A	4	39	4	39	typo: … to sea level rise. (Gábor BÁLINT, VITUKI Environmental Protection and Water Management Research Institute)	Addressed
12-99	A	4	39	4	39	… to adapt to sea level rise. (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Addressed
12-100	A	4	39	4	39	typo: "seaL level rise"	Addressed

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Vladimir Kattsov, Voeikov Main Geophysical Observatory)	
12-101	A	4	40	3	40	increasing CO2 concentrations are expected to increase agricultural yields. This is not acceptable as it remains to clarify. (Helena Freitas, University of Coimbra)	Addressed
12-102	A	4	40	4	41	temperature will also have a reducing effect on yields in southern Europe. (John R Porter, KVL)	Addressed
12-103	A	4	41	4	41	rather: Southern and Southeastern Europe (Gábor BÁLINT, VITUKI Environmental Protection and Water Management Research Institute)	Addressed
12-104	A	4	42	4	42	… in Northern Europe, less in ... (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Addressed
12-105	A	4	43	3	43	less outdoor in southern Europe. May be in summer but it may be more in winter (Helena Freitas, University of Coimbra)	Text quotes TAR
12-106	A	4	46	4	46	"risk of forest fire risk" - misprint (Filipe Santos, University of Lisbon)	Addressed
12-107	A	5	1	0	0	Section 12.2: It is important that the text provides a review - an assessment - of the scientific literature, and not only a list of results for different studies. I will give examples of this in the more detailed comments. (Lars Bärring, Lund University)	Addressed. Will be improved in SOD
12-108	A	5	1	7	35	The text can be shortened because in many aspects it is too much detailed (Michele Colacino, ISAC-CNR)	This section will be changed in the SOD see comment 12-109
12-109	A	5	1	6	8	I was perhaps expecting this section to give me an overview of the well established impacts of climate variability and trends in Europe (I am no expert, but I assume there is a well known relationship between weather, climate and, say, agriculture). Instead this section appears to be a rather sketchy and incomplete description of the physical drivers of European climate with a heavy bias towards the winter NAO which is just one of those factors. There seems little or no discussion of the current sensitivities and vulnerabilities of European humans and biological systems to climate. This is in contrast to the next section (12.2.2) which appears to give a very succinct account of current non-climate factors affecting Europe. I would recommend that section 12.2.1 is completely re-written following the format of section 12.2.2. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	Yes, this comment is very important, this section will be rewritten accordingly.
12-110	A	5	1	6	7	Section 12.2.1 is mostly focused in the influence of the NAO on European climate. However, recent findings show that other teleconnections, such as East Atlantic or the Sandinavian patterns play a significant role which is not addressed in the section. The description of the precipitation trends is rather vague and a finer	This section will be rewritten, see comment 12-109. This part of text will be removed.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						picture is provided in my specific comments below. (Ricardo García-Herrera, Universidad Complutense de Madrid)	
12-111	A	5	1			Section 12.2.1 - there is no mention of the Arctic Oscillation (Matthew Livermore, University of East Anglia)	This section will be rewritten, see comment 12-109. This part of text will be removed.
12-112	A	5	3			It is very important that the statements in this section are consistent with information in the chapters on observed climate in WG I. (Timothy Carter, Finnish Environment Institute)	Yes, as some of this part is WG1, this section will be rewritten, see comment 12-109.
12-113	A	5	3			Section 12.2.1. It is my opinion that trends covering the entire period up to 2005 should be included wherever possible. Elsewhere it should be stated which year is the last in the series discussed. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed, but due to delays in corrections of data and publications trends calculated up to 2005 will be difficult to find
12-114	A	5	5	5	8	I think this material could be shortened considerably, or be omitted entirely - is it necessary to spendmore than three lines just defining Europe? The indication of the area of the continent is particularly irrelevant, I think. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Text removed
12-115	A	5	5	5	19	The description of the factors which determine European climate is rather inadequate. However, a more complete description of all the factors which control both winter and summer European climate could stretch over many pages so it may be best omitted or dealt with be WG1. In addition, the last two sentences (lines 15-19) are in apparent contradiction – is it advection of heat in the ocean which warms Europe or heat transport associated with the atmospheric stationary waves? This is still very much an open question in dynamical climatology so is perhaps best kept away from in this document. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	This section will be rewritten, see comment 12-109. This part of text will be removed.
12-116	A	5	5		7	Remove "Extending from the Atlantic... ...Caucasus Mountains in the south." This is correct, but not needed here. (Raija Laiho, University of Helsinki)	Text removed
12-117	A	5	8	5	10	A more accurate version of this sentence should be: ' Europe's climate is primarily ifluenced by the continuous apprarance of new Icelandis Lows over the North Atlantic Ocean, which stem from stationary waves in the atmosphere. These lows, together with the quasi-stationary Azorean high, determine the mean position and direction of airflow across most Europe (Hurrel et al, 2003)' . Hurrell et al 2003, already cited in the chapter 12, is a better reference than Bolle, which is mostly focused on the Mediterranean. (Ricardo García-Herrera, Universidad Complutense de Madrid)	Part of text removed in SOD (see comment 12-109).
12-118	A	5	9	5	11	Comment: At two locations it is written "stationary waves". I think "quasi-	Part of text removed in SOD (see comment

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						stationary waves" would be better. Also the words "much of" or "most of" before "European weather" would improve the text. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	12-109).
12-119	A	5	9	5	9	what are 'stationary waves in the atmosphere'? More jargon to be ruthlessly excised. (John R Porter, KVL)	Part of text removed in SOD (see comment 12-109).
12-120	A	5	10			This was all known before Bolle, 2003. The number of REFs is already large, no need for references here (Kwadijk Jaap, WL Delfthydraulics)	Yes
12-121	A	5	13	5	13	… Genoa cyclones in the lee-side of the Alps). (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Yes, but text removed
12-122	A	5	13			Remove the example "(e.g. Genoa cyclones...)". It is an unnecessary detail. (Raija Laiho, University of Helsinki)	Yes
12-123	A	5	15	5	15	This could be a place to mention the particularly strong warming observed in the mountains (or on line 43 of p. 5). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Accepted, included in SOD
12-124	A	5	16	5	16	Chapter 12, p.5, line 16. Gulf Stream and it's branches reduce the winter sea-ice cover also in Barents sea, and beyond. After "up to north of Norway" put ", north Kola Peninsula and west Svalbard". (Gregory Insarov, Institute of Global Climate and Ecology)	Part of text removed in SOD (see comment 12-109).
12-125	A	5	17		19	Remove the last sentence "The fact that the western...". This is unnecessary. You present in the previous sentence the warming effect of the Gulf Stream, and I think that a specific comparison between European and American west coasts is not relevant here. (Raija Laiho, University of Helsinki)	Part of text removed in SOD (see comment 12-109).
12-126	A	5	18		18	"offshore stationary waves" is very technical language. Could be expressed in a more generally understandable way (Marcus Lindner, European Forest Institute)	Part of text removed in SOD (see comment 12-109).
12-127	A	5	19	5	19	Seager et al, 2002 not in the reference list. (Lars Bärring, Lund University)	Part of text removed in SOD (see comment 12-109).
12-128	A	5	21	5	23	The presentation of the NAO need to be linked to the stationary waves presented in the preceding section (CH.12, P.5, L.8-13. (Lars Bärring, Lund University)	Part of text removed in SOD (see comment 12-109).
12-129	A	5	21	5	26	This paragraph should be more accurate if written as follows: 'Climate in europe is controlled by a relatively short number of large-scale atmospheric circulation patterns: a) the North Atlantic Oscillation (NAO), b) the eastern Atlantic (EA) and Eastern Atlantic/Western Russia pattern (EA/WRUS) and c) the Scandinavian pattern (SCAN), (Trigo et al 2005). Among these, the most relevant pattern driving	Part of text removed in SOD (see comment 12-109).

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						the climate of Europe is the NAO'. Reference: R. Trigo and 16 coauthors, 2005. Relations between variability in the Mediterranean region and mid-latitude variability In Mediterranean Climate Variability. P. Lionello R.Boscolo (Eds). Elsevier (NETHERLANDS) in press. (Ricardo García-Herrera, Universidad Complutense de Madrid)	
12-130	A	5	21	5	26	Effects of NAO should be distinct from other effects that determine vulnerability, especially in the North Eastern Europe. (Alexander Golub, Environmental Defense)	Part of text removed in SOD (see comment 12-109).
12-131	A	5	21	5	41	Comment: ENSO is mentioned on lines 25-26. It would make sense to move this sentence to line 41 (i.e. after the NAO discussion). Also, ENSO needs to be spelled out and it would help with a short description on how ENSO influences the European climate. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Part of text removed in SOD (see comment 12-109).
12-132	A	5	21		26	What is expected to happen to NAO? The last sentence introducing ENSO does not present much information as such. (Raija Laiho, University of Helsinki)	Part of text removed in SOD (see comment 12-109).
12-133	A	5	21	5	26	shortly explain the practical substance of "positive index" to clarify sence of the sentence in line 35, etc. (Jan Pretel, Czech Hydrometeorological Institute)	Part of text removed in SOD (see comment 12-109).
12-134	A	5	22	5	22	meridional displacement' is jargon. (John R Porter, KVL)	Part of text removed in SOD (see comment 12-109).
12-135	A	5	23	5	25	The NAO is often defined as the Azores-Iceland pressure difference at any time of the year. It is only that most studies focus on Winter as the connections with climate variability are stronger due to the NAO explaining a higher proportion of SLP variance. Refs for Summer studies are given in Hurrell, J. W., Y. Kushnir, G. Ottersen, and M. Visbeck, 2003: An overview of the North Atlantic Oscillation. The North Atlantic Oscillation: Climatic Significance and environmental impact, J. W. Hurrell, Y. Kushnir, G. Ottersen, and M. Visbeck, Eds., American Geohysical Union. (Malcolm Haylock, Univeristy of East Anglia)	Part of text removed in SOD (see comment 12-109)..
12-136	A	5	25	5	26	In this section, mainly focussing on the (major) importance of NAO, also mentioning ENSO influences without discussing their relative importance for the European climate, is perhaps the most obvious example of lack of assessment. Are the two phenomena equally important, or does the ENSO phenomenon have only a minor impact, perhaps small enough to omit from the discussion. (Lars Bärring, Lund University)	Part of text removed in SOD (see comment 12-109).

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12-137	A	5	25			Insert: "The influence of NAO on European climate is well documented. In Southern Europe also the influence of MO plays an important role" (Michele Colacino, ISAC-CNR)	Part of text removed in SOD (see comment 12-109).
12-138	A	5	25	5	26	Very brief ENSO coverage. There has been some work on how ENSO links with the North Atlantic via the Nth Pacific. See e.g. Walter, K. and H. F. Graf, 2002: On the changing nature of the regional connection between the North Atlantic Oscillation and sea surface temperature. Journal of Geophysical Research-Atmospheres, 107, art. no.-4338. (Malcolm Haylock, Univeristy of East Anglia)	Part of text removed in SOD (see comment 12-109).
12-139	A	5	25	5	26	ENSO also influences European winter weather - how? (Matthew Livermore, University of East Anglia)	Part of text removed in SOD (see comment 12-109).
12-140	A	5	25			ENSO is not defined. (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	Part of text removed in SOD (see comment 12-109).
12-141	A	5	25	5	25	ENSO needs to be spelt out. (John R Porter, KVL)	Part of text removed in SOD (see comment 12-109).
12-142	A	5	25	5	25	Explain (the abbreviation) ENSO! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Part of text removed in SOD (see comment 12-109).
12-143	A	5	28	5	40	The NAO also influences sea level in parts of Europe (e.g. Baltic Sea), see Johansson et al. (2004). (Timothy Carter, Finnish Environment Institute)	Part of text removed in SOD (see comment 12-109).
12-144	A	5	28	5	40	The text can be eliminated. Details about the correlation NAO – European climate are not necessary (Michele Colacino, ISAC-CNR)	text removed in SOD
12-145	A	5	28			The first sentence can be left out (Raija Laiho, University of Helsinki)	Text removed in SOD
12-146	A	5	28			See above 3: 15. (Nils-Axel Mörner, Paleogeophysics & Geodynamics)	??
12-147	A	5	29	5	29	Comment: The term "NAO index" is not defined in the text. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Part of text removed in SOD (see comment 12-109).
12-148	A	5	29			NAO index is not defined in the text where it is used. (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	Part of text removed in SOD (see comment 12-109).
12-149	A	5	32			Also: Fowler, H.J. and Kilsby, C.G. 2002. Precipitation and the North Atlantic Oscillation: A study of climatic variability in Northern England. Int. J. Climatol., 22, 843-866 studied effects on positive and negative NAO on preciptiation patterns in northern England. Found that significantly increased rainfall in western regions under positive NAO and reductions in rainfall under negative NAO. (Hayley Fowler, Newcastle University)	Part of text removed in SOD (see comment 12-109).

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12-150	A	5	34	5	34	After " (Kettlewell et al., 2003)." I would like to be introduced the following : " Significant results have been obtained investigating the relation between NAO and summer Palmer Drought Severity Index (PDSI). Statistical significant signals are: NAO in March has an impact on the PDSI in north-western Mediterranean (NWMED); NAO in January influences the behaviour of PDSI in Danube Basin, Romania zone and lower Volga region. For all the cases a positive NAO favours a dry period and reverse (Mares et al., 2002)." (Ileana Mares, ROMANIAN ACADEMY OF TECHNICAL SCIENCES)	Part of text removed in SOD (see comment 12-109).
12-151	A	5	37	5	37	Comment: What is the connection between the NAO index and extreme rainfall? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Part of text removed in SOD (see comment 12-109).
12-152	A	5	42	5	44	The Klein-Tank et al. data are daily, and are probably little used in impact studies, though they have been increasingly used to identify recent (multi-decadal) trends in extremweather/climate events. However, the major source of information for longer-term trends in climate across the whole of Europe is still monthly data, for which records extend back to the 19th century and beyond. These sources need to be properly distinguished here, and reference made to the chapters in WG I where trends are discussed in detail. (Timothy Carter, Finnish Environment Institute)	In this section, we discuss trends in Europe and the Klein database is usefull as you say. In the SOD, this section will be coherent with the WG1 chapters
12-153	A	5	42	5	50	If retained, this should be cross-referenced with corresponding WG1 chapter. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	Part of text removed in SOD (see comment 12-109).
12-154	A	5	42	5	51	Factors and trends should be separated. The table or diagramm might be useful. (Alexander Golub, Environmental Defense)	Text improved in SOD
12-155	A	5	42	5	50	Need some mention of the lengthening growing season as this is an important driver of impacts (Jo Hossell, ADAS)	Yes, this part improved in the new table 12.2.1
12-156	A	5	42			The first sentence can be left out (Raija Laiho, University of Helsinki)	Part of text removed in SOD (see comment 12-109).
12-157	A	5	42	6	8	Section 12.2.1 reports a brief summary of European climate factors and trends and highlights the benefits of the recent construction of new data sets of secular records describing European climate variability and change. In my opinion this section should also underline (e.g. at row 43) the activities concerning HISTALP - the new data set of secular records of the Greater Alpine Region. Relevant references are: Böhm R, Auer I, Brunetti M, Maugeri M, Nanni T, Schöner W. 2001. Regional Temperature Variability in the European Alps: 1760-1998 from homogenised instrumental time series. Int. J. Climatol. 21, 1779-1801. Auer, I., et al., 2005: A new instrumental precipitation dataset in the greater alpine	Adressed References to the alpine region will be added Coherency with WG1 will be checked in SOD

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						region for the period 1800-2002. Int. J. Climatol., 24, 139–166. Auer I., et al., 2006: HISTALP – Historical Instrumental climatological Surface Time Series of the Greater Alpine Region: 1760-2003. Submitted to Int. J. Climatol., Oct. 2005. Moreover at row 49 one more reference should be included to better support the statement that the mean precipitation per wet day is also increasing in areas getting drierer. It is: Brunetti, M., Maugeri, M., Monti, F., Nanni, T., 2004: Changes in daily precipitation frequency and distribution in Italy over the last 120 years. J. Geophys. Res., 109, D05102, doi:10.1029/2003JD004296. Finally, section 12.2.1 should also highlight that Europe has the longest (and most reliable) observational records of the world and that a number of research projects aiming to recover, quality check, homogenise and analyse this huge amount of data have been performed in the last years. Examples of very long records that have recently become availble to the research community are Milan, Padova, Cadiz-San Fernando, Stockholm, Uppsala, St. Petersburg and the Central Belgium Temperature series. The following two references give a complete picture of problems and methods of such early records and underline the improvements that can be obtained by a detailed homogenisation: Maugeri, M., Buffoni, L., Chlistovsky, F., 2002: Daily Milan temperature and pressure series (1763-1998): history of the observations and data and metadata recovery, Climatic Change, 53, 101-117. Maugeri, M., Buffoni, L., Delmonte, B., Fassina, A., 2002: Daily Milan temperature and pressure series (1763-1998): completing and homogenising the data, Climatic Change, 53, 119-149. (Teresa NANNI, ISAC-CNR)	
12-158	A	5	42			What is Klein? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	Addressed , a" (" is missing
12-159	A	5	42	5	42	"database Klein Tank" to "database (Klein Tank" (Filipe Santos, University of Lisbon)	Adressed
12-160	A	5	44	5	45	These opposing trends (dry and wet spells both increasing) are caused by increased blocking/generally decreased zonality. (Lars Bärring, Lund University)	Part of text removed in SOD (see comment 12-109).
12-161	A	5	44	5	45	Can a brief definition of warm spell days and cold spell days be included? (Paula Harrison, University of Oxford)	Part of text removed in SOD (see comment 12-109).
12-162	A	5	44	5	45	Comment: What is meant by "warm spell"? "cold spell"?	Part of text removed in SOD (see comment

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						(Erik Kjellström, Swedish Meteorological and Hydrological Institute)	12-109).
12-163	A	5	44	5	46	rewording of these two sentences would be useful; saying that is "...not a negative trend in the number of cold spell days…", and "...number of cold spell days has increased…" could be contradiction (Jan Pretel, Czech Hydrometeorological Institute)	This part will be clarified in SOD
12-164	A	5	45	5	46	Is it really true that the number of cold spells has increased in Europe? Over what period and according to what source? (Timothy Carter, Finnish Environment Institute)	Study by Klein Tank et al, 2002 Period 1976 1999 mainly over Greece and North of Europe This part will improved in SOD
12-165	A	5	45	5	46	Is the statement about the number of cold spell days increasing correct? I'm not sure exactly how these are defined. But number of frost days, for example, has decreased (except over parts of the Greek mainland) according to STARDEX work. (Clare Goodess, University of East Anglia)	Yes , in Greece , Turkey and North This part will be clarified in SOD
12-166	A	5	45	5	46	…, but not by negative …….has increased over Europe. >Not valid exactly, at least for most Czech Republic station data in 1961-2000 there is negative trend for cold spell days (by the way, why not using heat wave and cold wave days), statistically significant at lowland stations, for highland and mountain stations mostly nonsignificant. Definitely not positive trend for cold days in winter, some positive trend (usually nonsignificant) appears rather in other seasons, especially in autumn and spring (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	This part will be clarified in SOD
12-167	A	5	45	4	46	Comment: It says that warmer temperatures and higher CO2 levels may increase the risk of forest fire in Southern Europe". Is this really so? Isn't it the warmer temperatures in combination with drier conditions that increase this risk? Not CO2 increases. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Yes, but this comment is probably misreferenced
12-168	A	5	46	5	47	The sentence 'Mean precipitation is increasing in Northern Europe and decreasing in Southern Europe' is not really true, since it gives the false idea that Southern Europe shows an homogeneous decreasing trend, whihc is not true. So, this could be substitued by ' Mean precipitation is increasing in Northern Europe, while negative (positive) winter trend are detected over the eastern (western) Mediterranean regions, while autum and spring reveal mostly negative trends in Iberia and central Mediterranean regions, with a conspicuous decline of march precipitation in the Western Mediterranean sector (Paredes et al 2005). Reference: Paredes D., R. M. trigo, R. García-Herrera, I.F. Trigo, 2005: Understanding precipitation changes in Iberia in early spring: weather typing and storm-tracking approaches. Journal of Hydrometeorology (in press).	This part will be reworded. We will try to take it into account, but place is limited

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						(Ricardo García-Herrera, Universidad Complutense de Madrid)	
12-169	A	5	46	4	46	Comment: Could anything be said about the changes in seasonality of precipitation? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	This section will be modified in SOD (see comment 12-109)., we will concentrate on consequences on systems
12-170	A	5	48			Frich et al not Frish et al (Clare Goodess, University of East Anglia)	Accepted
12-171	A	5	49	5	50	This sentence need a supporting reference. Do not (!) use the word "scientists" as this can/will be interpreted as a indirect statement about the professional standing of the authors behind this result in relation to those behind 'all' other cited literature. (Lars Bärring, Lund University)	Part of text removed in SOD (see comment 12-109).
12-172	A	5	49	5	50	This UK study is too small-scale to reference here unless other comparable studies can also be cited for comparison. The reader can hardly conclude much about Europe from information specific to northern and western UK! In any case, there is no supporting reference given. (Timothy Carter, Finnish Environment Institute)	Part of text removed in SOD (see comment 12-109).
12-173	A	5	49		50	This sentence is referring to my work and should be referenced as such (Fowler and Kilsby 2003a,b): References are: Fowler, H.J. and Kilsby, C.G. 2003. Implications of changes in seasonal and annual extreme rainfall. Geophysical Research Letters, 30(13), 1720, doi:10.1029/2003GL017327. Fowler, H.J. and Kilsby, C.G. 2003. A regional frequency analysis of United Kingdom extreme rainfall from 1961 to 2000. International Journal of Climatology, 23(11), 1313-1334. (Hayley Fowler, Newcastle University)	Adressed, but will be suppressed in the next draft
12-174	A	5	49	5	49	Reference needed for the 'scientists' - who are they? (John R Porter, KVL)	Part of text removed in SOD (see comment 12-109).
12-175	A	5	49	5	50	Provide a reference for this finding. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Part of text removed in SOD (see comment 12-109).
12-176	A	5	49	5	50	also in the Central Europe (Jan Pretel, Czech Hydrometeorological Institute)	Part of text removed in SOD (see comment 12-109).
12-177	A	5	50			This statement needs supporting by a reference (Paula Harrison, University of Oxford)	Part of text removed in SOD (see comment 12-109).
12-178	A	6	1	6	7	Does the ampitute of cold outbreaks increases over time? If yes, it should be acknoledged (Alexander Golub, Environmental Defense)	The study by Klein Tank et al does not precise this point
12-179	A	6	1	6	7	This para needs to be put after p5 ln 46 (Jo Hossell, ADAS)	OK to separate precipitation and temperature
12-180	A	6	2	6	2	In January 1987 there was a cold spell with many people freezing to death across	Part of text removed in SOD (see comment

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						Europe. (Lars Bärring, Lund University)	12-109).
12-181	A	6	2	6	2	What is the significance of these two events, that were anyway localised to only parts of Europe? Other cold events can be identified throughout the 20th century that were probably of great significance, for various reasons. Moreover, the timing of cold events varies in different parts of Europe. For instance, another cold spell was experienced in northern Fennoscandia in winter 2002-2003, during which a new all-time national minimum temperature record was set for Finland (-51.5 degC). Overall, I think these references are more likely to confuse rather than inform the readers unless they are related directly to impacts. Presumably, recent events since the TAR would be the logical events to focus on, if any are to be discussed. (Timothy Carter, Finnish Environment Institute)	Part of text removed in SOD (see comment 12-109).
12-182	A	6	2	6	4	The text can be eliminated (Michele Colacino, ISAC-CNR)	Accepted.
12-183	A	6	2	6	4	Comment: This sentence is difficult to understand. Does "generally" refer to the particular events or what? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Text removed
12-184	A	6	2		6	I don't quite see the function of the sentence "Although these events are related...". Could it be left out? I don't think that the mentioning of the heat wave needs references here. These fine refenrences can be used later in the more detailed discussion. (Raija Laiho, University of Helsinki)	Text removed
12-185	A	6	3	6	4	The sentence "… shifted to the east of the nodal location of the NAO" seems a bit too much jargon to me. Try to explain in more popular terms (if necessary at all!) (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Text removed
12-186	A	6	5	6	5	I suggest a re-wording to read: "Other particularly noteworthy recent weather events were the floods …. (Timothy Carter, Finnish Environment Institute)	Accepted
12-187	A	6	5	6	5	The floods of 2002 are mentioned in the text, but not discussed in detail (they are not part of the "Case Studies"!) (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Part of text removed in SOD (see comment 12-109).
12-188	A	6	6	6	7	The text can be eliminated (Michele Colacino, ISAC-CNR)	Yes
12-189	A	6	6	6	6	Are these refs for the floods or the heat wave? Move to appropriate place. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Part of text removed in SOD (see comment 12-109).
12-190	A	6	10			I think this section is a bit verbose and should be checked for language tightening	

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						and removal of material that is not really necessary. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	
12-191	A	6	10			Can something be said in this section about current trends in environmental pollution? (Timothy Carter, Finnish Environment Institute)	
12-192	A	6	10			Section 12.2.2: transportation, air quality, effects to climate change should be mentioned to complete the picture (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	OK
12-193	A	6	10			Section 12.2.2: energy production (sources), suply and distribution, industry changes and composition in relation to GHG production should be included as well as economy, agriculture and social characteristics (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	This was partly covered on page 6, line 50 and following paragraph. However, this has been reorganised to cover GHG emissions broadly
12-194	A	6	10	7	35	consider if 12.2.2 is really needed to be included (Jan Pretel, Czech Hydrometeorological Institute)	This section is from WG II outline. Cannot be deleted.
12-195	A	6	12	6	14	I do not think this material is relevant for the chapter - simply omit (population trends would be relevant, however!). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Disagree. Sets the stage.
12-196	A	6	12	6	14	What are the main demographic trends in Europe at present? This is important information that underpins many of the assumptions made in some of the impact studies reported later in the chapter. For instance, rural-urban migration (or vice versa), stabilised or falling birth rates, and ageing are particularly important trends in Europe. (Timothy Carter, Finnish Environment Institute)	This is covered in section 12.3.2
12-197	A	6	12	6	12	Comment: Give year of the population estimate. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	OK
12-198	A	6	12		13	give also share of world population (this will make interpretation of % in line 21-48 easier) (Marcus Lindner, European Forest Institute)	Unnecessary lengthening of chapter.
12-199	A	6	12	6	42	Some scope for shortening this section slightly? (Michael Morecroft, Centre for Ecology & Hydrology)	The agriculture section has been shortened
12-200	A	6	12			What is the definition for urban areas? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	UN reference given
12-201	A	6	16	6	16	Are all of the EU-25 regarded as developed countries? Aren't some still economies in transition? (Timothy Carter, Finnish Environment Institute)	Transition economies are commonly understood to refer to countries, which have moved or are moving from a primarily state-planned to a market-based economic system, with private ownership of assets and market-

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							supporting institutions. With the accession of countries in the EU this process can be considered completed. The phrase on "developed" has been deleted.
12-202	A	6	18	6	19	Is this a market exchange rate? (Alexander Golub, Environmental Defense)	Yes, this is now clarified.
12-203	A	6	19		23	Is the detailed differentiation between EU and non-EU really necessary here? Could the passage from "The EU covers 60%..." to "...plus European Russia had 16% of global GDP. Thus," be left out? (Raija Laiho, University of Helsinki)	Differentiation between EU and non-EU emphasizes important regional differences that are important with regards to impacts and adaptation.
12-204	A	6	21	6	28	What are the trends in economic activity (i.e. between primary, manufacturing and service industries? What are the trends in employment? (Timothy Carter, Finnish Environment Institute)	Unnecessary lengthening of chapter.
12-205	A	6	25	6	28	The text can be eliminated (Michele Colacino, ISAC-CNR)	Sets the context for impacts and adaptation.
12-206	A	6	25			Add "(CEE)" as acroynm used later in paragraph (Paula Harrison, University of Oxford)	Acronym has been added
12-207	A	6	25	6	25	Comment: Add "(CEE)" (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	See response to 12-206
12-208	A	6	28	6	28	The acronym "CEE" should be explained at the first occurrence. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	See response to 12-206
12-209	A	6	28	6	28	In Russia GDP growth was more than 4 percent last 6 years. (Alexander Golub, Environmental Defense)	Text confirms this
12-210	A	6	28	6	28	EU15 or EU25? -- Clarify! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	EU will be referred to as either EU15 or EU25
12-211	A	6	30	6	48	What are the proportions of different land uses/cover and how are these changing? (Timothy Carter, Finnish Environment Institute)	Unnecessary lengthening of the chapter
12-212	A	6	32	6	32	EU15 or EU25? -- Clarify! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	See answer to 12-211
12-213	A	6	33	6	34	You need to give the absolute average cereal yields for Europe to make the '60% higher' figure meaningful. See the EJA paper by Olesen and Bindi (2002). (John R Porter, KVL)	This figure supports contention that Europe high production relative to other regions
12-214	A	6	34	6	42	The text can be eliminated (Michele Colacino, ISAC-CNR)	The text has been shortened
12-215	A	6	41	6	42	Unless the relevance/implications of this sentence are explained better, I think it should be omitted. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	The sentence will be deleted

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12-216	A	6	41	6	42	It is likely that revisions to the CAP will alter European agriculture much more than climate change. Do you need to comment on this? (John R Porter, KVL)	Not relevant in this section.
12-217	A	6	44	6	45	Replace "fillings" by "fellings". More importantly, I disagree with the phrase "lower than required for sustainable wood production" – sustainable wood production does not require that the fellings equal the increment (but they must certainly not be above the increment). Thus, replace by "lower than possible from a sustainability point of view". (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK
12-218	A	6	44	6	48	For more information on recent trends in forest cover in Europe, see Kankaanpää, S. and Carter, T.R. 2004a. An overview of forest policies affecting land use in Europe. The Finnish Environment 706, Finnish Environment Institute, 106 pp. (Timothy Carter, Finnish Environment Institute)	OK
12-219	A	6	44	6	45	The area …. increasing and annual fillings … lower … >I don't understand so much, maybe … increasing, but … (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Se response to 12-217
12-220	A	6	44			Should this be decreasing area rather than increasing? (Jo Hossell, ADAS)	No, correct as is
12-221	A	6	44			"fellings" instead of "fillings", I suppose. (Raija Laiho, University of Helsinki)	See answer to 12-215
12-222	A	6	44		44	annual *fellings*...than *what would be possible* under stustainable wood production. There is no requirement for high fellings under SFM. (Marcus Lindner, European Forest Institute)	See answer to 12-215
12-223	A	6	44			Fellings instead of fillings. (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	See answer to 12-215
12-224	A	6	44	6	48	Where do other GHGs fit into this chapter. Europe is a significant emitter of N20 and CH4 - with their higher GHG warming potential. Any discussion of GHG balances in Europe needs to take these other trace gases into any calculation. (John R Porter, KVL)	See response to 12-193
12-225	A	6	44	6	44	I guess 'fillings' are 'fellings' (?) (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	See answer to 12-215
12-226	A	6	46		48	What is the time scale of these sink/ source estimates? (Raija Laiho, University of Helsinki)	The emissions refer to the mid/late 1990'es
12-227	A	6	46	6	46	Are Tg the agreed unit for IPCC? Are not Mt more useful? (John R Porter, KVL)	Tg is an official SI unit
12-228	A	6	46	6	48	Provide a reference for the numbers in this sentence.	OK

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						(Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	
12-229	A	6	48	6	48	I doubt that this is equivalent to 7-12% of the global C anthropogenic C emissions. The latter are around 6 Gt C/yr (excluding LULUCF), and Europe's numbers are between 0.135-0.205 Mt, so this is about 2 to 3.4%, i.e. a factor four lower than stated in the text. Please check and correct if necessary. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	This should be in percent of European emissions. The text has been changed.
12-230	A	6	50			European Union countries Need to beware elsewhere of using Europe where what is meant is EU (Jo Hossell, ADAS)	Changed to EU
12-231	A	6	50			Should we use 10 year old data on emissions? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	The data has been updated with the newest figures
12-232	A	6	50	6	50	Are there no more up to date data than those from 1995 for this? (John R Porter, KVL)	See answer to 12-231
12-233	A	6	50	6	51	why referrence to 1995 data? (Jan Pretel, Czech Hydrometeorological Institute)	See answer to 12-231
12-234	A	6	50	6	51	The meaning of "European Countries"is not clear. Is it EU-25 countries or all European countries? In both cases more recent information on CO2 emissions from fuel combustion is available (e.g. the UNFCCC database on GHG emissions or IEA publication on "CO2 emissions from Fuel Combustion") and can be used as information for 1995 is rather old. (Yannis Sarafidis, National Observatory of Athens)	See answer to 12-231 "European countries" is replaced by "all European countries"
12-235	A	6	51	7	2	clarification needed - several "countries in CEE" are now also EU member states (Jan Pretel, Czech Hydrometeorological Institute)	See answer to 12-210
12-236	A	6	51	7	2	It is not clear what is meant by "no general difference in emissions" as in most EIT countries emissions profiles and trends are different from those of Annex II Parties. (Yannis Sarafidis, National Observatory of Athens)	The phrase refers to the amount of emissions per capita. However, this will be clarified.
12-237	A	7	0	0	0	Section 12.3.1: Both snow cover and soil moisture, that both are projected to change substantially, need to be discussed. Changes to these climatological elements will have important impact on society and environment. (Lars Bärring, Lund University)	
12-238	A	7	1	8	11	The role of small and medium size businesses (SMEs) should be singled out in this section related to particular challenges they raise in achieving sustainability and climate change goals. Multinationals BP, Dupont and Time Warner are discussed in this section and they certainly have an impact, but most of the world economic growth is from SMEs (Asia Pacific Economic Co-operation forum (APEC). Eco-Efficiency in Small to	This does not seem to refer to chapter 12

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						Medium Enterprises: Final Report 1998. Available from: www.actetsme.org/archive/eco-efficiency/). SMEs are perceived as having greater barriers to implementing sustainability practices (e.g. lack of expertise and capital) compared to larger firms (S. Lawrence, S., Collins, E., Pavlovich K., and Arunachalam M. Sustainability practices of SMEs: The case of NZ. Accepted for publication in early 2006 in Business Strategy and the Environment.; Ammenberg J. & Hjelm O. Tracing business and environmental effects of environmental management systems – A study of networking small and medium-sized enterprises using a joint environmental management system. Business, Strategy and the Environment 2003;12(3): 163-174). SMEs are less likely to engage in voluntary practices, as one of the key issues facing small business owners is that they already feel overburdened with existing government regulations(Corner, P. Improving the performance of New Zealand SMES: Measures for success. University of Auckland Business Review 2001;3(2): 51-66). While individual SMEs may have small social, environmental and financial impacts, in many regions their cumulative impact is significant. For example, taken as a sector, SMEs could contribute up to 70% of all industrial pollution (Hillary, R. Small firms and the environment—a groundwork status report. Birmingham: Groundwork, 1995). (Eva Collins, University of Waikato)	
12-239	A	7	1	7	3	It is not the Kyoto target, it is European redistribution of the emission budget. (Alexander Golub, Environmental Defense)	See response to 12-242
12-240	A	7	1		1	was CEE explained somewhere? (Marcus Lindner, European Forest Institute)	See response to 12-206
12-241	A	7	1	7	1	original EU' presumably means 'EU15'? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	See response to 12-210
12-242	A	7	2	7	3	The – sign for Portugal can induce to confusion. I propose to indicate a global reduction for Europe of 8%, but with a distribution of individual targets ranged from an increase of 27% for Portugal to a reduction of 28% for Luxembourg. (Sergio Alonso, Universitat de les Illes Balears (University of the Balearic Islands))	The text has been rephrased
12-243	A	7	3	7	3	Does this statement refer to EU-15 countries only or all Europe? Does a negative value indicate a reduction or an increase? (Timothy Carter, Finnish Environment Institute)	See response to 12-210 and 12-242
12-244	A	7	3	7	3	Are these figures correct? I cannot reconcile them with an average CO2 emission reduction of 8% for the whole EU. (John R Porter, KVL)	See response to 12-242
12-245	A	7	11			Read and Fernandes,2003 is not quoted in the references	References added

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						(Michele Colacino, ISAC-CNR)	
12-246	A	7	13	7	13	The water framework Directive should be mentioned in this paragraph as it is a common legislation (Helena Freitas, University of Coimbra)	Reference to the Water Framework Directive and other environmental regulations are made in the following section
	A	7	13	7	23	The EU Water Framework deserves a more thorough mention in this paragraph as it is as important to water resources/quality as the CAP is to agriculture. (Paula Harrison, University of Oxford)	See response to 12-247
12-248	A	7	15			What are the percentages standing for? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	Sum up to 100%
12-249	A	7	16	7	16	Before the sentence starting with "Freshwater...", add the following sentence: "European mountains have a key role for the generation of fresh water, as more than 50% of the riverflow in the summer is coming from the mountains (cf. Viviroli, D.,Weingartner, R. and Messerli, B. 2003. Assessing the hydrological significance of the world's mountains. Mtn. Research and Development, 23: 32–40). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK
12-250	A	7	17			"more slowly" - than what? (Paula Harrison, University of Oxford)	"more" has been omitted from the phrase
12-251	A	7	17	7	17	more slowly' than what?? (John R Porter, KVL)	See response to 12-251
12-252	A	7	17	7	17	… is growing more slowly in …': More slowly than where? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	See response to 12-251
12-253	A	7	18	7	23	The text can be eliminated and substituted by: "Anthropogenic activities, floods and droughts put some stresses on water availability" (Michele Colacino, ISAC-CNR)	Text should not be shortened here because it makes key points about European water system.
12-254	A	7	19		20	I do not understand the wording"the impact of agriculture on water resources need to be reduced" , On water quality or quantitiy or both?? (Kwadijk Jaap, WL Delfthydraulics)	Change "water resources" to "water quality and availability"
12-255	A	7	19	7	19	impact of agriculture' - be more explicit - abstraction of water for irrigation / eutrophication / pesticide run-off? (Michael Morecroft, Centre for Ecology & Hydrology)	See comment to 12-247
12-256	A	7	20	7	20	Define "good ecological" status and cite the source of where this is terminology is used. (Timothy Carter, Finnish Environment Institute)	Reference to Water Framework Directive added. See comment to 12-253
12-257	A	7	20	7	22	tourism generally exert a low pressure on water resource, and shoud not be compared to agriculture and industry in that perspective (Ghislain Dubois, Tourism Environment Consultants (TEC))	Tourism can have a big impact in certain locations.

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12-258	A	7	20			Need to make mention of that this is a requirement of the Water Framework Directive. (Jo Hossell, ADAS)	See comment to 12-253
12-259	A	7	25	7	29	The tourism sector in Europe had a specific and fragmentated develpoment over the last five years. I would suggest to use a more sophisticated and newer source of information from the World Tourism Organisation (WTO - Madrid) and not the given EEA. (Rolf Buerki, PHS - College of Secondary Education of St. Gallen)	Dealt with in section on Tourism in Sections 12.4 and 12.5. The section here on tourism has been deleted due to lack of space.
12-260	A	7	30	7	35	The text can be eliminated (Michele Colacino, ISAC-CNR)	This paragraph was revised – Some text was deleted, and short text about air pollution and other issues has been added.
12-261	A	7	32	7	35	Can something be said about trends in land conservation/protected areas, etc? (Timothy Carter, Finnish Environment Institute)	See comment to 12-260
12-262	A	7	35	7	35	clarification what is the meeing CEE is needed - does CEE cover also new EU member states or only EU candidates plus states of former Soviet Union? (Jan Pretel, Czech Hydrometeorological Institute)	See response to 12-206
12-263	A	7	36	7	36	Was it intentional not to mention other drivers such as N deposition and ozone? I think these would be worth while mentioning. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	See comment to 12-260
12-264	A	7	36	11		Chapter 12, pp. 7-11, Section 12.3 Assumptions about Future Trends. This section contains also projections for future trends in the last para. Adapt the name of the section, or replace part of the material to another sections. (Gregory Insarov, Institute of Global Climate and Ecology)	**Substantive** **Change Assumptions to Projections ??**
12-265	A	7	36	33	22	Sections 12.3-12.5. Comment: I think that there should be some short summary of which models and scenarios that are used in the sections (i.e. GCMs, RCMs, scenarios). This could be given as a Table. It is important to state if there are large differences between the scenarios depending on choice of model (GCM and RCM) and emission scenario. Especially, I think it is important to state if the models lying behind the studies discussed in 12.4-12.5 are different from the ones in 12.3. As an example of a problematic sentence is line 47 on p 16 which starts with "Simulations" and then does not say anything about which simulation it refers to. Another example are scenarios refered to on p19 (10-16), there is no information about which model runs they are based on. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Inadequate room for such a significant expansion of text.
12-266	A	7	38	7	38	Is "assumptions" the best word for this title? It may be interpreted as if this was done in a somehat haphazard or sloppy way. In science, "assumptions" should always be critically reviewed because they are not necessarily based on facts and/or	Title changed

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						are simplifications just to be able to proceed (without making things unnecessary complicated). In this case, this is probably not the intention behind this title. (Lars Bärring, Lund University)	
12-267	A	7	38			To my understanding, this section should introduce the main projections about future conditions that are assumed in the impact, adaptation and vulnerability studies assessed in this chapter. It should not attempt to report in detail the latest knowledge about future projections, because these will not have been adopted in those studies. It can, however, report any notable discrepancies between the scenarios assumed and the newest projections if these are likely to affect the conclusions of the chapter. (Timothy Carter, Finnish Environment Institute)	Yes, but all estimates of future climate change in Europe are valuable for estimating future impacts. Therefore this section should not be limited to only SRES scenarios.
12-268	A	7	38	11	7	The text can be shortened because for some aspects it is too much detailed (Michele Colacino, ISAC-CNR)	Text shortened
12-269	A	7	38			Section 12.3.1 could do with some figures to demonstrate future climate change, possibly something similar to those produced in Chapter 3 of the ACACIA report showing median change in temperatures and precipitation together with the range. Should be based on the RCM outputs from the PRUDENCE project. (Matthew Livermore, University of East Anglia)	Covered in WG I.
12-270	A	7	38			"Assumptions about future trends" - Move subsection 12.3.1 out of section 12.3. I understand that we have to make assumptions regarding socio-economic development but the climate change scenarios are not a set of assumptions; rather a range of projections. (Matthew Livermore, University of East Anglia)	Title changed
12-271	A	7	38			Section 12.3.1: This section presents a number of results from different regional climate models with results pointing in different directions. After reading this section a number of times I am not able to draw many conclusions with general applicability. Are the diverse results an effect of the models used? Are the models and data employed compatible? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	Section has now been clarified with the help of a contributing author
12-272	A	7	38			Still I do not understand the meaning of 'assumptions' in the title of section 12.3 What is reported here are (climate) simulations for different scenarios (which could of course be called assumptions ;-) [I have remarked this already in the ZOD, and probably it has been dealt with, but since there is no feedback, I have to bring it up again] (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Title assumptions has been removed
12-273	A	7	40			More attention is needed in this section on the main characteristics of the climate scenarios assumed for Europe in studies reported elsewhere in this chapter. Many	Figure added (with data from WG I) added and text reduced .

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						of these are SRES-based, though some are using earlier scenarios (e.g. IS92a-forced). (Timothy Carter, Finnish Environment Institute)	
12-274	A	7	40			For the purposes of comparing the climate scenarios assumed for Europe in this assessment with the latest knowledge emerging in WG I, it is very important that the regional section on "Europe and the Mediterranean" in Chapter 11 of WG I be consulted (FOD is now available). However, it should not be necessary to repeat that information in this chapter; it is enough merely to summarise those projections that are markedly different from earlier scenarios, and perhaps also those statements for which there is now more confidence than in the TAR. These are nicely summarised in Chapter 11, WG I for both mean changes and variability/extreme events. (Timothy Carter, Finnish Environment Institute)	WGI group contacted and text changed with the help of a contributing author
12-275	A	7	40	9	50	There seems to be a heavy reliance in this section on the results of only a few modelling studies. While I realise there is a general issue of authors having to prepare WG1 and WG2 drafts simultaneously, there is at lease an opportunity at this point to update the summary in section 12.3.1 based on the FOD of the regional projections chapter of WG1 with perhaps some steer from the lead authors of that chapter to the likely "stability" of their conclusions. One of the key aspects of the projections that must be discussed is their uncertainties. While some indications of uncertainty are peppered throughout the text, it is difficult to get an overall impression. One of the advances of recent years has been in the development of methods to quantify uncertainties in predictions and WG1 is devoting a considerable amount of effort in this regard. Perhaps a separate subsection or "box" could be included? (Matthew Collins, Hadley Centre for Climate Prediction and Research)	Text updated with results from WG I.
12-276	A	7	40			Section 12.3.1. Comment: There are only 7 citations of work on climate change in Europe in this section. There is a large number of papers that are relevant and merits citation. For instance, Lecekbusch and Ulbrich on windstorms in Global and Planetary change 44(1-4), 2004, (other papers in the same issue are also relevant, Christensen and Christensen on extreme precipitation, Semmler and Jacob on extreme precipitation, Sanchez et al on extreme events in the Mediterranean region). There is also the Christensen and Christensen Nature paper on extreme precipitation that is worthwhile citing (Nature 421, 2003). Further Pryor et al. on changes in wind climate in northern Europe (Climate Dynamics, 2005 - published online). Then there is a whole range of relevant papers from the PRUDENCE project intended for a special issue in Climatic Change (These are all in the review	More papers have now been used and Information from papers that are advanced in review process has been incorporated. Prudence results have been summarised with the aid of a contributing author.

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						process. Jörgen Olesen should know more about this). I think it important to cite some of the relevant PRUDENCE literature since these papers try to adress uncertainties in the climate change scenarios that can not be adressed in some of the already cited papers relying on single realisations of climate change. As a further note to this subject of studies relying on single realisations I think that the present text should be removed of "will" in favour of "may" which is more apropriate. In the papers intended for the PRUDENCE special issue of Climatic Change there are also attemps made to put the regional climate change scenarios in context of different global scenarios. This issue is also addressed in Déqué et al. (Clim Dyn, published online 18th August, 2005).Finally, there is no mentioning whatsoever of the new climate change simulations that has been undertaken for the AR4 within IPCC?! I take it that this is going to be added? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	
12-277	A	7	40			From the onset it should be said which climate scenarios are looked at! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Text made clearer
12-278	A	7	42			Section 12.3.1.1, when having reference to fig. for wind it would be reasonable to have figs. for temp. and prec. as well (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Due to lack of space all figures have been removed.
12-279	A	7	42	9	12	include in 12.3.1.1. also information at least about snow cover and evaporation (Jan Pretel, Czech Hydrometeorological Institute)	Snow cover discussed in Sec. 12.4.9. Evaporation too detailed. Better for WG I.
12-280	A	7	44	7	45	Reference to chapter on scenarios? (Jo Hossell, ADAS)	Christos
12-281	A	7	44	7	45	Could you briefly comment on why the period 2070-2099 was selected? (Lisette (E.J.) Klok, Royal Netherlands Meteorological Institute)	Climate simulations are only available for this period. The length of this period is meant to be comparable with the length of the climate normal period.
12-282	A	7	45	7	45	Normal is a questionable term since climate has been already slightly changed in 1961-1990. (Alexander Golub, Environmental Defense)	This concept is from the climate science community.
12-283	A	7	47	0	0	With so much written about the NAO and current climate, something should be said about future changes in the NAO. It should address the question of whether the trend in recent decades is an indication of climate change or just variability. See Gillet, N. P., H. F. Graf, and T. J. Osborn, 2003: Climate Change and the North Atlantic Oscillation. The North Atlantic Oscillation: Climatic Significance and environmental impact, J. W. Hurrell, Y. Kushnir, G. Ottersen, and M. Visbeck, Eds., American Geohysical Union. (Malcolm Haylock, Univeristy of East Anglia)	NAO information included in separate section in the chapter

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12-284	A	7	47	8	22	What is the reason for starting 12.3.1.1 with mean sea level pressure? Usually it is surface air temperature and precipitation that are considered first. (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	Text re-arranged
12-285	A	7	47			Section 12.3.1.1 consistently mixes and matches results from GCMs & RCMs and talks about a number of scenarios. It might make for easier reading if the evolution of climate change through the 21st Century was first dealt with using GCM results before refering to RCM results to add information about the climate of the 2080s and changes in the frequency and magnitude of extreme events. In fact very few examples where impacts are reported for all the three IPCC time slices in this chapter. Makes it hard to see if there is any critical threshold that should not be exceeded. (Matthew Livermore, University of East Anglia)	We believe proposed change in order of information would make text less clear. We have reported whatever time slice info available in the literature.
12-286	A	7	47			I would not start the climate descriptions with 'mean sea level pressure'. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Text re-arranged
12-287	A	7	48	7	48	"Regional climate simulations indicate …": Which simulations? Is it the simulations involving 2 scenarios (A2 and B2) and 2 GCMs as explained later (page 8). (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Text clarified
12-288	A	8	2			HadAM3H - Gordon et al., 2000 is the incorrect reference; it's a paper about HadCM3, in particular the ocean component. Better reference would be UKCIP (2002) or one of several Hadley Centre Technical Notes. (Matthew Livermore, University of East Anglia)	Reference corrected
12-289	A	8	5	9	2	Maybe worth pointing out that the results described here are not based on all the PRUDENCE simulations, but a limited number. Should there also be some reference to the appropriate WG1 chapter here? (Clare Goodess, University of East Anglia)	WGI group contacted and text changed with the help of a contributing author who summarized PRUDENCE results
12-290	A	8	5	8	22	There is a lot of repetition in this paragraph (last half) that warming is greatest in DJF in north and in JJA in south. (Malcolm Haylock, Univeristy of East Anglia)	Repetitions removed
12-291	A	8	5	9	2	The sections on SAT and precip are quite complicated and could be shortened to give the main points. (John R Porter, KVL)	Text shortened with the aid of a contributing author
12-292	A	8	6	8	6	The exclusive focus on the A2 and B2 scenarios should be explained - I have no fundamental reservations against this selection, but it is coming a bit out of the blue here. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Most climate modelling results available only for A2 and B2 scenarios. These scenarios were selected because they reflect contrasting pathways of greenhouse gas emissions.
12-293	A	8	6	8	8	Chapter 12, p.8, line 6. Give references or a brief description for the A2 and B2	

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						climate scenarios like brief description for the A2 and B2 socio-economic development scenarios are given in the Tab. 12.1. (Gregory Insarov, Institute of Global Climate and Ecology)	But the text already presents climate results for A2 and B2. Unnecessary lengthening of text.
12-294	A	8	6		6	A2 and B2 scenarios have not been explained yet. The section comes further down but is needed for understanding of this section (Marcus Lindner, European Forest Institute)	Reference to later section will be added.
12-295	A	8	6	8	7	A2 and B2 scenarios need to be defined. Is the warming range that of the annual mean or what? (John R Porter, KVL)	Added “Mean annual warming”
12-296	A	8	8	6	11	The text can be eliminated (Michele Colacino, ISAC-CNR)	Repetitions removed
12-297	A	8	8	8	8	What is Eastern Europe? Please define it in the beginning of the Chapter, where appropriate. E.g., is it all eastern European countries excluding Russia? Is the definition used consistently in different sections of the Chapter? Please check. (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	New text added to define geographic terms.
12-298	A	8	12	8	13	Sentence "In Southern…is virtually repeated at line 17 p8 (Jo Hossell, ADAS)	Repetition removed
12-299	A	8	12	8	18	The phrase "The seasonal cycle of temperature change differs dramatically between Northern and Southern-Central Europe" should appear before the phrase "In Northern Europe all four simulations indicate a larger warming in winter than in summer" and the remaining text rearranged accordingly (Filipe Santos, University of Lisbon)	Text reworded
12-300	A	8	16	8	16	delete "where the warming locally exceeds 10oC in France" - too catastrophic extimate (Jan Pretel, Czech Hydrometeorological Institute)	This finding is the peer-reviewed literature.
12-301	A	8	17	8	22	The text can be eliminated (Michele Colacino, ISAC-CNR)	Repetition removed
12-302	A	8	18	8	22	Major factors behind this regional/seasonal difference is that the wintertime warming in the north is related to the retreating snow cover, and the summertime warmin in the south is to decreasing soil moisture/drying out of soils. To aid the reading in making sense of all these regionally different signals this should be explained, there should be a reference to relevant AR4 WG1 sections dealing with this. Relevant references: Lenderink, G., van Ulden, A., van den Hurk, B. and van Meijngaard, E.: 2005, ’Summertime inter-annual temperature variability in an ensemble of regional model simulations: analysis of the surface energy budget’, Clim. Change [in press; Prudence Special Issue]. (Lars Bärring, Lund University)	WGI group contacted and text revised with the help of a contributing author

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12-303	A	8	25	8	26	That should be referred to as four simulaitons or two scenarios. Details on GCMs are needed (ECHAM4 and HadCM3?). (Andrei Kirilenko, Purdue University)	Unnecessary lengthening of text
12-304	A	8	29	8	29	I'm not sure what you mean by "up to Central Scandinavia". Do you mean extending from Southern and Central Europe as far north as Central Scandinavia? (Malcolm Haylock, Univeristy of East Anglia)	Geographical regions of Europe now clearly defined.
12-305	A	8	30	9	2	The text can be eliminated (Michele Colacino, ISAC-CNR)	Repetition removed
12-306	A	8	44	8	45	Does "in phase" mean within models or temporally or spatially? (Jo Hossell, ADAS)	Text believed to be clear.
12-307	A	8	44	9	2	delete - previous paragraph is repeated here in many cases (Jan Pretel, Czech Hydrometeorological Institute)	Repetition removed
12-308	A	9	4	9	12	The scenario results for wind are based on one 1999 publication, with no reference to PRUDENCE results. Figure 12.2 doesn't seem to be included. Also, some comment on the reliability of wind over land is required. (Clare Goodess, University of East Anglia)	With the aid of a contributing author, Prudence results have been added.
12-309	A	9	5		12	ECHAM4 reference was already provided in the previous page. Reference to the windness data is missing. It is not clear from the text what are the "two simulations" and "four simulations" (Andrei Kirilenko, Purdue University)	But reference these specific “simulations” is consistent in the previous paragraphs.
12-310	A	9	5			Windiness? Is this mean wind or maximum gust? Need to be more specific. (Matthew Livermore, University of East Anglia)	Text revised
12-311	A	9	5	9	6	Give a reference for the statement in this sentence! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Text revised
12-312	A	9	5	9	6	Is it possible to quantify the decrease of windiness in the Mediterranean region? (Yannis Sarafidis, National Observatory of Athens)	Not in literature
12-313	A	9	7	9	10	The text can be eliminated (Michele Colacino, ISAC-CNR)	Repetition removed
12-314	A	9	7	9	8	Is this Raisanen et al., 2004? Please refer. (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	Text revised
12-315	A	9	7	9	10	An additional reference could be: S.C. Pryor et al., Potential climate change impact on wind energy resources in northern Europe: analyses using a regional climate model, Climate Dynamics, 2005. (Yannis Sarafidis, National Observatory of Athens)	Text revised and reference added
12-316	A	9	12	9	12	>location of Figure 12.2 closer to the reference here would be better, it should be even Fig. 12.1, as the topic is rather concerning with wind than coastal and marine systems, maybe some figure for temperature and precipitation as well	No figures were included due to lack of space

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						(Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	
12-317	A	9	12			12.3.1.2. Extreme events: the two paragraphs present results from two sets of studies. These need to be synthesized as a single description of projections for extreme events. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	Why?
12-318	A	9	12	9	12	Figure 12.2 is cited here before any citation of Figure 12.1; and it can be found only 4 pages later! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	No figures were included due to lack of space
12-319	A	9	14	9	50	This section comments on temperature and precipitation extremes. Can anything be said about other extremes? E.g., wind, waves, or phenomena such as hail…. (Clare Goodess, University of East Anglia)	Information about other extreme events covered in WG I.
12-320	A	9	14			Section 12.3.1.2 , better separation of temperature and precipitation extremes, maximum and minimum, wet, dry, … in the structure of the section could improve the readibility and classification of effects of climate change (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Text already separated
12-321	A	9	14			Section 12.3.1.2 - Changes in precipitation are comprehensively dealth with but there is no quantification of the change in behaviour of summer time heatwaves - why? (Matthew Livermore, University of East Anglia)	Text revised and Prudence results added.
12-322	A	9	14			Section 12.3.1.2: There are citations for the changes in precip intensity but none for the changes in max temps - these are needed. Does the part on precip intensity repeat part of that from p8 on precipitation. (John R Porter, KVL)	See previous comment
12-323	A	9	16	9	22	Regional differences in the climate change signal of temperature extremes are discussed in some detail in: Kjellström, E., Bärring, L., Jacob, D., Jones, R., Lenderink, G. & Schär, C., 2005: Variability in daily maximum and minimum temperatures: Recent and future changes over Europe. Climate Change [in press. Prudence special issue]. (Lars Bärring, Lund University)	Now included in text
12-324	A	9	19	9	22	The text can be eliminated (Michele Colacino, ISAC-CNR)	Repetitions removed
12-325	A	9	19	9	22	The implication that "only cold extremes of the present climate would disipate" is not such a bad thing and much less important than rising hot extremes I think is very short sighted. Many environmental problems can arise from rising cold extremes, especially those industries/ecosystems relying on occasional frosts and snowfall. (Malcolm Haylock, Univeristy of East Anglia)	Text revised

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12-326	A	9	19	9	22	This implies that a lack of cold temperatures will not have a significant impact? (Jo Hossell, ADAS)	Text revised
12-327	A	9	19	9	19	This indicates a decrease in wintertime spatial variability. (John R Porter, KVL)	Text revised
12-328	A	9	22	9	22	should be 'unprecendentily' as an adverb. (John R Porter, KVL)	Text left as is
12-329	A	9	24	9	33	The first sentence of this paragraph (higher maximum precipitation) is a sharp contradiction with the "reduced intensity of rainfall" mentioned on line 29 - please make clear whether the Mediterranean is an exception here, otherwise this sentence conveys a confusing message. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Text revised
12-330	A	9	24	9	50	Increase in extreme one day or several day precipitation totals in warmer summer climate in Central Europe can be designed also by simple precipitation model. Considering 1.6 – 3.8 °C warming and increase of water vapor content by 13 - 25% in summer (by 3 GCMs) can cause increase of extreme precipitation totals during strong thunderstorms and cyclonic weather (at 5-day totals it was modeled by 23 – 42% in the April to September season and the 2075 time frame). These results have been published in: LAPIN, M., HLAVCOVA, K., 2003: Changes in Summer Type of Flash Floods in the Slovak Car-pat-hians due to Changing Climate. Proceedings of the International Conference on Alpine Meteoro-logy and MAP2003 Meeting, Brig, Swit-zerland, 19.-23.V.2003, Publ. Of MeteoSwiss, No. 66, 105-108. (Milan Lapin, Comenius University)	A contributing aurthor was selected to revise the text.
12-331	A	9	24	9	27	the content of the sentence more or less covered by the next paragraph (Jan Pretel, Czech Hydrometeorological Institute)	Text left as is
12-332	A	9	26	9	26	Deviations above which normal? Need specify whether it is the present day (1961-1990) or the future (2070-2099) normal. (Lars Bärring, Lund University)	Text made clearer
12-333	A	9	27			Replace PRUDENCE, 2004 reference (Clare Goodess, University of East Anglia)	Prudence references added
12-334	A	9	27	9	29	This reduced intensity is in contrast to trend noted on p5 ln47 and p9 ln41-43 (Jo Hossell, ADAS)	Text changed
12-335	A	9	32	9	33	A brief comment on what these uncertainty estimates incorporate is needed (e.g., uncertainty across x number of models?). (Clare Goodess, University of East Anglia)	Text changed
12-336	A	9	32	9	33	I'm unclear as to what exactly this sentence is referring to. Total annual precipitation? In this case is the "most extreme changes" referring to the areas (and seasons?) with the largest changes? In this case "extreme changes" should be	Text revised with the aid of a contributing author

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						replaced with "largest changes" as we are not talking about extremes so this is confusing. (Malcolm Haylock, Univeristy of East Anglia)	
12-337	A	9	35	9	36	Giorgi's findings (higher max precipitation even in a drier climate) seem to constitute a clear contradiction to those mentioned on lines 28-29 (drying with reduced intensity of rainfall). Please clarify - if there is controversy around thes trends, then it should be brought out clearly. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Dealt with in reply to comment 12-334
12-338	A	9	35	9	41	The text can be eliminated (Michele Colacino, ISAC-CNR)	Repetitions removed
12-339	A	9	35	9	50	Para mixes temperature and preciptation - need to be separated out (Jo Hossell, ADAS)	separated
12-340	A	9	35	9	50	rewording required - frequent skiping between precipitation and temperature issues (Jan Pretel, Czech Hydrometeorological Institute)	separated
12-341	A	9	41	9	43	This is a repetition of the Giorgi material mentioned on lines 35-36. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Text changed
12-342	A	9	41			Also worth mentioning that there is evidence that longer duration multi-day extreme rainfall events may have a larger relative increase in magnitude under climate change (from study over the UK) than shorter events (i.e. 1 day) from Ekström, M., Fowler, H.J., Kilsby, C.G. and Jones, P.D. 2005. New estimates of future changes in extreme rainfall across the UK using regional climate model integrations. 2. Future estimates and use in impact studies. Journal of Hydrology, 300(1-4), 234-251. (Hayley Fowler, Newcastle University)	Text changed with the help of a contributing author
12-343	A	9	43	9	50	The text can be eliminated (Michele Colacino, ISAC-CNR)	Text eliminated
12-344	A	10	0			Section 12.3.2: This should include something on trends in water demand/use related to the SRES scenarios instead of them coming later in the water resources section (Paula Harrison, University of Oxford)	Discussion of water fits better at its current location in Section 12.4.1
12-345	A	10	0			A probably decline of population in Europe and ageing are mentioned. A population issue linked to climate change is the increasing pressure towards migration into Europe from Africa and other poorer regions vulnerable to climate change, which might merit more attention. (Pasi Kuoppamäki, Sampo plc)	Unnecessary lengthening of chapter
12-346	A	10	2			I would have expected to see some information on projected environmental	Only room here to discuss socio-economic

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						pollution (e.g. from AIR-CLIM, EEA, FINSKEN) and on projected sea-level changes (e.g. from recent projects such as SURVAS, SEAREG, ATLANTIS - though these were extreme cases, FINSKEN). FINSKEN references are: Syri S, Fronzek S, Karvosenoja N, Forsius M (2004) Sulfur and nitrogen oxides emissions in Europe and deposition in Finland during the 21st century. Boreal Environment Research 9:185-198; Laurila T, Tuovinen J-P, Tarvainen V, Simpson D (2004) Trends and scenarios of ground-level ozone concentrations in Finland. Boreal Environment Research 9:167-184; Johansson et al. 2004. Note, that FINSKEN is described in a paragraph in Chapter 2, WG II (p. 67, FOD), so a cross-reference may suffice here. (Timothy Carter, Finnish Environment Institute)	trends.
12-347	A	10	2			As for the climate futures, projected trends in non-climate factors should also reflect those adopted in studies reported in the chapter. (Timothy Carter, Finnish Environment Institute)	Reference is made to the appropriate SRES scenarios
12-348	A	10	2			Section 12.3.2: trends in transportation, air quality, possible effect in GHG and aerosols production should be involved (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Only room here to discuss socio-economic trends.
12-349	A	10	2			Section 12.3.2: trends in energy consumption, energy production and industry changes even not mentioned in connection to GHG production, in more detailes than only very general SRES scenarios characteristics (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	These are driving forces of emissions which are more appropriate for WG III rather than WG II.
12-350	A	10	2	11	7	consider if 12.3.2 is really needed to be included (Jan Pretel, Czech Hydrometeorological Institute)	This section is specified as part of outline of WG II report.
12-351	A	10	8	10	8	fertility' is not correct word - 'fecundity'? (Michael Morecroft, Centre for Ecology & Hydrology)	“Fertility” is commonly-used term.
12-352	A	10	10	10	12	Decrease of life expectancy in FSU should be mentioned. (Alexander Golub, Environmental Defense)	Olesen
12-353	A	10	14	10	15	The ATEAM project also adopted socio-economic storylines for Europe - full reference is Schröter, D., Cramer, W., Leemans, R., Prentice, I.C., Araújo, M.B., Arnell, N.W., Bondeau, A., Bugmann, H., Carter, T.R., Garcia, C.A., de la Vega-Leinert, A.C., Erhard, M., Ewert, F., Glendining, M., House, J.I., Kankaanpää, S., Klein, R.J.T., Lavorel, S., Lindner, M., Metzger, M.J., Meyer, J., Mitchell, T.D., Reginster, I., Rounsevell, M., Sabaté, S., Sitch, S., Smith, B., Smith, J., Smith, P., Sykes, M.T., Thonicke, K., Thuiller, W., Tuck, G., Zaehle, S. and Zierl, B. 2005. Ecosystem service supply and vulnerability to global change in Europe. Science, 27 October 2005 (10.1126/science.1115233). The FINSKEN project developed socio-economic scenarios for Finland (Kaivo-oja J, Luukkanen J, Wilenius M (2004)	Olesen

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						Defining alternative socio-economic and technological futures up to 2100: SRES scenarios for the case of Finland. Boreal Environment Research 9:109-125) and more recently a second set of socio-economic scenarios has also been developed in Finland for use in climate change adaptation work (Marttila, V., Granholm, H., Laanikari, J., Yrjölä, T., Aalto, A., Heikinheimo, P., Honkatuki, J., Järvinen, H., Liski, J., Merivirta, R. and Paunio, M. (eds) 2005. Finland's National Strategy for Adaptation to Climate Change, Ministry of Agriculture and Forestry, Helsinki, 280 pp. http://www.mmm.fi/sopeutumisstrategia/) (Timothy Carter, Finnish Environment Institute)	
12-354	A	10	14	10	20	To what extent, if any, do these modified socio-economic scenarios reflect criticisms of the SRES scenarios, e.g., ENSEMBLES review report by Tol et al. (Clare Goodess, University of East Anglia)	Critique of SRES scenarios is a task of WG III rather than WG II.
12-355	A	10	14	10	20	move this section about SRES scenarios up, it is required for better understanding of climate scenarios before section 12.3.1 (Marcus Lindner, European Forest Institute)	Add new first sentence in 12.3.1
12-356	A	10	15			Holman et al (2005) reference should be Holman, I.P., Rounsevell, M.D.A., Shackley, S., Harrison, P.A., Nicholls, R.J., Berry, P.M. and Audsley, E. (2005). A regional, multi-sectoral and integrated assessment of the impacts of climate and socio-economic change in the UK: Part I Methodology. Climatic Change, 70, 9-41. (Paula Harrison, University of Oxford)	OK
12-357	A	10	15			Jordan et al. (2000) - this publication is cited simply as Parry (2000) elsewhere. (Matthew Livermore, University of East Anglia)	OK
12-358	A	10	18	10	19	These increases in crop productivity are related to assumptions about agricultural technology, and show how important, indeed dominant, these assumptions can be in comparison with other changes (e.g. in climate and CO2 concentration). (Timothy Carter, Finnish Environment Institute)	Text in 12.4.7 is revised
12-359	A	10	20			The Ewert et al (2005) paper refers to the A1FI scenario, not A1. (Paula Harrison, University of Oxford)	OK
12-360	A	10	23			Table 12.1 - this needs to come earlier in the chapter before reference in the text is made to the SRES. (John R Porter, KVL)	This is artificact of chapter outline. Will add reference to SRES in Sec. 12.31
12-361	A	10	23			Table 12.1: A1: "Rapid enlargement of the EU" -- where to? B2: "Europe is more heterogeneous leading to …": More than now? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Olesen Text changed
12-362	A	10	23			Table 12.1 should be moved to the beginning of section 12.3 and used to explain the scenarios used (see remark above)	Reference to be made to the table at the start of section 12.3

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						(Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	
12-363	A	10	23	10	25	Table 12.1. as it is not needed (Jan Pretel, Czech Hydrometeorological Institute)	SRES scenarios used often in European impact assessments and therefore we feel this table gives useful background information
12-364	A	10	27	11	7	Comment: It could be mentioned that none of the discussed changes in land use have so far been incorporated in the climate models to allow for feedback on the climate system in the scenarios discussed here. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Not dealt with here. Technical issue of climate modelling.
12-365	A	10	28			Section 12.3.2: This is an illustration of the discussions I had on the chapter in general. The analysis are based on market, productivity, rural development, environmental policy developments and climate impacts. If I remember correctly from the report, these non-climate factors overshadow the climate impacts but everything is report as climate impacts and this is, e.g., repeated in Section 12.4.4.2, line 15. In fact, the non-climate trends are not really discussed in Section 12.3.2. It is mainly a discussion on the SRES scenarios. (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	No room in this small section to comprehensively deal with these issues.
12-366	A	11	0	0	0	Section 12.4: This whole section tends to focus too much on only listing negative impacts. It is important that the assessment is balanced in this respect. Even if the projected impacts are mainly negative also positive impacts should be mentioned. If there are no positive impacts worth mentioning, this should be explicitly stated or the assessment will draw criticism for being biased. Also, there is too much focus in listing impacts, more efforts are needed on assessment and synthesis. (Lars Bärring, Lund University)	The positive effects will be mentioned. The synthesis of impacts is suggested to do in Table. The table could contain the impacts, the adaptation and vulnerabilities remaining after adaptation
12-367	A	11	1	11	1	Add Schröter et al. 2005. (Timothy Carter, Finnish Environment Institute)	
12-368	A	11	2	11	2	To say something is different in fact says nothing. You always need to say how it is different if it is to be meaningful - this is a general comment for the chapter and the whole FAR. (John R Porter, KVL)	
12-369	A	11	2	11	2	should be urban areas (John R Porter, KVL)	
12-370	A	11	3	11	4	Reference here is Kankaapää and Carter, 2004b.Construction of European forest land use scenarios for the 21st century. The Finnish Environment 707, Finnish Environment Institute, 57 pp. (Timothy Carter, Finnish Environment Institute)	
12-371	A	11	5	11	6	Indicate which SRES scenarios the lowest/highest changes are associated with. Are CAP effects considered in these scenarios?	

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						(Clare Goodess, University of East Anglia)	
12-372	A	11	6	11	7	No consideration is given to the increasing demand for "free-range" and organic produce which are extensive forms of agriculture. (Matthew Livermore, University of East Anglia)	
12-373	A	11	7	11	7	Add Schröter et al. 2005. (Timothy Carter, Finnish Environment Institute)	
12-374	A	11	9	26		Chapter 12, Section 12.4. There are subsections 12.4.3 Mountains and sub arctic regions, 12.4.4 Forest, grasslands, and shrublands,12.4.5. Wetlands and aquatic ecosystems. Tundra subsection is missed, and no literature about expected future impacts and vulnerabilities for tundra, except note that "lowland permafrost will eventually disappear" one can find in Section 12.4.3. Tundra covers a huge area in Europe, so it is worth to include more information on this subject either to Section 12.4.3, or to a new section for tundra. (Gregory Insarov, Institute of Global Climate and Ecology)	Tundra will be added in SOD
12-375	A	11	9			12.4 Expected future impacts and vulnerabilities: Here, overall focusing on key impacts and vulnerabilities is clearly needed. Now various issues, some more and some less likely and important, are just listed. I would also suggest changing the title accordingly ("key", not "expected"). (Raija Laiho, University of Helsinki)	A map has been added listing key vulnerabilities
12-376	A	11	10	27	40	The text can be shortened erasing every reference to specific regions. Some statements relative to the cultural heritage should be inserted (Michele Colacino, ISAC-CNR)	See note to comment 12-34
12-377	A	11	11	12	51	Please add wether there is any report on evidence in the hydrological records that the climate is changing, or add that there is no report known to the authors that there is a change. E.g. Pfister L., Hoffmann L. & Humbert J., 2000. Recent trends in rainfall-runoff characteristics in the Alzette river basin, Luxembourg. Climatic Change 45: 323-337. (Kwadijk Jaap, WL Delfthydraulics)	The question how the hydrological records prove (or not) that climate is changing is discussed in Section *12.2.1. Climate factors and trends*. Otherwise, no significant change is detected in annual runoff in most part of Europe (*Pekárová et al, 2001*), in flood occurrence rate for rivers Elbe and Oder having longer-term records in central Europe (*Mudelsee et al., 2003).* Some hydrological records show decreasing (annual runoff for Don and Dnepr rivers) or increasing (winter low flow for Russian, Belarus and Ukraine rivers) trend (*Shiklomanov and Georgievsky, 2005*). The report "Pfister, L., Hoffmann, L and Humbert, J. (2000). Recent trends in

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							rainfall-runoff characteristics in the Alzette river basin, Luxembourg. Climatic Change 45. 323-327".is report before 2001 and is a local report.
12-378	A	11	12			The FINADAPT project will release a report on climate change impacts and adaptation for water resources in Finland in December 2005. (Timothy Carter, Finnish Environment Institute)	Addressed, the FINADAPT will be considered
12-379	A	11	12			Section 12.4.1 - what about issues of groundwater resources, and water quality (Jo Hossell, ADAS)	There has been very little research on the impacts of climate change on groundwater. Some findings about decreasing recharge of groundwater are included into FOD, namely: *"groundwater recharge may be reduced (Eitzinger et al., 2003) with larger reduction in valleys (Krüger et al., 2002) and lowlands (Somlyógy, 2002)".* Some other scientific paper - Brouyere, S., Carabin, G., and D. D. Dassargues, A., 2004*. Climate change impacts on groundwater resources: modelled deficits in a chalky aquifer, Geer basin, Belgium., Hydrogeology Journal 12 (2): 123-134,* Döll, P. and M. Flörke, 2005*: Global-Scale Estimation of Diffuse Groundwater Recharge. Frankfurt Hydrology Paper 03, Institute of Physical Geography, Frankfurt University, Frankfurt am Main, Germany* - will be considered in SOD. Water quality of lakes is included in *Section 12.4.5. Wetlands and aquatic ecosystems*
12-380	A	11	12			Section 2.4.1, comment: Again, there are many "will", "decrease", "increase", "rises", "shift" without almost any "may", "could", "possible" etc. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed
12-381	A	11	13		23	With respect to water resources, it would be good to add a line where these problems are compared with other parts of the world. (Kwadijk Jaap, WL Delfthydraulics)	The limited text page doesn't allow to make this comparison in Chapter 12, moreover, the suggested comparison would be rather the task of Chapter 3 (Chapter on Water). Nevertheless a sentence, "South- and Eastern-Europe is one

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							of the regions of world, where the highest decrease in mean annual runoff is expected (Arnell, 2004)" may be added.
12-382	A	11	14	11	25	I would like to suggest one additional reference relevant for the Scandinavian area: Andréasson, J., Bergström, S., Carlsson, B., Graham, L.P. and Lindström, G. (2004). Hydrological Change - Climate Change Impact Simulations for Sweden, Ambio Vol. 33, No. 4 - 5. 228-234. (Sten Bergström, Swedish Meteorological and Hydrological Institute)	Addressed, the references will be considered
12-383	A	11	14	11	25	There are also a lot of more localised hydrological studies in regions of Europe carried out e.g. to assess flood risk or dam safety, or to evaluate scenarios from RCMs), see for example Graham, L.P.: 2004. Climate change effects on river flow to the Baltic Sea, Ambio 33, 235-241; Graham, L.P., Hagemann, S., Jaun, S. and Beniston, M.: 2005. On interpreting hydrological change from regional climate models, Climatic Change, in press; Graham, L.P., Rummukainen, M., Gardelin, M. and Bergström, S.: 2001, Modelling Climate Change Impacts on Water Resources in the Swedish Regional Climate Modelling Programme, in Brunet, M. and López, D. (eds.), Detecting and Modelling Regional Climate Change and Associated Impacts, Springer-Verlag, Berlin Heidelberg New York, pp. 567-580. (Timothy Carter, Finnish Environment Institute)	Addressed, the references after 2001 will be considered
12-384	A	11	14	11	15	Comment: There are more recent studies discussing hydrological effects in northern Europe. For instance Andreasson et al., and Graham, both in Ambio 33(4-5) 2004. And again several articles intended for the PRUDENCE special issue in Climatic Change concerning the catchments of the Baltic Sea and the Danube river. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed, the references will be considered
12-385	A	11	15			Are these recently computed sceanrios from RCMs? (Clare Goodess, University of East Anglia)	The impact assessment was made mostly under GCM scenarios.
12-386	A	11	16	11	36	Suggestion: increase in winter runoof and decrcrease in summer runoff is largely due to a combination of decrease in snow cover in winter and increase in evaporation in summer, both related to temperature increase. This explanation covers many of the claims of increases in flooding shift of summer to winter runoff, decrease in summer runoff. May be start with explaning this mechanism, and summarize the resulting effects, reduces the length. (Kwadijk Jaap, WL Delfthydraulics)	Generally the suggestion is a good idea and will be thought over in writing process of SOD
12-387	A	11	16	11	16	"(Santos, 2002;" to "(Santos et al., 2002;" (Filipe Santos, University of Lisbon)	Addressed
12-388	A	11	17	11	17	Add Schröter et al. 2005 who also present an assessment of water availability in Europe.	Addressed, the reference will be considered

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						(Timothy Carter, Finnish Environment Institute)	
12-389	A	11	17	11	23	The text can be eliminated (Michele Colacino, ISAC-CNR)	Text from line 17 to line 21 will be rewritten (see comments e.g. 391). Text about the impact of climate change on groundwater (from line 21 to line 23) will be reformulated taking into consideration the comment 12-379.
12-390	A	11	17		19	Also same impacts observed in northwest England on the Lune and Dee (see: Fowler, H.J. and Kilsby, C.G. Using regional climate model data to simulate historical and future river flows in the UK. Climatic Change, accepted subject to minor revisions) (Hayley Fowler, Newcastle University)	Addressed, the reference will be considered
12-391	A	11	19	11	21	The sentence "Lowest flows … of its glaciers" is ambiguous for several reasons. First of all, it is not clear which flow will decrease by 50%. Therefore, write "SUMMER flows decrease by up to 50%". Secondly, the conclusion "in particular in the Alps after the melting of its glaciers" is NOT supported by Schneeberger et al.'s (2003) paper. Therefore, omit this reference. Thirdly, Eckhardt and Ulbrich's (2003) 50% does not apply to the Alps as is suggested here. Therfore, omit "in particular in the Alps after the melting of its glaciers". Use for instance the reference " Hock, R., P. Jansson and L. Braun, 2005. Modelling the response of mountain glacier discharge to climate warming. In: Huber, U.M., M. A. Reasoner and H. Bugmann (Eds.): Global Change and Mountain Regions - A State of Knowledge Overview. Advances in Global Change Series. Springer, Dordrecht, 243-252." to state that glacier retreat initially enhances the summer discharge in a river basin runoff that is melt water fed. However, when glaciers have shrunk sinificantly, the seasonal cycle in discharge and summer discharge is reduced. (Lisette (E.J.) Klok, Royal Netherlands Meteorological Institute)	The role of Alpine glaciers melting in change of winter and summer runoff will be revised. We agree, that the glacier retreat initially enhances the summer discharge, however, when glaciers have shrunk significantly, the seasonal cycle in discharge and summer discharge is reduced, as it was stated in report of Huber *et al.*. The reference Hock *et al.,* 2005 will be added if it is available. Schneeberger was cited in FOD only relating to glaciers melting, and no relating to the decrease of runoff. The citation in this form is ambiguous, and will be omitted. Also will be corrected the citation from Eckhardt and Ulbrich, claim that climate change will lead to change in hydrological cycle (and to reduce of summer streamflow by 50%) was applied to low mountain range catchment in central Europe and was not applied to the Alps.
12-392	A	11	21	11	21	modify this sentence to "...in particular in the Alps (Zierl & Bugmann 2005), a trend that is aggravated by the melting of its glaciers (Schneeberger et al. 2003). Reference: Zierl, B. & Bugmann, H., 2005. Global change impacts on hydrological processes in Alpine catchments. Water Resources Research 41(W02028): 1-13. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Role of glaciers in change of runoff of Alpine catchments will be revised and rewritten (see note to comment 12-391). The references Zierl, B and Bugmann, H., 2005, Hock, R., P. et al., 2005 will be added.
12-393	A	11	26			As I recommended before, there should be some reference to temporal changes in	The suggested phrases are cited from report

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						the occurrence of greatest flood risk. I suggest: "Projected increases in the occurrence of greatest flood risk may move from Spring to Winter and may coincide with times when agricultural soils are vulnerable to erosion. Increases in the frequency of winter cyclonic rainfall coupled with a high level of vulnerability is likely to increase the delivery of sediment and sediment-associated contaminants to receiving rivers, wetlands and lakes (Foster, 1995)" (David Smith, University of Oxford)	written in 1995. Nevertheless, we are agree that moving of floods from spring towards winter may lead to increase of erosion because the agricultural soils are more vulnerable.
12-394	A	11	27			Table 12.2 - "selected IPCC-SRES and climate scenarios" - which ones? (Matthew Livermore, University of East Anglia)	We agree, that it is very important which IPCC-SRES scenarios and climate models (climate scenarios) were used in climate change impact assessment, e.g. cited in Table 12.2. The information about the used IPCC-SRES scenarios will be added if they are available.
12-395	A	11	28			Table 12.2: northeastern is spelt incorrectly in the Table (John R Porter, KVL)	Addressed
12-396	A	11	29			Indicate which SRES scenarios are used. (Clare Goodess, University of East Anglia)	See note to comment 12-394
12-397	A	11	31	11	37	This paragraph repeats much of the information in Table 12.2. (John R Porter, KVL)	The harmonisation between the paragraph and the Table 12.2 will be done in SOD.
12-398	A	11	36	11	38	Claims on effetcs of land use on floods are heavily debated (still) most certainly these have only very local effects I suggest to skip these lines or also include other references where these claims are rejected. e.g. MULTI-SCALE MODELLING OF ANTHROPOGENIC EFFECTS ON FLOODS IN THE RHINE CATCHMENT, PART II: RESULTS A. Bronstert (1), A. Bárdossy (2), H. Buiteveld (3), M. Disse (4), H. Engel (4), U. Fritsch (5), Y. Hundecha (2), Lammersen (3), D. Niehoff (5), and N. Ritter (4) (Kwadijk Jaap, WL Delfthydraulics)	We are agree the claims that effects of land use on floods are heavily debated (still), and theses have only a very local effect. E.g. Robinson *et al.,* 2003 cited by FOD found that coniferous (on poorly drained soils in NW Europe) and eucalyptus (in South Europe) forest can have marked effects on peak flow and baseflow, and changes in other forest types will have a relatively small effect on peak and low flow at a regional scale. On the contrary, De Roo, A *et al.*, 2003 using the distributed catchment model LISFLOOD found that floods had been affected by land use change in Oder catchment area, and the urban growth would slightly increase flood risk in future. The suggested reference 'Bronstert et al., 200?: Multi-scale modelling

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							…. will be considered and the statement about the effect of land use change on flood will be reformulated in SOD
12-399	A	11	37	11	37	"Ad De Roo" should read De Roo et al., 2003 consequently in the reference list De Roo, A.; G. Schmuck …. (Gábor BÁLINT, VITUKI Environmental Protection and Water Management Research Institute)	Addressed
12-400	A	11	37	11	37	Ad' is the first name of Mr. De Roo! (correct also in References) (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Addressed
12-401	A	11	37	11	37	add "industrialization" - due to urbanisation and industrialization (Jan Pretel, Czech Hydrometeorological Institute)	Addressed
12-402	A	12	1	12	1	levee' is american ingleesh. The equivalent expression is 'dyke' in Europe. (John R Porter, KVL)	Addressed
12-403	A	12	4	12	4	The phrase "Model calculations..." is misleading, as it suggests that all previous statements were not based on model calculations. Just omit this, and start the sentence with "The studies by Lehner et al. (2003), ... suggest that...". (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Addressed
12-404	A	12	4	12	4	Add ATEAM results here - Schröter et al. 2005. (Timothy Carter, Finnish Environment Institute)	Addressed, the ATEAM results will be considered (see note to comment 12-388)
12-405	A	12	4	12	11	Figure 12.1 doesn't use an SRES scenario. And it shows river discarge not water availability. (Clare Goodess, University of East Anglia)	The text in paragraph and legend to Figure 12.2 will be harmonized.
12-406	A	12	4	12	27	See also (9) Suggestion: The increasing water stress is related to the dryer scenarios (less precip) for S. Europe combined with higher evaporation. Mention this mechanism and summarize the impacts in S. Europe, this improves the readability. (Kwadijk Jaap, WL Delfthydraulics)	See note to the comment 12-386
12-407	A	12	4	12	27	This repeats earlier material and the whole water, precipitation, extreme events with water sections need to be reduced to avoid overlap. It is noticable that much more space is given in chapter 12 to water than to temperature and CO2 effects. (John R Porter, KVL)	It is not clear that which earlier material is repeated in paragraph from line 4 to line 27.
12-408	A	12	7	0	0	Section 12.3.1: This section builds to a large extent on results derived from the ECHAM4/OPYC3 and/or HadAM3 global models, or from RCM scenarios where one/both of these two global models were used as lateral boundary conditions. One important result from Räisänen et al. is that there is a substantially different climate change signal in the SLP pattern between these two global drivers, and that this difference influences the climate change signal in other climatic elements. If one	This comment related to section 12.3.1 Assumptions about future trends.

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						knows about this, it is possible to spot several conclusions where the results are related to this underlying fact difference in the driving models. In particular, this is notable in the Precipitation section [P. 8, L.24-50], and in the wind speed section [P.9 L.4-12]. It is better to either discuss this difference upfront here, or to make reference to relevant AR4 WG1 sections dealing with this. (Lars Bärring, Lund University)	
12-409	A	12	9	12	10	Does water availability actually mean low flow - They are not the same thing! (Jo Hossell, ADAS)	The definition of water availability changes from country to country, so I agree to give a clear definition here (or in the Glossary) on the water availability, as it was accepted in Chapter 12.
12-410	A	12	11	12	11	Start a new paragraph after the reference to Figure 12.1, as this is a new topic. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Addressed
12-411	A	12	11	12	25	The text can be eliminated and can be substituted by: "Climate change impact on water availability determines water stresses in South and South-eastern Europe, due also to the increase of water demand for irrigation" (Michele Colacino, ISAC-CNR)	Suggestion to eliminate (or shorten) the paragraph from line 11 to 25 is accepted and will be done in writing process of SOD
12-412	A	12	12	12	14	The verb in this sentence should not be "increases" but rather "is expected to increase" or "is likely to increase" - after all, this is a description about future impacts, not measured facts. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Addressed
12-413	A	12	12	12	16	> what is influence or relation of expected decrease of agricultural area mentioned above to the increase of irrigation demands? (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Comment relating to decrease of agricultural land in Europe and to question how this will affect the irrigation will be considered
12-414	A	12	16	12	16	Again, this should be rephrased to something like "Irrigation requirements are likely to become substantial even in countries where they now hardly exist" (this is a description of future possibilities, not facts). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Addressed
12-415	A	12	17	12	19	Downing et al 2003 shows increasing domestic demand in UK. Similarly as range of studies show increasing water stress in the UK, particularly the SE - West, C. and Gawith, M.(eds). "Measuring Progress: Preparing for climate change through the UK Climate Impacts Programme". UKCIP, Oxford provides a summary (Jo Hossell, ADAS)	The reference 'Downing *et al.,* 2003 … will be considered
12-416	A	12	19			How is 'water stress' defined? (Clare Goodess, University of East Anglia)	Definition will be given
12-417	A	12	21	12	22	In the current text it is not clear where 19 - 36% severe water stress category will happen	In SOD it will be clarified where the severe water stress will be happen. The change in

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						(Kwadijk Jaap, WL Delfthydraulics)	water stress category is expected meanly in South- and South-eastern Europe
12-418	A	12	25	12	27	The statement can be placed better in Adaptation (Michele Colacino, ISAC-CNR)	Addressed, the statement will is removed into Section 12.5.1 Adaptation
12-419	A	12	25	12	25	add "in particular" - vulnerable, in particular, in Southern and Southeastern Europe; reservoirs are vulnerable (Jan Pretel, Czech Hydrometeorological Institute)	Addressed
12-420	A	12	26	12	27	This is an interesting statement that merits some expansion, either here or in the later discussion on adaptation in section 12.5.1. (Timothy Carter, Finnish Environment Institute)	Addressed, **t**he statement will be removed into Section 12.5.1 Adaptation (see note to comment 12-418)
12-421	A	12	26	12	27	More relevant to section on adaptation. (Clare Goodess, University of East Anglia)	Addressed
12-422	A	12	27	12	27	Introduce the phrase "Recent climate change projections under the A2 and B2 scenarios for the European Atlantic Islands indicate a significant reduction in precipitation specially in the Madeira Islands (Santos et al., 2004) which will make them much more vulnerable to water stress" (F.D.Santos, M.A.Valente, P.Miranda, A.Aguiar, E.B. Azevedo, A.Tomé and F.Coelho, World Resources Review, 16 (2004), 473-491 (Filipe Santos, University of Lisbon)	Suggestion on introduce the phrase about the climate change impact on water stress in Madeira Island is rejected because of the islands are discussed in other Chapter (Chapter 16, Small Island)
12-423	A	12	28	12	46	Figure 12.1: What is happening in the Moscow region? Are these results due to projected water use? (Timothy Carter, Finnish Environment Institute)	Will be examined
12-424	A	12	28	12	46	Figure 12.1: Is there an SRES-based alternative to this set of figures using WaterGap? Does Chapter 3 include a map of this kind? ATEAM also produced maps based on the Arnell models (cf. Schröter et al., 2005). (Timothy Carter, Finnish Environment Institute)	It will be examined to change the map in Figure 12.1 for the map based on SRES scenario, e.g. for ATEAM map based on the Arnell model (cf. Schröter et al., 2005)
12-425	A	12	47			Figure 12.1: Here (and elsewhere) it surprises (and puzzles) me that even in references after 2001 use is made of the antique and outdated IS92a scenario! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	See the note to comment 12-424
12-426	A	13	0	0	0	Figure 12.2: As noted in another comment, there is a big difference between the climate change signal in the ECHAM4/OPYC3 (shown) and HadAM3, where the latter shows a less strong signal. Why is only the more severe scenario shown here without much discussion of the uncertainty? Furthermore, which, more precisiely, is the "reference scenario"? (Lars Bärring, Lund University)	Agreed +Figure add/ change? RD Note in 12.4.2 _ that refs to NAO etc are x-refed to earlier & removed as nec.
12-427	A	13	0	14		Suggestion: this section is rather difficult to read due to the huge number of	Agreed

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						references after each sentence. In many cases the same author is mentioned more then 1 time, which is not really necessary. Reduce the number of references (Kwadijk Jaap, WL Delfthydraulics)	
12-428	A	13	0	14		Suggestion: Reorganize this section Start with the recorded changes that can be linked to ASLR. Then the most certain effects (SLR) , then describe effects of storms and the relation with NAO; end with impacts. Alternatively make clear that the most new insights are derived from the link between coastal development and NAO (Kwadijk Jaap, WL Delfthydraulics)	Consider???_Need _ No
12-429	A	13	3			Something should be added in this section concerning water quality, in particular pollution-related impacts that may be exacerbated or otherwise modified by climate change (e.g. algal blooms in the Baltic Sea). (Timothy Carter, Finnish Environment Institute)	Possible_ consider
12-430	A	13	3			Cross check the information on sea level in this section with the appropriate chapters in WG I (5 and 10) (Timothy Carter, Finnish Environment Institute)	Yes
12-431	A	13	3			section 12.4.2 - there is no mention of the ecosystem value and impacts - this is a key area for this habitat see: Robinson, R.A., Learmonth, J.A., Hutson, A.M., Macleod, C.D., Sparks, T.H., Leech, D.I., Pierce, G.J., Rehfisch, M.M. & Crick, H.Q.P. (2005) Climate Change and Migratory Species. BTO Research Report No. 414. Defra, London. (available from http://www.defra.gov.uk/wildlife-countryside/resprog/findings/climatechange-migratory/index.htm) (Humphrey Crick, British Trust for Ornithology)	
12-432	A	13	3			Section 12.4.2. Comment: This section should be about impacts and vulnerabilities. The review of literature on changes in storminess and winds should be moved and merged with the text in section 12.3.1. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Consider_ x-check
12-433	A	13	3			Section 12.4.2. Comment: This section lacks some impacts, namely changes in salinity driven by changes in runoff and wind climate. These features are studied for the Baltic Sea in for instance Meier and Kauker, (Clim. Res., 24 2003). Another missing impact is due to changes in sea-ice in the Baltic Sea. This turns out to have ecological consequences for the winter habitat of Seals as described in Meier et al., Ambio 33(4-5), 2004. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Consider_ x-check
12-434	A	13	5	13	16	The text can be eliminated (Michele Colacino, ISAC-CNR)	Don't Agree. Text relevant info to marine & coasts of Europe.
12-435	A	13	5	11	9	This text could be shortened and moved to section 12.2.1	Will check if need to move.

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						(Matthew Livermore, University of East Anglia)	
12-436	A	13	5	14	48	In the whole 12.4.2 clear differentiation between efects of storminess and effects of SLR recommended - several skipings between both issues in text - both issues are different by origin (Jan Pretel, Czech Hydrometeorological Institute)	Will look if there's a problem.
12-437	A	13	6	15	7	Section 12.4.2: This section includes 10 references which are in preparation - is this allowed as they have not been reviewed and are not publically available? (Paula Harrison, University of Oxford)	Agreed
12-438	A	13	9			It's the NAO trend towards more positive index values which leads to fewer storms. (Clare Goodess, University of East Anglia)	Check & change
12-439	A	13	9			"The NAO leads to…" only in one phase surely? (Jo Hossell, ADAS)	Check
12-440	A	13	9	13	9	Comment: It is not the NAO that leads to fewer storms … (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Check
12-441	A	13	9			The NAO per se does not lead to fewer storms, it is the phase of the NAO! (Matthew Livermore, University of East Anglia)	Check
12-442	A	13	9			"The POSITIVE NAO leads---" (Allen Perry, University of Wales Swansea)	
12-443	A	13	10	13	10	Maybe explain (once) AOGCM (?) (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Check overall use AOGCM/ entire
12-444	A	13	11	13	14	Its said the NAO has a strong influence on SLR - it would be helpful to give an indication of the (relative) magnitude of this effect. (Clare Goodess, University of East Anglia)	Its there, later in text
12-445	A	13	12	13	12	After 'sea level rise' include (SLR). (Sergio Alonso, Universitat de les Illes Balears (University of the Balearic Islands))	Edit check on acronym
12-446	A	13	13	13	16	There is discussion of these effects for the Baltic Sea in Johansson et al. 2004. (Timothy Carter, Finnish Environment Institute)	Check
12-447	A	13	14			Is 4 m correct? (Clare Goodess, University of East Anglia)	Yes. Check x2_ Refs: Anatoli
12-448	A	13	14		15	It is clear that the Black |Sea water level is not related to NAO as it is linked to the oceans and its level is determined by the global sea level.. The Caspian sea is a closed sea, which level is not related to the global sea level. The level of the Caspian sea is strongly dependend on the water balance of the Volga and therefore through precipitation variations in this basin, probably related to the NAO. Skip line 15-16 (Kwadijk Jaap, WL Delfthydraulics)	???Only a statement_ point? The text is more precise. Ln15-16 consider, but keep.

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12-449	A	13	15	13	15	explain abreviation SLR, which is frequently used in the text (Jan Pretel, Czech Hydrometeorological Institute)	As above
12-450	A	13	18	13	18	To get an even longer time perspective on N. European storms you may (or may not) wish to in clude areference to: Bärring, L. & von Storch, H., 2004: Scandinavian storminess since about 1800. Geophysical Research Letters, 31, L20202, <doi:10.1029/2004GL020441> (Lars Bärring, Lund University)	Consider
12-451	A	13	20	13	20	Hesselbjerg et al. is an incorrect reference to Chapter 11 of WG I. This should be Christensen et al. 2007. In the FOD (p. 97) there is a case example presented of extreme water levels along European coasts based on results from the PRUDENCE project. A reference to this, plus a short summary may suffice here. (Timothy Carter, Finnish Environment Institute)	Accepted
12-452	A	13	21	13	22	Bärring and von Storch (GRL 31, 2004) looking into pressure based indeces for storms should be cited here representing a different method of using pressure data to derive information about storminess. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Consider
12-453	A	13	22	13	25	Check meaning of sentence if it is not in contradiction with the previous one - could you be more specific? (Jan Pretel, Czech Hydrometeorological Institute)	No its correct_ but will double check
12-454	A	13	25	13	25	I don't think Fig. 12.2 should be cited here (Filipe Santos, University of Lisbon)	Consider position
12-455	A	13	46	13	47	What is the 'reference scenario of greenhouse gas emissions' (Clare Goodess, University of East Anglia)	Check
12-456	A	13	46			Explain what the reference scenario of GHG emissions means (Paula Harrison, University of Oxford)	As above
12-457	A	13	46	13	47	What means 'reference scenario for greenhouse gas emissions'? -- Tell which one it is! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	As above
12-458	A	13	47			Figure 12.2 - what is the default scenarion - IS92a, SRESA2 ? (Matthew Livermore, University of East Anglia)	As above
12-459	A	14	0	14		I do not understand why the abrupt melting of glaciers would happen and why it has such a large effect on sea level rise, unless here is meant the greenland ice sheet or parts of the antarctic icesheet (Kwadijk Jaap, WL Delfthydraulics)	Clarify, as necessary
12-460	A	14	1	14	15	There are some apparent contradictions in these two paragraphs. E.g., 'different outcomes', then 'most model experiments' and decline in Mediterranean storminess, then increase in Adriatic, Aegian storminess. No mention of more recent storm	Clarification will be made

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						surge modelling work done in PRUDENCE. (Clare Goodess, University of East Anglia)	
12-461	A	14	1		8	Please indicate how good the climate models are able to reproduce NAO (Kwadijk Jaap, WL Delfthydraulics)	Statement here /or 12.3*. Link to cooments for Cristos
12-462	A	14	1	14	3	How do the projections differ? Between GCM and RCM or between individual experiments. Is it a scale issue or a more generic model structure issue? (Matthew Livermore, University of East Anglia)	Defer to 12.3 & chps 1 & 2. Clarify, if needed "Regional models giving finer detail……."
12-463	A	14	4	14	5	Check units for columns., e.g., captial loss value. Right-hand side referes to adaptation - so could be shown/discussed in later section. (Clare Goodess, University of East Anglia)	Corruption error in formatting to pdf. Correct Pick up in 12.5
12-464	A	14	6	14	7	The statement "… and a decline in storminess and wind intensity along the Mediterranean…" is in contrast with that of line 10 "Increased storminess is predicted in parts Adriatic, Aegean and Black Seas". (Michele Colacino, ISAC-CNR)	Check as 460
12-465	A	14	10	14	10	Comment: A reference is missing. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	OK
12-466	A	14	11	14	11	The variable H_sig is nowhere used -- drop it! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Change to signif in text
12-467	A	14	12	14	15	Comment: Two relevant recent publications on storm surges in the North Sea based on several RCMs and GCMs by Woth (JGR, accepted for publication 2005) and Woth et al., Ocean Dynamics (published online, 2005). For the Baltic Sea possible changes in extreme sea level is described in Meier et al. (accepted for publication in the report series of the Geological Survey of Finland) and in Meier, H.E.M., 2005: Baltic Sea climate in the late 21st century - a dynamical downscaling approach using two global models and two forcing scenarios. Part 2: Scenarios of the heat balance and sea level extremes. Clim. Dyn., submitted. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Check refs_ update
12-468	A	14	13		13	leave out references in prep (Kwadijk Jaap, WL Delfthydraulics)	Update as above.
12-469	A	14	15			The statement "… and a decline in storminess and wind intensity along the Mediterranean…" is in contrast with that of line 10 "Increased storminess is predicted in parts Adriatic, Aegean and Black Seas". (Michele Colacino, ISAC-CNR)	As above _ check
12-470	A	14	17	14	17	Make clear that "SLR" means "sea level rise" - this abbreviation is not explained anywhere in the current text, I think. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Acronym_ As above
12-471	A	14	17	14	17	Chapter 12, p.14, line 17. Give SLR in full, or add it to the Abbreviation section.	As above

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						(Gregory Insarov, Institute of Global Climate and Ecology)	
12-472	A	14	17	14	17	Comment: First time "SLR" is mentioned, spell out! (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	As above
12-473	A	14	17			SLR is not defined - is spelled out further down in the text. (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	As above
12-474	A	14	17	14	17	Spell out SLR at first occurrence! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	As above
12-475	A	14	17	14	28	More clear and specific SLR message for 12.4.2 needed (Jan Pretel, Czech Hydrometeorological Institute)	Message thought clear as is_ will consider further & check with Vo1 1 & Vol 2 (chp6)
12-476	A	14	18	14	18	Carter et al. 2004 is not a refereed, citable reference. Use the original citations from that report. (Timothy Carter, Finnish Environment Institute)	OK
12-477	A	14	19		20	do not refer to the same IPCC report (IPCC 2007??) (Kwadijk Jaap, WL Delfthydraulics)	Point? Use of ref style IPCC? Q'n to Plenary session on referencing_ xref?
12-478	A	14	20			Is it possible to comment on why estimates of European sea level rise are so much larger than global? (Clare Goodess, University of East Anglia)	Consider wording & give ref., e.g., to Woodworth et al. 2004 etc.
12-479	A	14	24			It is not clear from the case studies in Section 12.6 the additional uncertainty on SLR (Michele Colacino, ISAC-CNR)	Same as 478
12-480	A	14	24	14	28	Comment: Meier et al., (Climate Research, 27, 2004) show possible impacts of sea level rise in a regional perspective for the entire Baltic Sea under different climate change scenarios. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Same as 433 & check
12-481	A	14	25	14	25	"in Scandinavia" should probably read "along shorelines of the Baltic Sea" (Timothy Carter, Finnish Environment Institute)	OK
12-482	A	14	26	14	28	The text can be eliminated. A statement such as: "The SRL foreseen for Venice lagoon in the range between 13 – 80 cm at the end of century is a serious threat for the city and its monuments" can be inserted (Michele Colacino, ISAC-CNR)	No. & Not relevant_ too local a point, though info noted
12-483	A	14	26			It should be "storm surge impacts". I commented before in this context and in the context of sea level rise that the gradual reduction in isostatic uplift in both Scandinavia and the UK will bring increasing areas of coastal lowlands within the range of both storms and sea level rise. I also feel that the importance of tectonic activity in this context is insufficiently stressed. I note that there is no mention of tsunami. Both tsunami and tectonic activity are important to Mediterranean countries in that as sea level rises, more areas are susceptible to tsunami, while	Consider & go back on wording_ short

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						tectonic activity can exacerbate the effects of sea level rise. I made these points before and they have not been accepted. I make them again. (David Smith, University of Oxford)	
12-484	A	14	27	14	47	Flood Foresight 2004 provides costs of flooding for future scenarios (Jo Hossell, ADAS)	OK check
12-485	A	14	30	14	35	Move content of this paragraph after the line 15, which deals with effects of increased storminess; some rewording propably needed to distinguish between efects of storminess and effects of SLR (Jan Pretel, Czech Hydrometeorological Institute)	Clarify & check
12-486	A	14	34	14	34	An example of projected sea ice in the Baltic can be found in Jylhä, K., Fronzek, S., Tuomenvirta, H., Carter, T.R. and Ruosteenoja, K. 2005. Changes in frost and snow in Europe and Baltic sea ice by the end of the 21st century based on climate model projections for Europe. Climatic Change, in press. (Timothy Carter, Finnish Environment Institute)	OK
12-487	A	14	41			Different references are given in the text and in the caption for Table 12.3. (Clare Goodess, University of East Anglia)	Check
12-488	A	14	41	14	42	For the sentence starting "Under the A1FI scenario..." Why is the figure for only one scenario shown, why no examine the impacts of say the B2 or B1 scenarios which should be treated as being equally plausible. Providing the range would address he uncertainties associated with such estimates whilst at the same time deflect criticism that only the extreme scenarios are being looked at. This needs to be addressed throughout the Chapter. (David Viner, University of East Anglia)	Say why_ others have low impact.
12-489	A	14	42	14	43	Is this evaluation for Europe or global? (Timothy Carter, Finnish Environment Institute)	Clarify
12-490	A	14	45	14	47	Is it possible to give some examples of any important wetland areas that will be lost/particularly badly affected? (Clare Goodess, University of East Anglia)	Yes, if nec. & link to wetlands ex's Ebro + others see EU reports
12-491	A	14	46			See also Holman et al. (2005), Climatic Change, 70, 43-73. This contains more on wetlands and specifically the effects of climate change on the balance between salt marsh and coastal grazing marsh - 2 very important coastal wetland habitats. (Paula Harrison, University of Oxford)	OK
12-492	A	15	1			Table 12.3 Check units in columns "Capital value loss" and "Wetland loss" in USD??? (Gábor BÁLINT, VITUKI Environmental Protection and Water Management Research Institute)	As above, formatting corruption of the Table. Correct.
12-493	A	15	1	15	5	There should be some description of methodology for economic valuation of	

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						wetland losses (footnote or box). (Alexander Golub, Environmental Defense)	Check & As 492
12-494	A	15	1	15		Chapter 12, p.15, Table 12.3. Coastal floodplain population in the 8th column is measured in km2. Check headers. (Gregory Insarov, Institute of Global Climate and Ecology)	Check
12-495	A	15	1			Table 12.3: Units are unclear in the table. (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	As 492
12-496	A	15	1			Table 12.3: Something went wrong with this Table: Column 8 starts repeating Column 2, but with different numbers! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	**As 492**
12-497	A	15	7			I think that 1-2 sentences about the peculiarities of mountain systems would be appropriate here - if desired, I could write a bit of text about this. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	
12-498	A	15	7			Along with the Mediterranean region, mountain regions are identified as the regions most vulnerable to global change in Europe by Schröter et al. 2005. This might be worth citing in opening this section. (Timothy Carter, Finnish Environment Institute)	
12-499	A	15	7	21	9	Sections 12.4.3 Mountains and sub arctic regions, 12.4.4 Forest, grasslands, and shrublands, 12.4.5. Wetlands and aquatic ecosystems, 12.4.6. Biodiversity can be supplemented by analysis of a number of publications on influence of climate change on phenology, floras and ecosystems in Eastern Europe and Russian Nature Reserves. See please the book Climate Change impact on Ecosystems. Nature Protected Areas in Russia: Analysis of long-term observations. Edited by A.Kokorin, A.Kozharinov, A.Minin. - Moscow., 2001, 184 pp. http://www.wwf.ru/resources/publ/book/eng/21 (Gregory Insarov, Institute of Global Climate and Ecology)	Not widely available publication; Furthermore, it would have been difficult to treat all the literature for specific areas in Europe; although this particular book seemed of potential interest, it could not be obtained through usual procedure by our librarian (not available)
12-500	A	15	10	15	10	Add a sentence after the four references, as follows: "Zierl & Bugmann (2005) found that under the regionalized IPCC SRES scenarios the elevation where snow cover is sufficient to allow for downhill skiing would rise by 300-400 m, which would adversely affect a large number of resorts in the European Alps. Perhaps this addition could also be placed under "tourism" (p. 24, section 12.4.9). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Mountain tourism is treated in the tourism part
12-501	A	15	10	15	11	The sentence "An upward shift … 60-70 to 140 m/oC" is deceptive because these numbers are not representative for the glaciers in Europe. Vincent's (2002) conclusion is based on results of four French glaciers, whereas Maisch's (his name is Maisch, NOT Maish) conclusion is valid for Swiss glaciers only. Therefore, please also mention values for glaciers in Scandinavia. For instance a mean of 118	Addressed. The reference on Scandinavian glacier will be added. The comment on length of glacier is rejected as it depends strongly on local orography

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						m/oC for three glaciers in Norway (Oerlemans, 2003: Climate sensitivity of glaciers in southern Norway: application of an energy-balance model to Nigardsbreen, Hellstugubreen an Alfotbreen. Journal of Glaciology 38(129), 223-232). More importantly, I doubt if the reader is familiar with the term equilibrium line. In my opinion, it is therfore more illustrative to mention the glacier length sensitivity to temperature here. A characteristic value of the change in length for a temperature change is -4 km/oC. This number is based on results of several European glacier studies (Oerlemans, 2001: Glaciers and climate change. Rotterdam, A.A. Balkema Publishers: 148 pp.). (Lisette (E.J.) Klok, Royal Netherlands Meteorological Institute)	configuration.
12-502	A	15	10	15	10	The references Hantel et al. (2000) and Martin et al. (2004) are not listed in the References. (Lisette (E.J.) Klok, Royal Netherlands Meteorological Institute)	Addressed
12-503	A	15	11			Maisch, not Maish (Rolf Buerki, PHS - College of Secondary Education of St. Gallen)	corrected
12-504	A	15	11	15	13	The word "alpine" in this sentence ("Most alpine glaciers … the end of the century") implies all alpine glaciers in Europe whereas the cited research only refers to glaciers in the Alps. Therefore write: "Most glaciers in the Alps are likely…". Note that this research is based on a rough extrapolation of the present glacier area decline! The physical processes involved in the response of glaciers to climate change in not taken into account and this rather firm conclusion is therefore very doubtful. Therefore, you better omit this sentence or moderate this conclusion by referring to Schneeberger et al. (2003), already mentioned in the references, who estimated the future change in glacier volume taking into account some of the physics. They estimated an average volume loss of 60% until 2050 for northern hemispheric glaciers and give numbers of volume losses of four European glaciers. In that case, omit the the example of Storglaciären (Schneeberger et al., 2001) in the text as it is superfluous. (Lisette (E.J.) Klok, Royal Netherlands Meteorological Institute)	Sugggestion accepted, text changed
12-505	A	15	11	15	12	I don't understand what this means! A non-linear effect? -- Explain! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Text reworded
12-506	A	15	12	15	13	The combination that nearly all Alpine glaciers are vanished by the end of the century is nearly the same info as that area lower than 2500m is ice free (Kwadijk Jaap, WL Delfthydraulics)	Text reworded
12-507	A	15	14	15	14	The name of this glacier is: Storglaciären (Lisette (E.J.) Klok, Royal Netherlands Meteorological Institute)	Text suppressed
12-508	A	15	14			Stoglaciaren sounds strange.	Text suppressed

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						(Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	
12-509	A	15	18	15	18	Change "lower limit of permafrost" to "lower altitude of permafrost" or something of that sort. (Lars Bärring, Lund University)	Addressed, text changed
12-510	A	15	18	15	19	Additional references to add here, in relation to climate warming and the disappearance of palsa mires in Lapland (Luoto, M., Heikkinen, R.K. and Carter, T.R. 2004. Loss of palsa mires in Europe and biological consequences. Environmental Conservation, 31: 30-37; Fronzek, S., Luoto, M. and Carter, T.R. 2005. Potential impact of climate change on the distribution of palsa mires in subarctic Fennoscandia, Climate Research, submitted). (Timothy Carter, Finnish Environment Institute)	addressed, but in table of section12.2.1; only the published paper was cited; papers "submitted" cannot be included
12-511	A	15	18	15	18	What is meant by lower limits of permafrost? Boundaries of mountain permafrost? Please clarify and give a reference (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	Addressed (see comment 12-509)
12-512	A	15	19			Is it possible to give an estimate of when permafrost will 'eventually' disappear. (Clare Goodess, University of East Anglia)	no references found at this stage.
12-513	A	15	21	15	25	It is strange to mention a risk of ice fall (although locally true), as risk related to climate change as the former paragraph mentions the complete dissapearance of glaciers. I suppose the risk of an increase of land slides/ debris flows due to the decrease of permafrost in the moraine deposits is more important (see also the case study) (Kwadijk Jaap, WL Delfthydraulics)	The risk of Ice fall is temporary, of course. It exist when the glacier disappears, but is still present.
12-514	A	15	27	15	27	replace "in Europe" by "in the mountains of Europe". (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	addressed
12-515	A	15	27	16	6	It is worth saying that most of these changes are the result of changed outcomes of competition rather than inability of mountain plants to survive at higher temperatures. There is therefore potential in some cases for management responses. It is also worth noting that many alpine communities change only very slowly, so vegetation response may lag climate change substantially. (Michael Morecroft, Centre for Ecology & Hydrology)	Addressed in section 12.5.3
12-516	A	15	30	15	30	Documented changes in high mountain vegetation also for the Apennines are reported (Petriccione B., 2003: Short-term changes in key plant communities of Central Apennines (Italy). Acta Botanica Gallica, 150). (Bruno Petriccione, National Forest Service)	addressed, but in table of section12.2.1
12-517	A	15	36	15	36	The reference to Niklaus & Körner (2004) appears to be out of place here - this was not a treeline study, but one on calcareous grasslands. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Addressed; reference deleted

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12-518	A	15	38	16	1	This sentence needs some rephrasing. It implies that upward tree line shift is caused by land-use changes - is this the intention? What kind of land use changes? (Clare Goodess, University of East Anglia)	Addressed; sentence modified
12-519	A	16	2	16	4	This could be expanded as lots of studies show that this is one of the most threatened habitats in terms of species loss. Impacts due to agriculture, tourism and recreation, coupled with climate change and atmospheric pollution may impair montane diversity and ecosystem services in the future, particularly as many habitats and species are seriously endangered - 99 habitats, 97 animal species and 63 plant species of the montane region are listed in the EU habitat directive. (Paula Harrison, University of Oxford)	Addressed; text expanded and link to EU directive added
12-520	A	16	3	16	3	Are these necessarily "extreme" scenarios, or rather are they the maximum losses estimated based on the SRES-range of climate projections adopted in the ATEAM project? To put these changes into perspective, perhaps the losses under the scenario giving the smallest changes should also be described here. (Timothy Carter, Finnish Environment Institute)	Addressed; text expanded and made clearer
12-521	A	16	3			By extreme scenarios, do you mean extreme emissions, climate or impacts scenarios? (Clare Goodess, University of East Anglia)	Addressed (see 12-520)
12-522	A	16	4	16	6	Is this a speculation of what MIGHT happen, or is there really evidence in this direction? Please clarify. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Addressed (see 12-520)
12-523	A	16	4			Why would "Many plant species with deeper roots be replaced by shallow-root species"? (Raija Laiho, University of Helsinki)	Addressed; Sentence removed
12-524	A	16	4	16	6	I am not convinced about this as a generalisation. Will depend on soil conditions and greater soil build up is likely at high altitudes as vegetation cover expands. Increasing drought would tend to favour deep rooting species. (Michael Morecroft, Centre for Ecology & Hydrology)	Same as 12-523
12-525	A	16	5			Why might deep root species be replaced by shallow-root species? (Clare Goodess, University of East Anglia)	Same as 12-523
12-526	A	16	7			I would suggest to add 2-3 sentences on a recent study that looked at the future of wildfires in the European Alps, and found that the wildfire regime is likely to change drastically (towards higher fire frequencies). Suggestion for text: "The wildfire regime is likely to change strongly in the European Alps under anthropogenic climatic change. Schumacher (2004) focused on the interactions between climatic change, management practices and the development of the wildfire regime in selected landscapes of the European Alps. She found that	Addressed

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						wildfires are likely to become an important driver of ecosystem change in these systems, largely driven by the climate, with little variation depending on the management practice (cf. also Schumacher et al. 2004, 2005)." -- References: Schumacher, S., 2004, The role of large-scale disturbances and climate for the dynamics of forested landscapes in the European Alps. Ph.D. Thesis ETH No. 15573, Swiss Federal Institute of Technology Zürich, 141 pp.; Schumacher, S. et al. (2004), Ecol. Modelling 180: 175-194; Schumacher, S. et al. (2005), Modeling the impact of climate and vegetation on fire regimes in mountain landscapes. Lands. Ecol., in press. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	
12-527	A	16	9	19	16	This section is more balanced with other impact sections in terms of length than in the ZOD, though is still rather on the long side The forestry section, in particular, is still rather 'dense' and jumps around rather a lot. So it's rather hard to get a clear message of the key issues. Is it possible to include reference to some of the MICE work on forestry impacts? (Clare Goodess, University of East Anglia)	Will be harmonized References to MICI will be discussed
12-528	A	16	9			Maybe 'Forests' instead of 'Forest'? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK
12-529	A	16	11			Does this section include the results of the FP5 SILVISTRAT project on forests (Kellomäki et al., 2005) and the ATEAM project on forest productivity and forest fire (Schröter et al., 2005)? The FINADAPT project will also include a report on forests, forestry and forest ecosystems (to be released in December 2005). (Timothy Carter, Finnish Environment Institute)	FP 5 SILIVISTAR and ATEAM have not been used and will be examined. Materials from FINDAT are used, will be indicated more explicitely
12-530	A	16	11			location of Tab. 12.4 and mainly Fig. 12.6 should be close to the reference in this section, changing numbering of Figs. (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	OK
12-531	A	16	11	17		It seems that the effects on forests will be quite positive in large parts of Europe, also suggested by the table 12.4). Given the rather gloom and doom impact projections (also in other some other sections) , this might be mentioned more clearly. Generally in my view the negative effects are given more attention than the positive. I would appreciate a somewhat more balanced text (Kwadijk Jaap, WL Delfthydraulics)	OK, the comment is reasonable
12-532	A	16	13	18	25	It is important here to make a distinction between natural forests and managed forests. Almost all boreal forests are managed production forests. (Lars Bärring, Lund University)	OK; generally the second statement is true only for boreal zone in Western Europe. In European Russia, only 70% of *all* forests are managed forests (however it depends upon the definition)

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12-533	A	16	13	16	14	As almost all boreal forests are managed production forests, this sentence is strange. What is more important is to note that forest management practices can offset the climate change impact. How this may be carried out, means, measures, techniques, environmental impact and research needs is major issue in Swedish forestry at this time. (Lars Bärring, Lund University)	See the response above. However, the sentence will discussed in Merida
12-534	A	16	13			12.4.4.1 Forests: some of the elements here are not particularly well written: (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	The comment is too common
12-535	A	16	13			Section 12.4.4.1: In this section shifts of treelines and tree species are discussed based on some market results. How relevant are these models? Do they really take all factors into account that influence the shifts of tree species? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	"Market" is probably a misprint. The models mentioned are as all models of such a type
12-536	A	16	14	16	15	The line can be eliminated and table 12.4 (p.18) also (see next comments) (Michele Colacino, ISAC-CNR)	Table 12.4 is useful as a concentrated expression of existing estimates; we will consider how it could be improved
12-537	A	16	15	16	15	Table 12.4 appears only 2 pages further down. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK
12-538	A	16	16		17	If possible, specify which scenarios from the A1, A2, B1, and B2 family where used in these predictions (Andrei Kirilenko, Purdue University)	Indicated
12-539	A	16	16	16	16	Figure 12.6 refers to the boreal bioclimatic zone and not forests in particular. Either change the classifications in Fig 12.6 or make a new figure for forestry. (John R Porter, KVL)	Will be clarified
12-540	A	16	17		18	Please stress that the model used by Metzger et al. for forecasting future forest area takes into consideration only the change in demand for forestry production and a set of allocation rules and as so no T/P/CO2 changes are taken into consideration. Climate change is considered later, when forest produciton is predicted. (Andrei Kirilenko, Purdue University)	Will be clarified
12-541	A	16	18			Figure 12.6 is missing! (Paula Harrison, University of Oxford)	See 12-539
12-542	A	16	18	17	29	12.4.4.1 Forests, continued: li 18-29 present impacts relating to fire. It is surprising here that effects of fire on carbon fluxes are not presented here. They should. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	OK, will be done
12-543	A	16	18	16	18	Although "a redistribution of tree species may be expected, with most native tree species shifting northwards, (…)" it is not clear if a rapid rate of climate change will bring about some extinction of species. (Filipe Santos, University of Lisbon)	Probably we do not have any space for such fine clarifications

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12-544	A	16	19	16	20	I think this is too simplistic a statement. The interactions with other drivers of change as well as competition effects are neglected in this view, and therefore I suggest to omit this sentence. Note that in the following sentence, the first author is cited with wrong initials in the list of references – R.H.W. Bradshaw is correct. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	The sentence will be clarified, but it is important to indicate species' shift
12-545	A	16	19			Shifts of tree species are norteastwards as much as they are northwards (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	OK
12-546	A	16	19	16	25	the section on treeline shifts is weaker than the equivalent sections for mountains (12.4.3), whose model should be followed to improve this one. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	OK
12-547	A	16	20			Shifts inland… unclear sentence (Raisa Mäkipää, Finnish Forest Research Institute)	Is it really unclear?
12-548	A	16	20	16	21	Figure 12.6 appears only 11 pages later (in a different section)! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK
12-549	A	16	20	16	20	"Tree vulnerability until they adapt to new climate (Redfern and Hendry, 2002)." - there is something missing in this sentence. (Filipe Santos, University of Lisbon)	OK, will be corrected
12-550	A	16	21	16	25	The information is already in § 12.4.3 (Michele Colacino, ISAC-CNR)	Will be harmonized
12-551	A	16	21			Sentence doesn't make sense (Paula Harrison, University of Oxford)	OK, see 12-549
12-552	A	16	21			Sentence incomplete "Tree vulnerability… (Jo Hossell, ADAS)	OK, see 12-549
12-553	A	16	21	16	25	Repeat of p15 ln 38 (Jo Hossell, ADAS)	OK, see 12-550
12-554	A	16	21		21	Seems incomplete (Andrei Kirilenko, Purdue University)	OK, see 12-549
12-555	A	16	21			Something is missing in this fragment: "Tree vulnerability until they adapt...". (Raija Laiho, University of Helsinki)	OK, see 12-549
12-556	A	16	21		21	sentence unclear (tree vulnerability...) (Marcus Lindner, European Forest Institute)	OK, see 12-549
12-557	A	16	21	16	21	Sentence beginning 'tree vulnerability…' does not make sense. (Michael Morecroft, Centre for Ecology & Hydrology)	OK, see 12-549
12-558	A	16	21	16	21	Sentence starting 'Tree vulnerability..' is meaningless. (John R Porter, KVL)	OK, see 12-549
12-559	A	16	21	16	25	Does the tree line only move North or does it also extend to higher altitudes? Ie what is meant by tree line??	Will be clarified, see 12-550

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						(John R Porter, KVL)	
12-560	A	16	21	16	21	"Tree vulnerability …" is not a sentence. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK, see 12-550
12-561	A	16	21	16	16	There is no verb in the phrase "Tree vulnerability until they…" (Filipe Santos, University of Lisbon)	OK, see 12-550
12-562	A	16	22	16	23	It is not clear why the material in brackets is worth while to be mentioned specifically - just omit? Why is this "particular"? (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Simply, for these territories are available publications. Will be discussed with the writing team
12-563	A	16	25			Based on the several model approaches the potential occurrence and its possible changes due to climate change forcing has been analyzed according to the main altitudinal zones in West Carpathians. Published in: Mindas, J., Skvarenina, J., Strelcova, K., Priwitzer, T., 2000: Influence of climatic changes on Norway spruce occurrence in the West Carpathians. Journal of Forest Science, 46, 2000 (6): 249-259. (Milan Lapin, Comenius University)	Will be added
12-564	A	16	26	16	26	I am missing references to the latest studies on shifts in species composition, species ranges and biomass that are based on forest gap models. There was a large model comparison exercise that also involved scenario runs under hypothetical future climates, giving rise to a Special Issue of the journal Climatic Change (Bugmann et al. 2001, Clim. Change 51: 249-557. Particularly the paper by Badeck et al. (2001), Clim. Change 51: 307-347 would be worth while mentioning here. Badeck et al. (2001) found that although the projections from the various models disagree in the details, they generally agree in the sense that large changes of species composition are to be anticipated under warming scenarios of 2-3 °C and precipitation changes within ±15%. -- Furthermore, I am missing a description of the recent work by M. Lexer (Vienna) on the impacts of climate change on forest dynamics: Lexer et al. (2002), For Ecol Manage 162(1): 53-72. Excerpt from the Abstract of that paper: "A major finding was that beyond a temperature increase of approximately +1 °C (no changes in precipitation) the proportion of inventory plots showing severe climate change impacts increased markedly. While at higher elevations under warmer climates the set of suitable tree species increased due to increased competitivity of broadleaved species, the study suggests that under the set of analysed climate change scenarios at low-elevation sites Picea abies would become unsuitable as a crop species." (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Will be included in the analysis
12-565	A	16	27	16	37	In addition, there is increased risk for extreme conditions as a result of increased temporal variation in the climatic conditions e.g. drought in 2003	Do we know a relevant reference?

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						(Raisa Mäkipää, Finnish Forest Research Institute)	
12-566	A	16	28			"... will lead to increased soil wetness, water logging, and floods". Do you mean during the winter? This reference is unfortunately not given in the list yet. (Raija Laiho, University of Helsinki)	Yes, it's indicated. The reference will be added
12-567	A	16	29	16	31	Add references for these statements (Paula Harrison, University of Oxford)	Will be added (they have been presented in ZOD)
12-568	A	16	30	16	31	reference needed (Raisa Mäkipää, Finnish Forest Research Institute)	OK, see 12-567
12-569	A	16	33	16	34	A paper on this topic that appeared just before the TAR was published might be worth reporting here: Linkosalo, T., Carter, T.R., Häkkinen, R. and Hari, P. 2000. Predicting spring phenology and frost damage risk of Betula spp. under climatic warming: a comparison of two models. Tree Physiology 20:1175–1182. (Timothy Carter, Finnish Environment Institute)	The reference will be examined
12-570	A	16	33		34	This sentence contradicts Table 12.4 (autumn frost damage). (Andrei Kirilenko, Purdue University)	Table 12.4 will be clarified
12-571	A	16	35	16	35	Change "in particular drought" to "in particular drought and too early dehardening" (Lars Bärring, Lund University)	Should be discussed by the writing team
12-572	A	16	36	16	37	Wouldn't it be good to also mention the impacts on productivity? It is not just a matter of forest and woodland area. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	We discuss the problem in details below (line 39-51 (p. 16) and lines 1-3 (p.17)
12-573	A	16	36	16	37	there is oinly one short statement for southern Europe, in contrast to northern Europe (lines above), whereas a lot more than this is known. This needs to be completed. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	Will be harmonized
12-574	A	16	39		40	could you give the direction instead of saying "change"? (Raija Laiho, University of Helsinki)	Yes, *Increasing* instead of *Changes in*
12-575	A	16	39		41	you may consider to include Badeck, F.-W., A. Bondeau, K. Bottcher, D. Doktor, W. Lucht, J. Schaber and S. Sitch 2004. Responses of spring phenology to climate change. New Phytol. 162:295-309. and/or Schaber, J. and F.-W. Badeck 2005. Plant phenology in Germany over the 20th century. Regional Environmental Change. 5:37. (Marcus Lindner, European Forest Institute)	OK, the publications will be examined
12-576	A	16	42	16	42	particularly in the north': delete 'particularly' - it is not clear for the central and southern areas because of drought (as is made clear on page 17, lines 1-3 (Michael Morecroft, Centre for Ecology & Hydrology)	OK, will be deleted (however, the question is too simple over entire Europe)
12-577	A	16	42	16	42	Explain NPP at first occurrence! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK, it should be done in the whole Chapter

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12-578	A	16	42	16	42	explain abreviation NPP, which is frequently used in the text (Jan Pretel, Czech Hydrometeorological Institute)	OK, see 12-577
12-579	A	16	43			higher CO2 levels also increase NPP - see chapter 5 Box 5.2 (Jo Hossell, ADAS)	This is mentioned in Lines 46-47 below, but we will compare it with Chapter 5
12-580	A	16	44			The temperature dependence of decomposition is essentially affected by moisture. If it's either too dry or too wet, elevated temperatures don't have much effect (or may have negative effect). Here is a good example of where some space may be saved by leaving out some references; it is enough to give 1-2 key references even though many more have been utilized (preferably one from south and one from north). This should be checked overall, and specifically all reference to papers in prep. or submitted should be removed (they are given in several places but not really needed as there are always published references mentioned as well). (Raija Laiho, University of Helsinki)	OK, a good recommendation
12-581	A	16	45	16	48	Are there any studies that demonstrate an increase of forest productivity as a result of CO2 concentration increase over the last several decades? (Alexander Golub, Environmental Defense)	There is a number of studies reporting modelling results and/or results of experimental manipulations. But: definitely, it is very difficult to separate one of several major drivers impacted the increase of productivity and to upscale this impact on large areas
12-582	A	16	46		47	include Körner et al. 2005: Carbon Flux and Growth in Mature Deciduous Forest Trees Exposed to Elevated CO2, Science 309, 1360-1362. (Marcus Lindner, European Forest Institute)	Will be examined taking in mind 12-580
12-583	A	16	49			In the south of where? (Jo Hossell, ADAS)	OK, will be clarified
12-584	A	16	49		50	Increased water use efficiency simulated by Magnani et al was an intrinsic model feature: their model was based on an assumption of maximization of water use efficiency, hence the result under water stress conditions was hard-coded. I suggest he following replacement: "Water stress can be partially compensated by increased water use efficiency due to biomass relocation to fine roots (Magnani et al., 2004)" Also you might find it useful to include here the data on increased water use efficiency under elevated CO2. (Andrei Kirilenko, Purdue University)	A possible version The simulations for conifer plantations in the south resulted in increased NPP due to partially compensated water stress by increased water use efficiency due to biomass relocation to fine roots (Ref)
12-585	A	16	50	16	51	The wording of this sentence is quite unfortunate and masks its meaning. Does this sentence add anything to common textbook knowledge (i.e., NPP varies with temperature, and at very high temperatures, it decreases)? If the sentence is to be retained (in improved form), it should be noted that the names of the authors of the	The text will be improved taking into account comments 12-586. The statement is not trivial (i.e., NPP may decrease under the expected increased

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						cited paper have a different spelling: Pretzsch and Dursky. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	temperature due to warming). OK, spelling will be corrected (it's correct in the reference list)
12-586	A	16	51		52	Lindner, et al. 2002. Integrating forest growth dynamics, forest economics and decision making to assess the sensitivity of the German forest sector to climate change. Forstwiss. Centralblatt. 121, Supplement 1:191-208. document that the assumptions in the Pretzsch and Dursky 2002 paper are somewhat questionable, because they use an empirical model linked with a parabolic temperature response function which is extending outside of the empirical data basis. cf. for example Loehle, C. 2000. Forest ecotone response to climate change: sensitivity to temperature response functional forms. Can. J. For. Res. 30:1632-1645. for a critical discussion of the parabolic temperature response function. (Marcus Lindner, European Forest Institute)	OK, see 12-585
12-587	A	17	1	17	3	As it stands now, this text is a clear contradiction to p. 16, lines 41-44). I would suggest to remove "particularly" from the material on p. 16, lines 41-44, so this would refer ONLY to northern forests, whereas the material on top of p. 17 would refer to central Europe and the Mediterranean. I think then all statements would be OK. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK (but we understand that this is a simplification)
12-588	A	17	1	17	1	coniferous and deciduous trees' … isn't that pretty much all trees? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Yes, but it seems important to stress that there are no differences between coniferous and deciduous forests
12-589	A	17	1	17	1	"Reduced water availability is likely to decrease the NPP and growth of coniferous and deciduous trees in Central Europe (Lasch et al., 2002" and southern Europe, increasing … (Filipe Santos, University of Lisbon)	Southern Europe should be added (Reference?) and the sentence will be replaced (in order to avoid *increasing…*)
12-590	A	17	5		16	This paragraph is a good candidate to be deleted if you have spece constraints as carbon sink is extensively covered by WG3 forestry section. (Andrei Kirilenko, Purdue University)	Will be harmonized with WG3 forestry section
12-591	A	17	5			Does Nabuurs et al. estimate include European Russia? I suppose not and in that case the text has to be changed. (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	OK, this publication does not cover European Russia
12-592	A	17	6	17	7	Comment: Units are given in PgC/a compare with p6, lines 46-48 (Tg CO2/yr). (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Will be changed in Tg C/yr. Note: p6, lines 46-48 - data in Tg C-CO2, not CO2
12-593	A	17	7	17	7	"… to be a sink …" should be changed into "… to have been a sink …" (it's a past event!) (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK

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12-594	A	17	8	17	16	This paragraph should consider the recent contribution by Ciais et al. on a Europe-wide primary productivity decline in Nature Vol. 437. (Stephan Glatzel, Dept. Of Geography and Regional Research)	Will be examined
12-595	A	17	8			"While NPP…." does this contradict what is said at p17 ln and p16 ln 49? (Jo Hossell, ADAS)	No, because these forests are not *in major forest regions of Europe*
12-596	A	17	8	17	12	What is balance between enhanced NPP and increased CO2 flux from the soil (Raisa Mäkipää, Finnish Forest Research Institute)	There is not any simple answer. Do we have a room for an explanation in 3-5 lines?
12-597	A	17	8	17	8	"While NPP is expected to increase in major forest regions of" Northern "Europe,..." (Filipe Santos, University of Lisbon)	OK, see 12-595
12-598	A	17	10	17	11	This comment can also be regarded as an illustration of the point made in comment 2. It is recommended that the authors increase the consistency of the content of this line (in paragraph 12.4.4) with paragraph 12.5.4. In this line also CO2 fluxes to the atmosphere are associated with the increase of forest areas. However, in 12.5.4 the focus of forest area increase is on carbon sequestration. The authors are encouraged to also review Heath et al. (Science vol. 309, 9 september 2005, 1711 - 1713) and Schulze&Freibauer (Nature vol. 437, 8 september 2005, pp. 205-206) and Bellamy et al. (ibid, 245-248) and other publications pointing to a controversy about whether biomass growth implies C-sequestration. (Jean-Paul Hettelingh, National Institute of Public Health and the Environment-MNP)	These new publications will be included
12-599	A	17	10	17	11	this experiment was in the boreal region, this may not hold for southern Europe because of reduced soil water content. Suggest that "in the boreal region" is included in the sentence. (Filipe Santos, University of Lisbon)	OK, see also 12-598
12-600	A	17	12			"Green parts" - does the author mean foliage? (Matthew Livermore, University of East Anglia)	Magnani – foliage, Lapenis et al. – all green parts. Probably we could change to *foliage*
12-601	A	17	13		16	You have pretty much said this on page 16, lines 44, (Raija Laiho, University of Helsinki)	Will be harmonized
12-602	A	17	15	17	16	Please be more specific - how increased nutrient availability stimulate carbon losses? (Raisa Mäkipää, Finnish Forest Research Institute)	The very interesting publication by Mack et al. does not deal with Europe – but probably this is a unique experiment.
12-603	A	17	18	17	18	replace "may" by "is likely"; this is not just a possibility. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK: A suggestion: *a very likely*
12-604	A	17	18	17	22	Very questionable statement concerning Nothern Scandinavia and Russia.Temperature in the North will increase significantly higher than that in the South. Then forest fires should increase too.	It is expected increasing temperature and precipitation in Northern Scandinavia and European Russian North (like during the

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						(Alexander Golub, Environmental Defense)	previous 30 years), thus increasing fire danger is not evident. Anyway, it should be clarified – this statement is true only for the northern part of Russia
12-605	A	17	19	17	19	In the Iberian Peninsula the fire season expands under a wide range of climate scenarios (Moreno, 2005) (Pereira et al. 2002) Pereira, J.S., A.V. Correia, A.P. Correia, M. Branco, M. Bugalho, M.C. Caldeira, C. Souto-Cruz, H. Freitas, A.C. Oliveira, J.M.C. Pereira, R.M. Reis and M.J. Vasconcelos 2002. Forests and Biodiversity. In Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures Eds. F.D. Santos, K. Forbes and R. Moita. Gradiva, Lisboa. Portugal, pp. 363-414. (Filipe Santos, University of Lisbon)	OK, will be added
12-606	A	17	20	17	21	Risk of forest fire is less in Northern Scandinavia and Russia - why? (Matthew Livermore, University of East Anglia)	See 12-604, but the topic should be discussed
12-607	A	17	20	17	27	Sentence "Fire danger may also increase in Central Europe, but the risk may be lower in Northern Scandinavia and Russia" is in contradition with the following "An increased frequency of vegetation fires is also expected in the forest and steppe zones of Russia" (Jan Pretel, Czech Hydrometeorological Institute)	See 12-604, will be edited
12-608	A	17	21	17	26	The statement on Russia in line 21 is a direct contradiction to the material on line 26. Please clarify. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	See 12-604, will be edited
12-609	A	17	21		21	Suggest to change "Russia" to "European Russia" (Andrei Kirilenko, Purdue University)	See 12-604, will be edited
12-610	A	17	21	17	21	Comment: Why is it so that the fire risk may be lower in northern Europe. Is it the increased precipitation? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	See 12-604, will be edited
12-611	A	17	27	17	29	Move final sentence to p16 ln 37? (Jo Hossell, ADAS)	It's reasonable, we will consider harmonizing of the entire text
12-612	A	17	28	17	29	Without additional explanation, it is not clear why forests adapted to permafrost should be threatened by its melting - they may just as well profit from an increased rooting space?! (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Mostly due to (1) physical destruction of sites (landslides, thermokarst), and (2) water table decline. Could be explained, but do we have any space?
12-613	A	17	31	17	38	Very repetitive - could remove the first sentence and start with the last sentence of the paragraph. (Matthew Livermore, University of East Anglia)	Will be edited
12-614	A	17	31	17	38	in addition to pests you could consider patogenic fungi	OK, although we have to find relevant

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						(Raisa Mäkipää, Finnish Forest Research Institute)	references
12-615	A	17	36	17	37	" however climate change …." essentially repeating what is said earlier in same para. (Jo Hossell, ADAS)	OK, see 12-613
12-616	A	17	39			I think a discussion of the effects of climate variability vs. the effects of changes in mean climatic parameters is lacking in this section. For example, Bugmann & Pfister (2000, Reg Env Change 1:112-125) systematically evaluated changes in these variables for a number of sites in Europe, and found that in about 50% of the cases future climate variability is at least as important as the change in average conditions, i.e. impact assessments that assume no change in climate variability may be erroneous (although it is clearly quite difficult to say something about future climate variability!). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Yes, an important comment, will be clarified
12-617	A	17	39	17	39	a sentence should be added on soil biology/carbon/decomposition. It is mentioned lateron (page 18, line 32) (Helena Freitas, University of Coimbra)	OK
12-618	A	17	43			Table 12.4: Can the difference between 1, 2 or 3 symbols be explained/quantified? (Paula Harrison, University of Oxford)	OK, will be explained
12-619	A	18	0			Table 12.4. I do not understand '++then ---' for the Spanish wood production. (Sergio Alonso, Universitat de les Illes Balears (University of the Balearic Islands))	OK, will be clarified
12-620	A	18	1	18	4	Table 12.4. When completed, this will be a very useful table. (Timothy Carter, Finnish Environment Institute)	See comments 12-621
12-621	A	18	1	18	4	Table 12.4 can be eliminated because it gives only vague information for few countries and is not significant (Michele Colacino, ISAC-CNR)	See comments 12-620
12-622	A	18	1	18	4	Title should refer to climate CHANGE impacts. What scenarios were used to obtain this information. Increase/decrease in what? - growth, productivity, area. Footnote 2 for UK does not appear. How can the reader identify the Ukranian references? (Clare Goodess, University of East Anglia)	We suppose to keep the Table and take into account critical comments to this
12-623	A	18	1			Positive impacts for insect outbreaks implies greater certainty than is suggested in p17 ln 37-38 (Jo Hossell, ADAS)	P17, ln 37-38 and Table 12.4 will be harmonized
12-624	A	18	1			Table 12.4: The first column is labelled "Changes in" although it mostly deals with "Damage caused by" (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	The two first line do not indicate *Damage caused by*
12-625	A	18	5			Section 12.4.4.2: five refs are pre-1999, could be updated with more extensive and recent literature review	OK, will be improved

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						(Paula Harrison, University of Oxford)	
12-626	A	18	5			Section 12.4.4.2: This section discusses what may happen with grasslands and shrublands from a climate point of view. Why aren't croplands discussed? On page 31, line 1 there is suddenly a mentioned of abandoned agriculture land. To my knowledge the impact of non-climate and climate factors will be as nearly as big for croplands as for grasslands and has much more drastic economic impacts than grasslands. Thus, why isn't croplands discussed in section 12.4.4? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	Ok, this element of global change seems relevant to ne mentioned
12-627	A	18	10	18	10	not sure what you mean: a 'mire' is not a grassland (Michael Morecroft, Centre for Ecology & Hydrology)	OK
12-628	A	18	11	18	13	These lines are rather vague. Also there is other literature - especially suggest you look at Grime et al (2000) Science 289, 762–765 and Morecroft et al Functional Ecology 2004, 18, 648–655) (Michael Morecroft, Centre for Ecology & Hydrology)	OK
12-629	A	18	16	18	22	The text can be eliminated (Michele Colacino, ISAC-CNR)	I'd suggest to keep this text but make it clearer and shorter
12-630	A	18	18	5		12.4.4.2. Grasslands: li. 20-22: more detail is needed on how and why nitrogen-poor, species rich grasslands differ in their response to climate and increased CO2. It is not like there is a lack of data on this in the literature. There is virtually no information on impacts on grassland biodiversity. Aspects relating to nitrogen-based emissions are also omitted. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	OK
12-631	A	18	20	18	22	These two sentences do not say much more than that everything may be place-dependent – if this is all that can be said, then the material should probably be omitted?! Note also that the spelling of the Cannell & Thornley reference should be corrected. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK, see also12-631
12-632	A	18	20	18	21	Again you mention difference - but how different? (John R Porter, KVL)	OK, see also12-631
12-633	A	18	21	18	22	Give an example of how/why short/long-term losses could be completely different. (Clare Goodess, University of East Anglia)	OK, see also12-631
12-634	A	18	21	18	22	Difference in short- and long-term responses could be expanded. (Matthew Livermore, University of East Anglia)	OK, see also12-631
12-635	A	18	22	18	22	Cannnel to Cannel (Filipe Santos, University of Lisbon)	OK, see also12-631
12-636	A	18	24	19	2	Impacts of climate change on heathlands and their soils are subject of a major study across Europe (VULCAN). Should be cited e.g. Emmett et al (2004) Ecosystems	OK

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						7: 625-637. (Michael Morecroft, Centre for Ecology & Hydrology)	
12-637	A	18	24	18	24	"European shrublands deliver a variety of goods and services, …": Which ones?? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Will be clarified
12-638	A	18				Table 1: Why were these 5 countries selected here? I think that this should be explained/substantiated in the main text. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	The comment probably means Table 12.4, see the previous Section
12-639	A	19	4	19	5	"Productive grasslands …": Isn't this ancient knowledge? Or has it really been only figured out in AD 2001 by Parsons et al.? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Will be clarified
12-640	A	19	6			The reference should be Holman, I.P., Nicholls, R.J., Berry, P.M., Harrison, P.A., Audsley, E., Shackley, S. and Rounsevell, M.D.A. (2005b). A regional, multi-sectoral and integrated assessment of the impacts of climate and socio-economic change in the UK: Part II Results. Climatic Change, 70, 43-73. Note that this is different to the reference listed in row 9. (Paula Harrison, University of Oxford)	OK
12-641	A	19	9	19	16	I think this material should be placed at the beginning of section 12.4.4.2, and the implications of these changes should be worked out a bit more in the text. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	The text will be harmonized
12-642	A	19	9	19	16	Rounsevell et al (2005a) use the A1FI scenario not the A1 (Paula Harrison, University of Oxford)	OK
12-643	A	19	9	19	9	Comment: What is EU-15? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Does it require any explanation?t
12-644	A	19	9	19	16	Projections of grassland total area should be best moved to the beginning of the grasslands section. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	OK
12-645	A	19	10			Section 12.4.5: Could be expanded to include more on range of services provided by wetlands - water regulation and purification, plus carbon storage - sea MEA (2005). Also, could include something on the influence of land use change on wetlands, e.g. conversion of bogs into agricultural land, and influence of coastal inundation due to flooding/SLR on fens? (Paula Harrison, University of Oxford)	OK
12-646	A	19	11			Figure 12.6 doesn't appear (Clare Goodess, University of East Anglia)	OK
12-647	A	19	13			What is 'surplus land'? (Clare Goodess, University of East Anglia)	Will be edited
12-648	A	19	15	19	16	This final setnence is far too vague.	Will be edited

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						(Clare Goodess, University of East Anglia)	
12-649	A	19	19			Section 12.4.5: Is this a section where the tundra effects could be included? Or is it necessary to make another section dealing with tundra - i prefer the latter as the tundra story is so important. I appreciate that the eastern limit of the study is the Ural mountains but there is a lot of tundra in the Finno-Scandic countries. (John R Porter, KVL)	Tundra mostly should be a part of 12.4.4.2 and some elements should be indicated in 12.4.5
12-650	A	19	21	19	21	Comment: Here it would be justified to say "will" instead of "may" (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	OK
12-651	A	19	21	20	7	I was disappointed that "peat" is only half-heartedly mentioned here once at line 25, with an inaccurate reference. Peat soils are found all over Europe, not only in pristine peatlands (mires) but also under croplands, grasslands and forests. These soils contain such a vast C pool that their future should be given some emphasis. There are results pointing to increased decomposition of peat under future climate (not Weltzin et al. 2003 that shows changes in plant populations only); however, there are also contrasting results and we still do not fully understand the responses of peat soils. Increased decomposition would result in increased CO2 emissions and DOC leaching to water courses. Many interesting articles have been published since 1999, e.g. Freeman et al. 2001: Nature 412 (23 AUG 2001), p. 785; Minkkinen et al. 2002: Global Change Biology 8, p.785-799; also there was an article in the September issue of Science this year pointing to an overall loss of C from soils in England and Wales. North European peat soils were identified as C hot spots by the European Commission when preparing a soils directive. (Raija Laiho, University of Helsinki)	An important comment; will be carefully elaborated
12-652	A	19	21	19	22	Why only in northern and southeastern Europe? Explain! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK, will be edited
12-653	A	19	22	19	22	A consequences to A consequence (Filipe Santos, University of Lisbon)	
12-654	A	19	28	19	29	Evans and Monteich,2001 is not quoted in the references (Michele Colacino, ISAC-CNR)	OK
12-655	A	19	28	19	29	I think the second author in "Evans and Monteich" is actually "Monteith", but I cannot check since the ref is missing in the References! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK
12-656	A	19	29	19	29	The reference "Arctic Council, 2004" should be "ACIA, 2004" (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	OK
12-657	A	19	31			Doesn't make sense - should "despite" read "in addition to"? (Paula Harrison, University of Oxford)	My impression that it should be *despite*
12-658	A	19	33	19	33	Does 'unstable' mean 'more variable'?	Ill be edited

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						(Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	
12-659	A	19	37	19	40	These two sentences appear somewhat contradictory. (Clare Goodess, University of East Anglia)	Will be edited
12-660	A	19	43			What is the hypolimnion temperature? (Clare Goodess, University of East Anglia)	The term will be changed
12-661	A	19	49	20	7	Biodiversity is specifically dealt with in the next section, so this might be moved there? (Raija Laiho, University of Helsinki)	Will be harmonized
12-662	A	20	1	20	4	Why might these changes, e.g., increased species richness in north, occur. i.e. what are the main climate drivers of these changes? (Clare Goodess, University of East Anglia)	It seems evident – should be discussed
12-663	A	20	1			Section 12.4.6: All these results are species-based. What does this mean for the main habitats of Europe, particularly those listed in the EU Habitats Directive? There is also nothing mentioned on the importance of land use change for biodiversity - del Barrio et al (attached) uses the land use change scenarios of Rounsevell et al (2005) as well as climate change scenarios to simulate impacts on species, whilst Berry et al. (attached) compares the vulnerability of biodiversity and agricultural land use - both papers are from the ACCELERATES project and are in press in Environmental Science and Policy. (Paula Harrison, University of Oxford)	
12-664	A	20	3	20	3	Invasive species may also increase in the south! Wetlands in southern europe are also at higk risk (e.g. Ramsar Convention reports) (Helena Freitas, University of Coimbra)	The criteria for selection of studies to be cited were: EU-wide studies of as many taxa as possible; published since the last IPCC assessment report. These criteria excluded a number of potentially interesting studies at small scales or dealing with limited number of species but given the limited space available we judged these criteria to be adequate.
12-665	A	20	10			section 12.4.6 - this is a very inadequate coverage of the topic. Europe has significant biodiversity capital that needs to be considered carefully in the context of climate change. Chapter 4 doesn't do this, as it is too global in nature. Huge amounts of money are sopent on nature conservation in Europe and the tourism value alone is huge. On purely economic grounds it deserves more detailed consideration than this. A review of imapcts on migraotry wildlife is in a major new report Robinson, R.A., Learmonth, J.A., Hutson, A.M., Macleod, C.D., Sparks, T.H., Leech, D.I., Pierce, G.J., Rehfisch, M.M. & Crick, H.Q.P. (2005) Climate Change and Migratory Species. BTO Research Report No. 414. Defra, London. (	A new reference was added that includes results for these groups.

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						available from http://www.defra.gov.uk/wildlife-countryside/resprog/findings/climatechange-migratory/index.htm) (Humphrey Crick, British Trust for Ornithology)	
12-666	A	20	10	21	9	This section only discusses plants, amphibia and reptiles. Can anything be said about birds, mammals, insects? (Clare Goodess, University of East Anglia)	Additional entries have been made. Yet, there is no room to cover everything
12-667	A	20	10	21	10	Section 12.4.6. I didn't feel this section particularly did justice to the complexity of the issue. More than half of it is taken up with describing in some detail a study on amphibians and reptiles this could be reduced to make room for other animal groups. All through the focus is on broadbrush studies using the climate envelope approach. This is to some extent inevitable, but there needs to be some recognition of the complexity of interactions, role of extreme events and uncertainty associated with the issue - present day climates provide an imperfect surrogate for future changes. There are a wide range of other issues that could have been included e.g. possibility of genetic adaptation of some populations with short generation times, impact on invasive species from outside Europe. (Michael Morecroft, Centre for Ecology & Hydrology)	OK. If available, will be looked up and, eventually, included.
12-668	A	20	12			The FINADAPT project will release a report on biodiversity and climate change in Finland in December 2005. (Timothy Carter, Finnish Environment Institute)	We have brought the main issues of biodiversity into this section, so it is appropriate to include it here
12-669	A	20	12	20	25	This part could be inserted in § 12.4.4 (Michele Colacino, ISAC-CNR)	Yes. Indeed I the word plants can be deleted because evidence is provided for other groups.
12-670	A	20	12			"European plant (and bird) species" (Jo Hossell, ADAS)	Agree. Ref inserted in lines 13-15 where we cite refs that provide evidence for changes.
12-671	A	20	12	20	25	Authors may want to review the paper C. M. van HERK, A. APTROOT and H. F. van DOBBEN. 2002. Long-term monitoring in the Netherlands suggests that lichens respond to global warming.Lichenologist 34(2): 141–154, and to add information on lichen flora change under climatic stress. (Gregory Insarov, Institute of Global Climate and Ecology)	The table has been eliminated in SOD. The text in this section is OK
12-672	A	20	12		25	The data on decreasing biodiversity seems to contradicting the table on page 18, here biodiversity increases except for Spain (Andrei Kirilenko, Purdue University)	We distinguish evidence from change from projections of future change. The first sentence summarises studies providing evidence for changes. The remainder summarises results of future projections
12-673	A	20	12		15	The first sentence can be left out. It is enough to describe the trends, like you do in the following. (Raija Laiho, University of Helsinki)	Include in brackets (A1FI)

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12-674	A	20	19			"most severe scenario" - which one A1FI, A2 - need to be specific. (Matthew Livermore, University of East Anglia)	Reworded
12-675	A	20	22	20	23	This is poorly worded as most modelling studies on species distributions have found a general south-west to north-east shift. Very broadly this means that the southern European species gain the most space, and the northern European ones lose the most, partly due to limited unoccupied space in the north. See Harrison et al. paper attached which is forthcoming in Environmental Science and Policy (due to be published Spring 2006). (Paula Harrison, University of Oxford)	The criteria used were: EU-wide studies of as many taxa as possible; published since the last IPCC assessment report. These criteria excluded a number of potentially interesting studies at small scales but given the limited space available we judged these criteria to be adequate. It should be noted that there are also very few studies modelling impacts of animal species in Europe and we think we covered them all. Concerning the use of bioclimatic envelope models, we endorse the criticism concerning uncertainties but are not aware of studies using process-based models to assess impacts of climate change scenarios on large numbers of animal species across Europe.
12-676	A	20	27	20	36	It is not clear whether this is one particular study, or a synthesis assessment. I have the feeling that this is based on the Araujo materials alone; this is just one out of about half a dozen groups doing research on species ranges in Europe at the moment, and there are strong controversies going on regarding how this should be done, and what can be said about future range shifts. Therefore, I think extreme caution is required in this field, otherwise the IPCC will look as if it endorses one particular approach. A more balanced representation of the various approaches is required (but I cannot provide this myself, I am sorry), and this implies, among others, that the strong focus on the studies from the Araujo group should be decreased. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Agree. Done.
12-677	A	20	33	20	36	Comment: Switch order of last two sentences. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	The same as above. Agree.
12-678	A	20	34	20	36	This sentence should probably be moved in forint of the preceding sentence. (Timothy Carter, Finnish Environment Institute)	Agree. The last paragraph should be part of the legend. Corrected.
12-679	A	20	43			Fig. 12.3 - explanation of colours should appear in legend, not only in the text (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Agree. Although bringing the last paragraph into the legend might also help.
12-680	A	20	43			Figure 12.3 - needs a legend and indication of scenario next to each map. Caption needs to be expanded - take information from text. (Matthew Livermore, University of East Anglia)	Agree. 'Herptile' was changed to reptiles and amphibians throughout. The key is the last paragraph that should move into becoming the

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							legend.
12-681	A	20	43			Figures: Sources for all figures should be cited. Fig 12.3: without a key it's hard to know what this figure is saying. Herptile needs explaining for your non-specialist audience. Why are there four different maps for each date? (Jean Palutikof, Hadley Centre)	Agree.
12-682	A	20	51	20	51	The figure caption speaks of herptile species, whereas the text above talks about reptiles and amphibians! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Crops are not dealt with in this sub-section
12-683	A	21	0			Climate change has an impact on food production, which makes is very important to develop and adapt crops that are optimal to the changing climate. One loss associated with the climate change (and new crops) is a cultural impact. Centuries old heritage for example in wine making could be lost. (Pasi Kuoppamäki, Sampo plc)	Agree. Done.
12-684	A	21	1	21	9	I think this material belongs into the caption of Fig. 12.3, not in the main text. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Changes in the legend were done do to help interpretation of the figure.
12-685	A	21	1	21	9	Even with this explanation, Figure 12.3 is hard to interpret. (Clare Goodess, University of East Anglia)	Agree. Corrected.
12-686	A	21	1	21	9	This should be the figure caption not in the main text? (Jo Hossell, ADAS)	Agree. Corrected.
12-687	A	21	1	21	9	This is the (missing) caption to Figure 12.3, if I am not completly mistaken. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Agree. Corrected.
12-688	A	21	1	21	9	reduced text move into Figure 12.3 as an explanation (Jan Pretel, Czech Hydrometeorological Institute)	Good point. Corrected.
12-689	A	21	3	21	3	HadCm3 should read HadCM3 (Timothy Carter, Finnish Environment Institute)	Good point. Corrected.
12-690	A	21	4			The sentence "Colours show..." may be left out. The next sentences describe that. (Raija Laiho, University of Helsinki)	This point was reported in adaptation section 12.5.7
12-691	A	21	5			Section 12.4.7: could add something on irrigation requirements? (Paula Harrison, University of Oxford)	Comment on previous section
12-692	A	21	5	21	5	It must read "DEcreasing species richness"! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	I can check these papers, however I guess that an really active person collecting literature published in Eastern European countries/journal is fundamental. I suggest for this purpose Dr. Zbigniew W Kundzewicz. He is the CLA of Chapter V on Hydrology of FAR, he was involved in the TAR and I worked with him in two Eu projects.

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12-693	A	21	7	22		Chapter 12, Section 12.4.7.1 Crops. In spite of the fact that there is a number of publications about impats of projected climate change on crops in European part of Russia, this huge territory is not covered in the Section 12.4.7.1 Authors may want to include results from papers: (1) Sirotenko, O.D., and Pavlova, V.N. 2003. Assessment of Climate Change Impact on Agriculture by Spatio-temporal Analogues Method. Meteorologiya i Gidrologiya, 2003, No 8,pp 89-99 (in Russian; this journal is translated into English by AlK18lerton Press, Inc., the English name of the Journal is Russian Meteorology and Hydrology) (2) Sirotenko, O.D., Abashina, E.V. and Romanenkov, V.A. 2005. Modelling of Climate Change Impact on dynamic of organic carbon in arable lands, CO2 emission and ecosystem productivity. Meteorologiya i Gidrologiya, 2005, No 8,pp 83-95 (in Russian; this journal is translated into English by Allerton Press, Inc., the English name of the Journal is Russian Meteorology and Hydrology) (3) Alcamo, J., Dronin, N., Endejan, M., Golubev, G. and Kirilenko, A. 2003. Will climate change affect food and water security in Russia? : Summary Report of the International Project on Global Environmental Change and its Threat to Food and Water Security in Russia. Center for Environmental Systems Research (CESR), University of Kassel, Germany, Kassel, 20 pp. - http://www.usf.uni-kassel.de/usf/archiv/dokumente/projekte/rglass.draft_2003-02-13.pdf (4) Kirilenko A., Alcamo, J., Golubev, G., Endejan, M., Dronin N. (2003). Climate change and its impact on agricultural production in regions of Russia. . Proceedings of the Workshop in Global and Regional Land Use/Cover Changes. International Geographic Union. Moscow, July 17-20, 2003. (5) Will Climate Change Affect Food and Water Security in Russia? Summary Report of the International Project on Global Environmental Change and its Threat to Food and Water Security in Russia March 2003. Joseph Alcamo, Nikolai Dronin , Marcel Endejan, Genady Golubev, Andrei Kirilenko http://web.ics.purdue.edu/~akirilen/manuscripts/manuscripts.html . Proceedings of the Workshop in Global and Regional Land Use/Cover Changes. International Geographic Union. Moscow, July 17-20, 2003.). (Gregory Insarov, Institute of Global Climate and Ecology)	The comments is not comprehensible
12-694	A	21	10	21	10	This section is very poor. Other recent references should be included (e.g. Grime) (Helena Freitas, University of Coimbra)	This is not true, we mentioned positive effect on higher elevations and latitudes (see the table summurising impacts in different areas

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							for several ecosystems, e.g. agricultural, grassland, forest. etc.)
12-695	A	21	12			I noted that the entire section 12.4.7 is focusing mostly on negative impacts of climate change - are there no positive impacts in Europe, such as better growing conditions at higher elevations or at higher latitudes?! (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Thanks
12-696	A	21	14			This material is generally very good, I think. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK, I will consider its results
12-697	A	21	16			The FINADAPT project will release a report on agriculture and climate change in Finland in December 2005. (Timothy Carter, Finnish Environment Institute)	Link with section 12.3
12-698	A	21	16	21	24	What are the main climate drivers (ie. Scenario changes) causing these changes? (Clare Goodess, University of East Anglia)	Maybe. Will be considered
12-699	A	21	16			The first sentence may again be loft out. (Raija Laiho, University of Helsinki)	I included only post TAR results. Moreover, N and C losses other GHG balances maybe included, but this section is dealing with impact and these tasks are more related to mitigation issues, WG II. Finally, the space available for agric. and fisheries sectors is not enough to consider all the different aspects (we have to discuss for more space for section 12.4.7 and 12.5.7. About this aspect I included one paragraph.
12-700	A	21	16	21	32	A lot of this stuff on crops is old and has been known since the early 1990s. It may have been revisited recently under a new EU project but the conclusions are basically the same as those from earlier such studies. I suggest that these results are presented very briefly. What is new since the TAR is the effects of climate change on N losses, C losses, other GHG balances and effects on product quality - both food for humans and fodder. I suggest that the agriculture section is rewritten to include the 'post-TAR' developments rather than re-presenting old stuff. (John R Porter, KVL)	A table summarizing the results will be included, including not only North and South but Central Europe
12-701	A	21	17	21	17	Can it really be true that climate change will lead to decreases in crop yields in central Europe? Even for the next few decades? Yields are increasing in most parts of Europe due to technological and management changes, so how would we detect a negative effect of climate change on yield in any case? Moreover, farmers are bound to adapt the crops they cultivate to a changing climate. So perhaps it is important to state the assumptions underlying such a statement - presumably	OK

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						unchanged crop varieties, and no positive effects of CO2 (dumb farmer hypothesis). (Timothy Carter, Finnish Environment Institute)	
12-702	A	21	18		18	… and in the South of European Russia (Alcamo et al., 2004) (Andrei Kirilenko, Purdue University)	We can say that these changes in suitable cultivation areas are potential (i.e. based on temperature requirements only)
12-703	A	21	18	21	32	Decreases in spring-sown crops such as maize are reported but the area suitable for maize does not decrease according to the following text and Figure 12.4. Authors need to check the definitions of suitability used in the two main studies cited in this section. Normally large decreases in yield would be linked to a loss of economic viability which would result in a change of farming enterprise. (Matthew Livermore, University of East Anglia)	OK, references will be updated
12-704	A	21	20			Results from the ACCELERATES project are due to be published in Spring 2006 in a special issue of the journal Environmental Science and Policy. All papers have been reviewed and accepted for publication and are in press - so it would be better to cite the Audsley et al paper attached rather than the project final report. The Berry et al paper mentioned on row 26 might also provide some useful findings for this section. (Paula Harrison, University of Oxford)	Why ? In southern Europe we sow both winter and spring wheat in autumn
12-705	A	21	21		21	Should the spring wheat be excluded? (Andrei Kirilenko, Purdue University)	This has been addressed and are consistent across different models..
12-706	A	21	24			Do results vary between impacts models or has this not been assessed? (Clare Goodess, University of East Anglia)	No, however we cross check other sections of the chapter or other chapter to confirm this. (see impact of extreme events)
12-707	A	21	26	21	32	Droughts and floodings may offset a positive effect in the North. (Alexander Golub, Environmental Defense)	OK
12-708	A	21	26	21	26	grown to grow (Filipe Santos, University of Lisbon)	OK, grain maize (add in the possible table)
12-709	A	21	27			Need to distinguish between grain and silage maize - the latter is already growing at northern latitudes (Jo Hossell, ADAS)	OK
12-710	A	21	31			Give examples of energy crops (Clare Goodess, University of East Anglia)	See above
12-711	A	21	31			Need to specify which energy crops are being discussed. (Jo Hossell, ADAS)	OK, I'll check
12-712	A	21	32			Global warming will cause a prolongation of vegetative period of grapevine variety ´Welsch Riesling´ in horizon of year 2075 by about 18 - 25 % (in average 33 days) what allow to growth this variety in higher altitude of Slovakia. Published in:	OK, the figure will be removed

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						SPANIK, F., HRONSKY, Š., SISKA, B., GALIK, M., 2004: Global warming as a basis for a new agroclimatic regionalisation of vine in Slovakia. In: Acta Agrophfysica Lublin, 2004, 3, s. 179 - 188. (Milan Lapin, Comenius University)	
12-713	A	21	33	21	51	This map shows suitability for maize cultivation based on temperature alone, with no consideration of moisture constraints (too little or too much) or of soils and other factors. I wonder if it is advisable to show such a map in this chapter, as more sophisticated models have been applied for this crop in the past (pre-TAR). These maps were really constructed for methodological reasons, to illustrate the uncertainty range in estimated northward shifts of suitability based on RCM and GCM projections. An alternative idea would be to show the range of shifts using the scatter charts that were presented in the same paper by Olesen et al. 2005 (Figure 5) or to show and equivalent map for soya bean (Fronzek, S. and Carter, T.R. 2005. Assessing uncertainties in climate change impacts on resource potential for Europe based on projections from RCMs and GCMs. Climatic Change, submitted. (Timothy Carter, Finnish Environment Institute)	Right but we remove the figure
12-714	A	21	50			Is 'uncertainty range of the respective scenario group' the right phrase? Isn't it the maximum range out of the 7/24 scenarios? (Clare Goodess, University of East Anglia)	Reasonable
12-715	A	22	2	22	8	This part should be inserted at the beginning of § 12.4.7.1 in p.21 (Michele Colacino, ISAC-CNR)	Link with 12.3.2
12-716	A	22	5	22	6	It might be useful to explain what is assumed about future technology to arrive at these values. The highest estimates merely assume an extrapolation of recent trends in crop yields, with some flattening off, so might be regarded by some as conservative. (Timothy Carter, Finnish Environment Institute)	OK
12-717	A	22	8		8	Add the effects of climate change on agriculture in Eastern Europe - e.g., Alcamo et al., 2004; Maracchi et al., 2005. (Andrei Kirilenko, Purdue University)	Yes, mainly
12-718	A	22	10	22	18	This paragraph refers to impacts of extreme events. So were the previous results based on changes in mean climate only? (Clare Goodess, University of East Anglia)	I'll rewrite the sentence to consider the comment (remove, thus and change significant in negative)
12-719	A	22	11		14	The sentence (12-14) "Thus,…" can not be obviously deduced from the previous one. Also, I think that the sentence on "_projected_ increase in temperature variability … in Central Europe" feels a bit too deterministic. (Andrei Kirilenko, Purdue University)	OK

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12-720	A	22	12	22	14	The two references in this sentence should be placed right after "temperature variability", as they do not refer to ag production, but to climate itself. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK
12-721	A	22	13			Holden and Breton,2003 → is not quoted in the references (Michele Colacino, ISAC-CNR)	OK, is likely to ….
12-722	A	22	16	22	17	First, again I would suggest to replace "may" by something more specific ("is likely to", or even "will" if we are very certain). More importantly, I do not follow the logic here: why should rain during the sowing (not during emergence, or seedling establishment!) period have a strong effect on yield? This needs to be explained , or the sentence needs to be re-written to become more meaningful. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK, however, up to know I was not able to find newer citations. We can remove the paragraph .
12-723	A	22	20	22	25	This paragraph opens with a rather sweeping statement and an old reference. The newest reference is 2000. Isn't there some more recent work that can be referred to? (Clare Goodess, University of East Anglia)	OK
12-724	A	22	21	22	21	"to over" to"to and over" (Filipe Santos, University of Lisbon)	OK
12-725	A	22	24			Chakraborty,2000 → Chakraborty et al., 2000 (Michele Colacino, ISAC-CNR)	OK, but I can not include the impact of single years
12-726	A	22	25			There were some decreases in pest and diseases as a result of the hot summer of 1995 in the UK (see ADAS (1999). The review of the direct effects of the dry and hot summer of 1995 on decision making of the individual farmer. ADAS, Cambridge.) (Jo Hossell, ADAS)	OK
12-727	A	22	25	22	25	delete "in particular in Northern Europe" or mention also Central Europe; increased problems with pests and diseases are observed also in middle latitudes (Jan Pretel, Czech Hydrometeorological Institute)	We have a paragraph on impacts of extreme events
12-728	A	22	27	22	34	There should be some discussion on a combined effect of all climate events, especially extreme weather events that are well presented in the Fourth Assessment Report (Alexander Golub, Environmental Defense)	OK
12-729	A	22	30	22	31	Climate change, could also lead … > without comma (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	OK, link with chapter 4 or 5 on food ….
12-730	A	22	31			Why might climate change lead to increases in gg emissions from agriculture? (Clare Goodess, University of East Anglia)	I'll check and add the reference after temperature word. (the phase was removed)
12-731	A	22	32	22	33	How does this statement square with the observations of Bellamy, P.H., Loveland, P.J., Bradley, R.I., Lark R.M. and Kirk, G.J.D. 2005. Carbon losses from all soils across England and Wales 1978–2003. Nature, 437, 245-248?	No given the limited space this topic was not included. We refer to chapter 4

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						(Timothy Carter, Finnish Environment Institute)	
12-732	A	22	32	22	32	The capacity of agricultural soils to store C. Again soils. Should this topic deserve a section? (Helena Freitas, University of Coimbra)	OK, we remove the figure
12-733	A	22	35	22	51	Figure 12.5. This figure is somewhat speculative, and has yet to be properly evaluated in the peer-reviewed literature. I suggest reporting the results, but perhaps not showing the figure. (Timothy Carter, Finnish Environment Institute)	OK, we remove the figure
12-734	A	22				The time slice to which Fig. 12.5 is referring should be mentioned. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	See section on energy
12-735	A	23	0			The geographic distribution of energy demand and supply could be interesting to present. Also the implications on energy flows could provide insight for policymakers planning adaptation. (Pasi Kuoppamäki, Sampo plc)	The revision concerns the materials available. Large progress has been made for EU countries. Unfortunately, this is not the same in all countries. We will try to incorporate of them as much as possible
12-736	A	23	1	23	19	This section is very poor, mainly considering the relevant impacts in terms of EU economy and nature conservation (Helena Freitas, University of Coimbra)	The message seems rather clear in the text . We will try to find a CA to help in this section
12-737	A	23	2	23	18	There is a tendency for some sections to appear rather too much as a list of papers, with not enough added synthesis value. This is particularly evident in this section. (Clare Goodess, University of East Anglia)	See section 12.4.4.2
12-738	A	23	2			Livestock: are more model results available in relation to grassland productivity? (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	OK
12-739	A	23	4	23	9	Why will impacts on these different systems be different? The last sentence deals with adaptation. (Clare Goodess, University of East Anglia)	OK
12-740	A	23	11	23	14	Discussion on fodder crops could be linked with section 12.4.4.2. Insert paragraph break before going on to discuss diseases. (Clare Goodess, University of East Anglia)	Due to lack of space, this graph could not be added.
12-741	A	23	25			Section 12.4.8: It is good to see a section on energy as this is a core issue. I suggest that a graph showing changes in European energy production and use since 1990 would be a useful addittion. (John R Porter, KVL)	Sentences removed
12-742	A	23	29	23	31	The first two sentences of the paragraph should rather appear in Sec. 12.2.2 or 12.3.2 (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	These references have now been included and discussion is not exclusively referring to electricity demand.
12-743	A	23	29	23	42	The literature review for energy demand is only refering to electricity demand. No	Some information for heating and cooling

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						information is provided for fuels consumption related to energy consumption in buildings mainly for space heating (e.g. (a) Th. Frank, Climate change impacts on building heating and cooling energy demand in Switzerland, Energy and Buildings, Volume 37, Issue 11, November 2005, Pages 1175-1185. (b) M.R. Gaterell and M.E. McEvoy, The impact of climate change uncertainties on the performance of energy efficiency measures applied to dwellings, Energy and Buildings, Volume 37, Issue 9, September 2005, Pages 982-995. (c) M. Christenson, H. Manz and D. Gyalistras, Climate warming impact on degree-days and building energy demand in Switzerland, Energy Conversion and Management, In Press, Corrected Proof, Available online 15 August 2005). (Yannis Sarafidis, National Observatory of Athens)	requirements for the Mediterranean has been added
12-744	A	23	29	23	42	It would be helpful if you indicate results such as (a) change of electricity demand for a change of mean temperature (e.g. for 1 oC); (b) increase of summer electricity demand and decrease of winter electricity demand. (Yannis Sarafidis, National Observatory of Athens)	Too detailed to be incorporated in document
12-745	A	23	30			Section 12.4.8.1 makes no mention of the effect of changing energy-use efficiency of future estimates of impacts or the regional variations in impacts due to differing level of air conditioning saturation. (Matthew Livermore, University of East Anglia)	Sentence removed.
12-746	A	23	30			Energy consumption was rising steadily long before the mid-1990s. (Matthew Livermore, University of East Anglia)	Text made clearer
12-747	A	23	33			Will these minimum demand temperatures change as people adapt to climate change? (Clare Goodess, University of East Anglia)	Distinction made clear
12-748	A	23	34	23	36	It is not clear what is meant by "seasonal cycle in energy demand" as it could be either total demand or electricity demand. If it is electricity demand then it needs to be mentioned that this trend is already occuring in southern European countries (e.g. Greece) although it is mainly attributed to improved living standards. (Yannis Sarafidis, National Observatory of Athens)	corrected
12-749	A	23	40	23	40	It may be more appropriate to use "summer" instead of "heat waves" given that in the next line winter demand is mentioned. Moreover, this issue is already happenning in some countries particularly in the Mediterranean region (e.g. Greece) (Yannis Sarafidis, National Observatory of Athens)	Text altered
12-750	A	23	41	23	42	Only necessary without adaptation. And not desireable from the mitigation perspective. (Clare Goodess, University of East Anglia)	Text rephrased

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12-751	A	23	41	23	42	Is this sentence from the point of view of previous one really valid? Annual energy demand should be roughly equal, therefore there are no technical needs to install additional generation capacities to cover some transient energy demand imbalance (Jan Pretel, Czech Hydrometeorological Institute)	Transport section has been added
12-752	A	23	43			There is no specific section on transportation - although there is one under "Adaptation" later! -, but anyway, as far as energy demand in a general sense is concerned, enhanced air conditioning demand should be a matter for vehicles too, not just buildings. Project SIAM 2nd phase has made some calculations pointing to about 7% more transportation fuel consumption at southern Europe, but the document is still on press and in Portuguese only. The reference should be (Santos et al., 2005) "Alterações Climáticas em portugal. Cenários, Impactes e Medidas de Adaptação - Projecto SIAM, F.D.Santos e P.Miranda (editores), Gradiva, Lisboa, 2005 (in press) (Filipe Santos, University of Lisbon)	Little connection with climate change
12-753	A	23	44			Section 12.4.8.2: Does nuclear power need to be mentioned in this section as this may come to play a larger role in European energy supply in the future. (John R Porter, KVL)	References added
12-754	A	23	46	24	10	There is a lot of ongoing work on climate and energy in the Nordic countries. These relates to production of renewable electricity, mostly hydropower, and safety aspects. A comprehensive, but maybe not so recent report is the following : Saelthun, N.R., Aittoniemi, P., Bergström, S., Einarsson, K., Jóhannesson, T., Lindström, G., Ohlsson, P-E. Thomsen, T., Vehviläinen, B. and Aamodt, K. O. (1998) Climate change impacts on runoff and hydropower in the Nordic countries. Final report from the project ”Climate Change and Energy Production” Report TemaNord 1998:552, Oslo. More recent is: Andréasson, J., Bergström, S., Carlsson, B., Graham, L.P. and Lindström, G. (2004). Hydrological Change - Climate Change Impact Simulations for Sweden, Ambio Vol. 33, No. 4 - 5. 228-234. It is important to note that hydropower is a dominant source of electricity in the Nordic area including Iceland. It covers almost 100% of the demand for electricity in Norway and some 50% in Sweden.Climate change seems to have a potential to lead to higher production but also to a more intriguing change in extremes. The latter may have safety consequences. (Sten Bergström, Swedish Meteorological and Hydrological Institute)	Sentence removed
12-755	A	23	46	23	47	The first sentence of the paragraph should rather appear in Sec. 12.2.2 (there maybe more characteristics about different sources of energy and relation to GHG production	Reference added

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						(Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	
12-756	A	23	47	23	48	Comment: Graham, (Ambio 33(4-5), 2004) discuss impacts on hydropower production in norhtern Europe. In particular, he refers to a shift in the seasonal cycle with an earlier onset of the spring flood. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Text rephrased
12-757	A	23	48	23	50	Since turbine use is limited by both low and high wind speeds use of mean wind speed as an indicator of impacts may be of limited value (Jo Hossell, ADAS)	Reference added
12-758	A	23	48	23	49	Comment: This is not in correspondance with what is said in section 12.3.1.1 that only cites studies based on ECHAM simulations with a relatively large increase in wind speed. The following reference discuss the wind energy in a changing climate (Pryor, S.P., Barthelmie, R.J. & Kjellström, E. 2005. Analyses of the potential climate change impact on wind energy resources in northern Europe using output from a Regional Climate Model. Climate Dynamics, published online, DOI 10.1007/s00382-005-0072-x) (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Reference taken into account and text made clearer
12-759	A	23	48	23	50	It would be helpful if you could be more specific in this issue (wind energy is a key renewable energy source for Europe) given the information mentioned in Section 12.3.1.1, as wind energy density is related to the cubic power of wind speed. Following Pryor et al., the wording used implies that no moving between different classes (below 3 m/s; 3 - 10.5 m/s; 10.5 - 19 m/s; Above 19 m/s) wind speeds would occur and especially from class 2 to class 3 and vise versa. If this is the case then this should be stated more specifically. (Yannis Sarafidis, National Observatory of Athens)	Precipitation included in text
12-760	A	23	50	24	1	Biofuel production is also strongly dependent on adequate moisture supply, so precipitation should be mentioned in this sentence as well, I think! (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Solar mentioned now, too.
12-761	A	23	50			Only hydro, wind, and biomass is mentioned, however there are also solar and waves. Although wave energy potential, like wind, may not change much for Europe as a whole, there seems to be more solar energy available in the southern region, especially during summer (see Santos et al., 2002). (Filipe Santos, University of Lisbon)	
12-762	A	24	0			Insurance industry could play a key role in limiting the impacts of extreme events. Insurance industry lives from risks, without risks it would not exist. The challenge to insurance industry comes from the distribution and frequency of minor and major climatic events and their impact on property. Correct pricing of risks could make climate change an opportunity for insurance industry. Some of the risks could	No appropriate references found. Can you indicate some?

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						be difficult to be priced by market mechanisms and large government supported insurance pools might be necessary. (Pasi Kuoppamäki, Sampo plc)	
12-763	A	24	1	24	10	What about affects of SLR on coastal power stations? (Jo Hossell, ADAS)	Paragraph rephrased
12-764	A	24	3	24	5	The content of the second sentence pf this paragraph should be more or less hypothetical. (Jan Pretel, Czech Hydrometeorological Institute)	Text altered to account for positive effects too.
12-765	A	24	7	24	10	Is it true that these effects are exclusively negative? (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Reference added
12-766	A	24	7	24	7	As a companion to the Arnell reference, add Zierl & Bugmann (2005) (full reference given in a previous comment). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Discussion added
12-767	A	24	8		10	I suggest more thorough discussion on possible impact of climate change on power distribution system, e.g. small increase in line resistance with increasing mean temperatures; negative effects of increasing maximum temperatures on line sag, positive effects of increasing windiness and higher minimum temperatures; increased peak electricity demands for cooling. All together adds to uncertainty in possible impact of climate change on power grids. (Andrei Kirilenko, Purdue University)	Paragraph changed
12-768	A	24	9	24	10	The content of last sentence should be more or less hypothetical. (Jan Pretel, Czech Hydrometeorological Institute)	References switch performed.
12-769	A	24	9	24	10	A switch of references should be performed, Santos et al. 2002 mentions enhanced resistivity, due to increased temperature (thus relevant for line 9) but not line sag which is mentioned in line 10 (Filipe Santos, University of Lisbon)	FINADAPT mentioned
12-770	A	24	13			A report on climate change impacts and adaptation in the tourism and recreation sector in Finland will be released in December 2005 (FINADAPT). (Timothy Carter, Finnish Environment Institute)	Text altered
12-771	A	24	13			Section 12.4.9 : the focus on water consumption seems excessive, owing to the relativey low consumption of this activity : hotels consume between less than 1% and 5,8% of the overall water demand in Mediterranean countries (Dubois, "Dossier sur le tourisme et le développement durable en Méditerranée", MAP technical reports n° 159, 2005) (Ghislain Dubois, Tourism Environment Consultants (TEC))	Now referred to in reference by Hanson et al.
12-772	A	24	13	24	43	IS it possible to refer to the MICE work on summer tourism? (Clare Goodess, University of East Anglia)	added

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12-773	A	24	13			12.4.9. Tourism and recreation: (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	More specific timing info has been included
12-774	A	24	13			Section 12.4.9 - little mention of the timing of impacts. Only the 2020s are mention explicitly; what happens by the 2080s? (Matthew Livermore, University of East Anglia)	Peer reviewed literature has been included and grey literature removed.
12-775	A	24	13	24	43	This section relies too much on grey literature. Due to the limited research currently available assessing climate change and tourism, this topic is a research gap – this needs to be indicated in the text. Distinction between impacts on tourism vs. impacts on recreation are not clear. (Filipe Santos, University of Lisbon)	Comments and references taken into account
12-776	A	24	13	24	43	Overall comments on these paragraphs. The emphasis should be on the reported points that with increasing temperatures the comfort of locations in the Mediterranean will decrease and that this may have a major impact upon the large flow of tourists from the source countries in Northern Europe to the destination countries in the south. By using the Tourism Comfort Index (Mieczkowski, Z. ,1985). Through the duration of the 21st Century it is likely that the current source countries (e.g., Germany, United Kingdom) will develop climates that are optimum for tourism. This has been reported in Amelung and Viner (2006) and Viner and Amelung (2003) Mieczkowski, Z. (1985) The Tourism Climatic Index: A Method of Evaluating World Cli-mates for Tourism. The Canadian Geographer 29(3), 220-233. Amelung B. and Viner D. 2006 The sustainability of tourism in the Mediterranean: Explor-ing the future with the Tourism Comfort Index Journal of Sustainable Tourism, Accepted Viner D. and Amelung B. 2003 Climate change, the Environment and Tourism: The Inter-actions. Proceedings of the ESF-LESC Workshop, Milan 4-6th June Publ. eCLAT, Climatic Research Unit, Norwich, UK 2003. 63pp (David Viner, University of East Anglia)	Reference removed.
12-777	A	24	15	24	18	The reference to Lise and Tol shoudl be deleted. This reference is based on a quick statistical analysis, crossing by countries annual tourism flows and annual average temperature. The scale is too large, some tourism is not climate related (urban tourism), some look for cold temperature (winter sports), while some look for warmer ones (coastal tourism). The average of 21°C means simply nothing. (Ghislain Dubois, Tourism Environment Consultants (TEC))	Sentence removed
12-778	A	24	16			Is this 21C prefered temperature only valid for Europe?	Text altered

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						(Clare Goodess, University of East Anglia)	
12-779	A	24	16	24	18	Tourists prefer comfortable to slightly warm thermal conditions. Complete heat budget must be considered. Given temperture values are useless. See comment No 3. (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	Text made more clear
12-780	A	24	16	24	17	"Tourists prefer a mean …..", need to identify which "tourists". (i.e. what countries they are from & what is their contribution to overall tourism flows in Europe) (Filipe Santos, University of Lisbon)	Peer reviewed literature has now been used
12-781	A	24	16			Matzarakis (2001) in no way examines tourist preferences with regard to climate as this study (an abstract is cited for the conference poster) did not communicate with tourists is any way (I.e., through a survey) nor use tourism data (visitor flows, etc) to derive climatic preferences. This analysis is a speculative 'expert-based' climate analysis of climate that tourists might prefer. Palutikof and Agnew (2001) is also an extended abstract with not enough detail to assess its contribution to this point. There are better (peer reviewed) citation possible (see work by Maddison for a European example). (Daniel Scott, University of Waterloo)	Sentence removed.
12-782	A	24	16			21 degrees' ...This is a very generalized statement based on a limited study of some Europeans (and importantly not a cross-cultural … do tourists from Italy, Spain and Greece desire the same temperatures as Germans, Bits and Scandiavians?) and needs to be qualified. (Daniel Scott, University of Waterloo)	Text made clearer
12-783	A	24	18	24	19	This statement is true only for the low elevations. Summer tourism in the mountains could profit strongly from higher temperatures if lowland dwellers want to escape the heat of the plains. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Sentence removed
12-784	A	24	18			"around 30.7oC" - very specific figure to associate with the term 'around'! (Paula Harrison, University of Oxford)	Comment taken into account
12-785	A	24	18	24	19	It should encourage toursim in currently cooler areas though (Jo Hossell, ADAS)	Comment taken into account
12-786	A	24	18	24	19	", increasing temperatures have the potential to discourage tourism." Or to encourage it! This depends on whether the place is already hot or not!! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Sentence removed
12-787	A	24	18	24	18	"around 30.7oC" - replace by "around 30 oC" or "around 31 oC" (Jan Pretel, Czech Hydrometeorological Institute)	Peer reviewed literature has now been used and text altered
12-788	A	24	18	24	19	That rising temperatures could 'discourage tourism', in Europe or anywhere, is a grand statement and the work cited (an extended abstract from a study that did not	ok

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						assess this question) in no way supports such a statement. It should be removed or supported with a far stronger body of evidence. (Daniel Scott, University of Waterloo)	
12-789	A	24	19	24	21	The text can be eliminated (Michele Colacino, ISAC-CNR)	Sentence removed
12-790	A	24	19	24	20	50% of energy consumption is due to air conditionning : quick statement : in which case ? Which location ? Excessive generalization of a case studies. (Ghislain Dubois, Tourism Environment Consultants (TEC))	Sentence removed
12-791	A	24	19	24	20	"50% of energy consumption in hotels due to air conditioning". This is highly relevant considering climate change and should also be included in the previous section on energy demand. (Helena Freitas, University of Coimbra)	Sentence removed
12-792	A	24	19	24	20	For which countries/regions does this 50% AC figure relate? (Clare Goodess, University of East Anglia)	ok
12-793	A	24	19	24	19	… Bohdanowicz and Martinec (2001) …> in References … Martinac … (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Comments taken into account
12-794	A	24	20	24	21	Higher temperatures could indeed increase energy consumption in the summer for some hotel/resorts, but if winter temperatures are also warmer, there could be net savings (particularly in temperate regions of Europe). Furthermore, if energy prices do increase, the cost will likely be passed on to tourists and not affect the profitability of hotel/resorts (very simple adaptation). If warmer temperatures bring more tourists to temperate regions (as the next sentence suggests), then even if air conditioning costs increase, with more people, resort/hotels could be more profitable. (Daniel Scott, University of Waterloo)	Refs added
12-795	A	24	21	24	24	Further references to support these statements include: Mather S. and Viner D. 2005 Climate and Policy Changes: Their Implications for International Tourism Flows. In: Tourism, Recreation and Climate Change, Eds Hall M. and Higham J. Publ. Channel View Publications 309pp. Amelung B. and Viner D. 2005 The Vulnerability to climate change of the Mediterranean as a tourist destination Exploring the future with the Tourism Comfort Index. In Climate Change and Tourism eds. Amelung B. and Viner D. Proceedings of NATO AWS. Publ. Kluwer. (David Viner, University of East Anglia)	Ref. added
12-796	A	24	23			The citation for Parry (2000) could not be found and could not be assessed for the evidence it provides to support this statement. Viner and Agnew (1999) speculate	added

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						on this impact, but provide no empirical evidence to support this statement (I.e., tourism flows during analogue years/seasons, modelling, tourist interviews). Recent modelling by Hamilton et al (Climate Research 2005) may support this statement however. (Daniel Scott, University of Waterloo)	
12-797	A	24	23	24	24	This final sentence should conclude with "...,however, seasonal shifts in tourism flows are likely to be constrained by the timing of school holidays in the major source countries." (David Viner, University of East Anglia)	Ref. taken into account
12-798	A	24	25			Two reports on climate change and energy in Finland have been prepared since the TAR. The first was published in 2002: Tammelin, B., Forsius, J., Jylhä, K., Järvinen, P., Koskela, J., Tuomenvirta, H., Turunen, M.A., Vehviläinen, B., Venäläinen, A. 2002. The Impact of Climate Change on Energy Management. Finnish Meteorogical Institute, Helsinki, 121 pp. A new report will be released in December 2005, ahead of the SOD, covering impacts of climate change on the energy sector and adaptation of the electricity network business in Finland (FINADAPT project). (Timothy Carter, Finnish Environment Institute)	ok
12-799	A	24	26			RE WORD "year-round but part time" (Allen Perry, University of Wales Swansea)	clarified
12-800	A	24	26	12	27	What is this sentence implying? Needs clarification. (Daniel Scott, University of Waterloo)	ok
12-801	A	24	27	24	28	Chapter 12.4.9 Mountainous parts of these regions and destinations in the Alps and in northern Europe, e.g Scandinavia, could become more popular ... (Hans Elsasser , University of Zurich)	Ok
12-802	A	24	28			Ceron and Dubois,2004 → Ceron and Dubois, 2000 (Michele Colacino, ISAC-CNR)	Text changed
12-803	A	24	28	24	29	"Tourism on the European Atlantic coast could suffer because of increasing winter rainfall." – This statement is not correct. Spain and Portugal are on the European Atlantic coast, and increased winter rainfall in these two tourism popular destinations is not expected to increase significantly and to have an effect on tourism. (Filipe Santos, University of Lisbon)	Text changed
12-804	A	24	29			What evidence is there to support this statement? Is this just speculation or is there evidence that during wet years/season now, tourist numbers have declined? (Daniel Scott, University of Waterloo)	Sentence removed
12-805	A	24	30			Where specifically could water shortages disturb tourism? In areas with water	Text altered

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						supply problems now or new areas? How might it disturb tourism (less tourists or just additional costs to adapt through imported water or desalinization for example)? This again is a very generic statement that is unsupported with any details or literature. (Daniel Scott, University of Waterloo)	
12-806	A	24	30			Where specifically and to what extent? During the 2003 heatwave how were tourists affected, how many died/were hospitalized vs general population? What literatue support this statement (not just speculates about it)? (Daniel Scott, University of Waterloo)	Text changed
12-807	A	24	30	24	31	With regards the sentence starting "Water shortages..". the emphasis here is one the word "could". is there any evidence in the literature to suggest that this will happen or has happened for resorts/regions where there have been water shortages in the past (e.g. Sardinia 2003). (David Viner, University of East Anglia)	Ref. removed
12-808	A	24	31			Parry (2000) reference could not be obtained, so unable to assess this statement. (Daniel Scott, University of Waterloo)	Ok, removed
12-809	A	24	33	24	35	Getting into adaptation issues here. (Clare Goodess, University of East Anglia)	Ok, taken into account and text changed
12-810	A	24	34			Desalination is already economically viable for tourism in the Meditterean (see Tunisia and other locations), so this statement needs to be made specific to certain regions (Spain, Greece?). (Daniel Scott, University of Waterloo)	ok
12-811	A	24	36	24	36	Pressure from other touristic activities, e.g. golf courses (Helena Freitas, University of Coimbra)	Ecotourism added in adaptation section
12-812	A	24	37	24	43	relationships with water availability for snow making need to be mentioned here this section surprisingly omits ecotourism. This needs to be fixed. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	Ok
12-813	A	24	38			...at the beginning and the end of the ski season and in general for ski resorts at lower altitudes. (Rolf Buerki, PHS - College of Secondary Education of St. Gallen)	Text rephrased
12-814	A	24	39			Availability of snow during peak holiday seasons is important for all winter tourism operators, not just in some cases, as that is when the majority of revenues occur. Is there evidence that this will change? If so, where, when and uto what extent? (Daniel Scott, University of Waterloo)	Ref. available and sent to IPCC
12-815	A	24	41			Unable to obtain Schwarb and Kundewicz (2004). Is ... '1oC rise in temperature, there will be about 14 fewer skiing days' applicable to all areas of the Alps (high and low elevation)? What is the potential for snowmaking as a climate chagne	Text altered

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						adaptation? Has this been explored? If the ski industry in the Alps is expected to suffer are there new opportunities in Scandinavia? (Daniel Scott, University of Waterloo)	
12-816	A	24	42	24	43	This sentence must be accompanied with a specification of the latitude and continentality; otherwise, the statement is likely to be wrong in many parts of Europe. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	ok
12-817	A	24	43			Due to the expectation of climate change and the need of the snow reability, artificial snow making is increasing, but getting more expensive in a warmer climate (see Scott, Daniel et al.). Probably you will say this at page 31, line 43. (Rolf Buerki, PHS - College of Secondary Education of St. Gallen)	No refs found
12-818	A	24	44			In general, I miss the increase in air traffic due to shifts in tourism destination choice. (Rolf Buerki, PHS - College of Secondary Education of St. Gallen)	Ok, pls suggest some reference to support this.
12-819	A	24	44	24	44	The higher risk of fire may also inhibit tourism in the south during summer (Helena Freitas, University of Coimbra)	Cultural heritage now added
12-820	A	24	45			Insert some statements about Climatic impact on Cultural Heritage: “Cultural heritage is an important economic source for Europe, due to the cultural tourism. As matter of fact Europe is the greatest pool of monuments, artefacts, ancient buildings in the world and it is well known that meteorological events such as heat waves, intense rainfall, floods, thunderstorms cause strong damages to historical built environment. (Camuffo, 1998; Colacino ed., 2003). Variation of groundwater level increases the subsidence, heat waves cause the facades deterioration due to the thermal stress, flooding and intense rainfall modify the moisture content of building fabric, intense wind, thunderstorm and hailstorm injure the ancient monuments, in particular stained glass windows impinging on them. Many countries have developed research programs on this subject and also the EU promoted projects related to this issue (Projects VIDRIO, Friendly-Heating, NOAH’S ARK). The climatic variation and the increase of extreme events can impact in a relevant way on cultural landscape all over, but particularly in Southern Europe where extreme events are foreseen to occur more frequently and more intense”. (Michele Colacino, ISAC-CNR)	Agreed
12-821	A	24	46			Heading should probably be 'Property insurance' as other aspects are not considered. (Clare Goodess, University of East Anglia)	Misplaced. This comment does not relate to this section.
12-822	A	24	46			Section 12.4.10: Suggestion: Mention that ecosystem responses to climate change that are characterized by nonlinearities or bistabilities (eg due to abrupt changes in	This comment relates better to section 12.4.1 I think.

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						the fire regime) lead to non-steady cost functions. Uncertainty in the magnitude and location of triggering thresholds translates to large uncertainty in the cost estimate close to the threshold. A better process understanding of nonlinear or bistable ecosystem responses (particularly in the Mediterranean aridification) would help to narrow down uncertainties but requires increased realism in impact models - they have to mechnistically include the relevant feedback loops. (Wolfgang Lucht, Potsdam Institute for Climate Impact Research)	
12-823	A	24	48			Reports on climate change impacts and adaptation on water resources (ncluding flooding), on the built environment, on transport and on urban planning will be released by the FINADAPT project in December 2005. In addition, a project entitled EXTREFLOOD is also being completed in Finland, which is mapping areas of potential flood risk under a changing climate. (Timothy Carter, Finnish Environment Institute)	Agreed. The damage relates to the area affected by the storm.
12-824	A	24	50	24	51	The specification of wind speed is not sufficient for this statement, the area affected by a windstorm must also be given, otherwise it is not clear to what the percentage numbers refer. Is this 0.2% of all property values in Austria? Or within the area affected by the storm??? (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Agreed. Insert the additional reference.
12-825	A	25	4			ABI,2000 → ABI,2004 (Michele Colacino, ISAC-CNR)	Agreed. Reference is (ABI,2004)
12-826	A	25	8	25	10	Give a reference for the statement in this sentence! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	It should read Table 12.5. Expand the text to explain that for the dmamge to rise from present-day levels to those of A1,A2, B1 would require an annual rate of increase of 2-4%.
12-827	A	25	9	25	9	There is no Tab. 12.4.10 in this chapter - should this be a reference to Tab. 12.5? If so, the text is confusing and everything but clear, because the link to the increase of insurance costs cannot be linked to the very few numbers that are given in Tab. 12.5. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Table 12.5
12-828	A	25	9			Where is Table 12.4.10 ? (Michele Colacino, ISAC-CNR)	Table 12.5
12-829	A	25	9			Can't see Table 12.4.10 (Clare Goodess, University of East Anglia)	Table 12.5
12-830	A	25	9	25	9	Table 12.4.10 does not exist! (a leftover?) (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	An important point. Flooding and subsidence do cause major damage, but in most European countries it is uninsured, the prime exceptions

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							being UK and France.
12-831	A	25	12	25	23	This paragraph assumes that wind storms are the major problem for property insurance (which I think is true). But this is not to say that flooding and subsidence aren't issues. Is it possible to comment on the latter? (Clare Goodess, University of East Anglia)	No difference. For consistency delete "climate".
12-832	A	25	16	25	18	Comment: Here it is said "extreme climate events", previously in the chapter "extreme events" have been used. Which is it that is refered to? And what is the difference? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Basis relates to the column headings "Present day, A1..etc)
12-833	A	25	26			Table 12.5: What does the entry "Basis" mean? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Addressed in the framework of available space. Russian references are used more widely.
12-834	A	25	30	26		Subchapter 12.4.11 should be extended. For example, concerning Russia some references from Chapter 10 could be used. (Alexander Golub, Environmental Defense)	Addressed indirectly through the impacts on air quality, heat islands and so on.
12-835	A	25	30			Section 12.4.11: impact on urban climate should be mentioned (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Not addressed because of absence of relevant literature. My query to M. Livermore on this question was not answered
12-836	A	25	30			Section 12.4.11 - fails to explicitly mention that potential changes in atmospheric circulation could affect air quality (e.g. particulates). Only ozone is mentioned in passing. There are many examples in the literature that could be drawn upon. (Matthew Livermore, University of East Anglia)	The list of examples is widened. The relevant examples from SIAM is included.
12-837	A	25	30	26	6	This section focuses on the heatwaves and vector borne disease in the UK, and uses the UK national health assessment study and subsequent information booklets as a principle source of information. It seems to me that it would be more logical to use examples of heatwaves and vectorborne diseases in regions that are more vulnerable to these impacts such as southern Europe. These health impacts were fully addressed in the Portuguese national health assessment (Casimiro & Calheiros, Human Health, in F.D. Santos, K. Forbes, R. Moita (editors) Climate Change in Portugal: Scenarios, Impacts and Adaptation Measures – SIAM Project, Gradiva Publishers, Lisbon, Portugal, 2002. available online at http://www.siam.fc.ul.pt/SIAM_Book/ (Filipe Santos, University of Lisbon)	Referred

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12-838	A	25	32			A report on climate change impacts and adaptation in relation to human health in Finland will be released in December 2005 (FINADAPT project) (Timothy Carter, Finnish Environment Institute)	Rephrased as: *The number of deaths due to heat is also expected to increase, depending on acclimatization, and adaptive measures*
12-839	A	25	34	25	35	This apprently contradictory sentence needs rephrasing. (Clare Goodess, University of East Anglia)	Projections of heat waves removed from the health section to the relevant place.
12-840	A	25	34			predictions for heat waves in the UK are proposed, but it is not said under which scenario (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	1. Where comments #2 and 7could be found? 2. *Keatingue et al*. are cited as one reference along with the other where the causal effects are mentioned (e.g. local and socio-economic)
12-841	A	25	36	25	39	See comments No 2 and 7 The Keatingue et al. result is based on formally considering just air temperature without the incomparable causal effects. (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	I
12-842	A	25	36		39	"It is likely that overall warming...": Not necessarily. It is usually the extreme cold events that cause mortality, and these may not change (in overall cold conditions people have to be prepared all the time anyway...). This could be left out. (Raija Laiho, University of Helsinki)	This phrase is deleted
12-843	A	25	37			On what kind of socio-economic variables does this depend? (Clare Goodess, University of East Anglia)	All available Russia's research, mainly based on the Proceeding of Moscow-2004 workshop and more recent publications, are included.
12-844	A	25	39	26	16	Assessment of climate change effects on human health in Russia is missed in the Section 12.4.11 Human health. Authors may want to cover this lack analysizing the publication: Revich, B., Platonov, A., Maleev, V., Baer, S. 2003. A new threat. WWF Russia Publisher, 20 pp. http://www.wwf.ru/resources/publ/book/eng/49 (Gregory Insarov, Institute of Global Climate and Ecology)	*Lyme Borreliosis* is included under an individual bullet
12-845	A	25	42	25	44	sentence on Lyme's disease does not make sense… (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	These words are excluded
12-846	A	25	43	25	43	What are 'average climate changes'? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	TBE -- *tick borne encephalitis.* ddressed.
12-847	A	25	44	25	44	The abbreviation "TBE" should be explained. I also found the previous sentence (lines 42-44) to make rough reading. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	See: 2-847
12-848	A	25	44	25	44	… TBE … > what is it? (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	This sentence is excluded
12-849	A	25	44	25	45	Dept Health 2002 actually says that the predictions of significant increases in tick bourne diseases are not well founded but they also say human contact with ticks may increases and the proportion of ticks infected with Lyme disease may increase or decrease - TBE = tick borne encephalitis	See: 2-847

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						(Jo Hossell, ADAS)	
12-850	A	25	44			TBE? Is this short for tuberculosis? (Matthew Livermore, University of East Anglia)	Will be adjusted according to the source.
12-851	A	26	1		2	Specify the scenarios (Andrei Kirilenko, Purdue University)	Where to found this comment?
12-852	A	26	8	26	12	See comment No 5 (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	Adressed
12-853	A	26	14	26	16	> more characteristics of climate change impacts on air quality and the effects on ozone precursors should be involved, interaction and impacts of biogenic emission in the processes mentioned (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Where to found this comment?
12-854	A	26	14	26	16	See comment No 4 (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	Applicable with availability of relevant estimations
12-855	A	26	14	26	15	Comment: Is there a chance of decreased air pollution during winter due to decreased demand for heating and therefor less burning of fuels? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	This section has been eliminated in SOD
12-856	A	26	19	27	40	This section is generaly rather odd/weak. The first couple of paragraphs seem to list some rather random changes. The third paragraph deals more with the issues I expected, but still rather more emphasis could be given to spatial variability in vulnerability. Generally its all a repeat of whats been said in earlier sections. Is there any 'new' material that could be included? Why will adaptive capacity be greater in the west than east? (Clare Goodess, University of East Anglia)	This section has been eliminated in SOD
12-857	A	26	19			Section 12.4.12 - This section seems a little thin as is stands - would it be better to tabultate changes in main sectors by geographic zones, since this would also highlight hotspots of impacts and indicate possible interacting effects? (Jo Hossell, ADAS)	This section has been eliminated in SOD
12-858	A	26	19	27		Add more information from this section (spatial variability) to the summary, very informative as an overview (Kwadijk Jaap, WL Delfthydraulics)	This section has been eliminated in SOD
12-859	A	26	19			Section 12.4.12. Comment: I think this section could be removed and the relevant parts of it that is not already in the preceeding sections could be incorporated into them. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	This section has been eliminated in SOD
12-860	A	26	19			12.4.12 Spatial variability: it was not clear to me at all what this section adds to the document… (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	This section has been eliminated in SOD

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12-861	A	26	19			Section 12.4.12 With the exception of the imformation on biodiversity and Figure 12.6 (move to section 12.4.6) all of the points made in this section can be found elsewhere in the chapter. It could, therefore, be removed in order to meet the page budget requirements. (Matthew Livermore, University of East Anglia)	This section has been eliminated in SOD
12-862	A	26	21	26	21	Rephrase to "European climate is marked by a gradient of decreasing temperature from south..." (the temperature is decreasing, not the gradient!). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	This section has been eliminated in SOD
12-863	A	26	21			Are there any economic assessments of the costs of climate change impacts and adaptation in Europe that can be cited here? Preliminary estimates for Finland will be released in December 2005 (FINADAPT). (Timothy Carter, Finnish Environment Institute)	This section has been eliminated in SOD
12-864	A	26	21	27	40	It seems that these three paragraphs mainly repeat the information from the previous subchapters. I suggest using a table to compare the change in different zones. Also, climate change impact on carbon stocks is discussed in WG3 volume and can be deleted to shorten the chapter. (Andrei Kirilenko, Purdue University)	This section has been eliminated in SOD
12-865	A	26	21	26	21	Comment: It is not the temperature gradient that is decreasing. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	This section has been eliminated in SOD
12-866	A	26	24		37	the Metzger et al. reference could now be replaced with the recent Science paper by Schröter et al. 2005: Ecosystem Service Supply and Vulnerability to Global Change in Europe (Science, 27 October 2005) (Marcus Lindner, European Forest Institute)	This section has been eliminated in SOD
12-867	A	26	36			This last sentence needs rewording. It is unlikely that habitats will shift en mass as most studies show that species respond to changes in climate individually - see papers by Harrison et al and del Barrio et al cited on rows 25 and 26. (Paula Harrison, University of Oxford)	This section has been eliminated in SOD
12-868	A	27	0	28		Is there any info on current incorporation of climate change in environmental management planning? If not, mention this. (Kwadijk Jaap, WL Delfthydraulics)	This section has been eliminated in SOD
12-869	A	27	2	27	23	Metzger also constructed vulnerability maps for Europe (Metzger, 2005, Ph.D. thesis, University of Wageningen. These maps are also found on the ATEAM CD-Rom referenced in the current draft. (Timothy Carter, Finnish Environment Institute)	This section has been eliminated in SOD
12-870	A	27	2	27	23	Figure 12.6: There are also maps of shifts in the Köppen zones for Europe constructed during the PRUDENCE project (see de Castro, M., Gallardo, C., Jylhä, K. and Tuomenvirta, H. 2005. The use of a climate-type classification for assessing	This section has been eliminated in SOD

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						climate change effects in Europe from an ensemble of nine regional climate models. Climatic Change, in press.) (Timothy Carter, Finnish Environment Institute)	
12-871	A	27	21			Fig. 12.6 as mentioned above, it should be closer the first reference, it should appear in bigger size for better readibility, e.g. with the legend on the right hand side (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	This section has been eliminated in SOD
12-872	A	27	21			The caption should probably read 'Shifts in potential biogeographic… (Paul J. Hanson, Oak Ridge National Laboratory)	This section has been eliminated in SOD
12-873	A	27	26	27	35	The text can be eliminated because is a repetition of what said in § 12.4.7 (Michele Colacino, ISAC-CNR)	This section has been eliminated in SOD
12-874	A	27	38	27	38	The definition of "adaptive capacity" should be given for readers who are not familiar with the ATEAM approach. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	This section has been eliminated in SOD
12-875	A	27	38	27	40	This sentence could go to 'Adaptation' (?) (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	The references will be considered in SOD
12-876	A	27	43			The sections on adaptation may be enhanced by including information from the Finnish National Strategy for Adaptation to Climate Change (Marttila et al., 2005), from FINADAPT reports to be released in December 2005: http://www.environment.fi/syke/finadapt, from publications of UKCIP, and from the ESPACE project on spatial planning in Europe: Nadarajah, C. and Rankin, J.D. 2005. European spatial planning: adapting to climate events. Weather, 60, 190-194. (Timothy Carter, Finnish Environment Institute)	OK
12-877	A	27	43	33	22	The text requires only an editing work for some minor errors (Michele Colacino, ISAC-CNR)	The reference will be considered in SOD
12-878	A	27	43			Section 12.5: see Holman et al. (2005), Climatic Change, 70, 43-73 as this discusses adaptation for water resources, coasts, biodiversity and agricultural land use. (Paula Harrison, University of Oxford)	To remove all adaptation measures from 12.4 to 12.5
12-879	A	27	43	32		I suggest moving all adaptation measures from 12.4 to 12.5; right now the subchapter on adaptation measures in many cases repeats the Impacts chapter. (Andrei Kirilenko, Purdue University)	OK
12-880	A	27	43			12.5 Adaptation / water resources: (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	The section 'adaptation' will be rewritten following TSU guidelines. Costs impacts, damages avoided by adaptation and damages avoided by mitigation will be considered if there are references available.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
12-881	A	27	43			Section 12.5: This section is called Adaptation but is, in reality, dealing more with the implications of climate change. Thus, the section has to be reorganized. The adaptation measures discussed are rather mild and weak. Why isn't the issue of moving out people and infrastructure from risk areas discussed an analyzed? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	OK
12-882	A	27	43			Headings: The Plenary-agreed headings have been broadly used. Section 12.5 is headed 'Adaptation' but should become 'Adaptation: practices, options and constraints'. (Jean Palutikof, Hadley Centre)	see 882 Cost analyses will be added, if there are references available
12-883	A	27	43	27	43	general comment to para 12.5 as a whole: underline the importance of cost analysis of adaptation measures! (Jan Pretel, Czech Hydrometeorological Institute)	Adaptive measures specific to Europe will be examined (examples)
12-884	A	27	45	28	25	As in most of the other adaptation sections the discussion tends to be rather general and not specific to Europe (other than mention of the EU FDW). (Clare Goodess, University of East Anglia)	OK
12-885	A	27	48	27	48	growing water demands Both …>missing dot (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	ATEAM project will be considered
12-886	A	27				It would perhaps be more interesting to show the results from a dynamic biogeography model (e.g., LPJ as applied in the context of the ATEAM project, see recent paper in Science by D. Schröter et al. (2005) - this was in Science Express on 27 October. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	This statement will be rewritten
12-887	A	28	1	28	2	I think it is unfair to say that legal and environmental requirements are the sole hindering factor for the construction of additional dams. It is also very costly and uncertain, because you'd have to plan for changes that may not actually happen, so the return on investment is everything but certain. At least this is what the "water stakeholders" in the ATEAM project said – they would not be willing to take the financial risk of building new dams as long as they are not really sure they will be really necessary (i.e., profitable). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Will be added examples of current adaptive measures
12-888	A	28	7	28	14	This paragraph does include some general proposals for adaptation options. Are any of these being used anywhere in Europe. Here, and in other sections, it would be good to give examples of current adaptive behaviour. (Clare Goodess, University of East Anglia)	Will be added examples of current restricting/limiting adaptation

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
12-889	A	28	7			It's said some strategies are more feasible than others. So it would be helpful to give some examples of what's currently restrciting/limiting adaptation. (Clare Goodess, University of East Anglia)	The irrigation need is discussed in Chapter
12-890	A	28	7	28	14	due to higher frequency of extreme weather events (longer dry spells), also the needs for extent number of irrigation techniques shall increase (in particulat in Southern and Central Europe) - increasing water demand fro irrigation (Jan Pretel, Czech Hydrometeorological Institute)	OK
12-891	A	28	12	28	12	Price policies for controlling and differentiate demand are included in the water framework directive (Helena Freitas, University of Coimbra)	Will be mentioned in paragraph on domestic and industry water
12-892	A	28	12	28	14	Encouragement of cooler season toursim can also reduce demande (as mentioned on p24 ln 33) (Jo Hossell, ADAS)	Too specific question. No accepted
12-893	A	28	16	28	17	fire effects on water resources and floods in small catchments need to be mentioned here (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	The statement is reworded
12-894	A	28	16			There is recent literature claiming that the link between reforstation and flooding is a myth. See CIFOR (2005). (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	This question is reported in Chapter 3. Will be removed
12-895	A	28	23	28	25	It is not clear what these three lines convey. Either draw some conclusions based on these facts, or omit the material. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	see 12-895
12-896	A	28	24	28	24	What is IWRM? -- Integrated WateR Management? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK
12-897	A	28	28	29	3	This section is better because it gives some examples of what's currently happening in Europe and therefore of what is feasible. It also notes aspects of the structural/policy framework which may enable/diable adaptation. (Clare Goodess, University of East Anglia)	OK, will be checked
12-898	A	28	31	28	33	I suggest that the info that most of the European coast line is robust should also be mentioned in the section SLR page 13-14 (Kwadijk Jaap, WL Delfthydraulics)	Insert reference
12-899	A	28	36	29	2	This text contains no references, it seems not to be based on scientific publications. (Gregory Insarov, Institute of Global Climate and Ecology)	Insert reference
12-900	A	28	44			Cooper et al.,2002 is not quoted in the references (Michele Colacino, ISAC-CNR)	OK
12-901	A	28	46			Insert: “The setting up of mobile dams in Venice should protect the city against floods, whose frequency should increase in a relevant way”	OK, will be checked

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Michele Colacino, ISAC-CNR)	
12-902	A	29	6			Section 12.5.3: needs references adding. (Paula Harrison, University of Oxford)	Addressed
12-903	A	29	6			Also need to re-evaluate in situ conservation strategies in light of climate change (Jo Hossell, ADAS)	Addressed, text will be reworded
12-904	A	29	6	29	15	This text contains no references, it seems not to be based on scientific publications. (Gregory Insarov, Institute of Global Climate and Ecology)	Addressed, see 12-902
12-905	A	29	6			Section 12.5.3. Comment: There are no citations here. Hasn't anything been done in this field? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed, see 12-902
12-906	A	29	6			12.5.3 Moutains and subarctic regions: effects of landscape fragmentation and land use in general need to be mentioned here in relationship to barriers to species migration. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	Will be included depending on space
12-907	A	29	8	29	8	The sentence "It may be possible..." should be complemented (at the end) by a phrase such as "..., but this would be quite costly in most cases, and thus may not be a viable option for the coming years to decades.". (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Addressed, see 12-907
12-908	A	29	8	29	8	re-word "...have a limited..." to "...have only a limited...". (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK
12-909	A	29	12	29	15	These species can generally survive higher temperatures (e.g. they grow in botanic gardens!) so there is some scope for management responses e.g. preventing upward spread of trees and shrubs (at least in nature reserves); manipulating grazing (either more or less) may help in some cases. One could also consider transplantation in extreme circumstances. Similarly some animal groups. (Michael Morecroft, Centre for Ecology & Hydrology)	Will be checked
12-910	A	29	15	29	15	It would be good to add some material on mountain protection forests here, such as "Many mountain forests protect humans and human infrastructure from a wide range of natural hazards. For the management of these forests, large uncertainties exist because the exact extent of climate-induced changes in stand structure and species diversity cannot be predicted today. Therefore, the adaptation options for mountain forestry are quite limited; among the recommendations that can be made is the diversification (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Will be checked
12-911	A	29	18			Section 12.5.4 - mention increased irrigation as a possible adaptation - but where is the water coming from? Conflicts with exogenous assumptions and climate scenarios reported earlier in Chapter 12.	A misprint – the Section 12.5.4 does not consider irrigation

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Matthew Livermore, University of East Anglia)	
12-912	A	29	18			Section 12.5.4: An important adaptation measure for water-limited regions is improving nutrient management, as it can increase water use efficiency (Huxman et al. 2004 Nature 429:651-654, J.I.L. Morison, M.D. Morecroft (eds.) (2006) Plant Growth and Climate Change. Blackwell, in press) (Filipe Santos, University of Lisbon)	OK, will be taken into account
12-913	A	29	20	29	21	remove word coniferous? And add "instead of coniferous speceis" after deciduous trees (Jo Hossell, ADAS)	OK
12-914	A	29	20	29	21	Comment: This may also be positive in terms for forests to withstand extremes in the present climate. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	OK
12-915	A	29	20		33	How about forest soil C in Europe? (Raija Laiho, University of Helsinki)	OK, will be added
12-916	A	29	20	29	29	fire protection issue in Southern Europe could be also mentioned (Jan Pretel, Czech Hydrometeorological Institute)	Will be mentioned
12-917	A	29	22	29	24	A more straightforward option is simply to plant different provenances e.g. use more Southern European varieties (and indeed species) in northern europe. Given long generation time of trees I don't think GM technology is likely to be very helpful here, even if other objections can be overcome. (Michael Morecroft, Centre for Ecology & Hydrology)	Will be taken account
12-918	A	29	22			How can prescribed burning be an adaptation option? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	As part of adaptation strategy for preparing boreal landscapes to negative consequences of climate change – but will be clarified
12-919	A	29	23	29	23	"genetically improved seedlings". Not only the risk that needs to be acceptable; also the efficacy has to be tested. (Helena Freitas, University of Coimbra)	Will be discussed
12-920	A	29	24	29	25	Without further explanation, it is everything but clear to me why more intensive management should be a general adaptive measurement - it is not the quantity, but the quality of the management that is decisive, I think. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK
12-921	A	29	25	29	27	Technically isn't this a mitigation measure not an adaptation one? (Jo Hossell, ADAS)	OK, see12-918
12-922	A	29	25	29	27	"increasing rotation period": This has a local effect only. If timber demand does not change, then carbon sequestration will be reduced somewhere else. Suggest to cut this out. (Filipe Santos, University of Lisbon)	Generally speaking, increasing rotation period should increase average carbon stock in managed forest

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
12-923	A	29	26	29	26	Replace "sequestration" by "storage" - sequestration doesn't have to increase! (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Would addressed Should be discussed – in my opinion the question is not simple: the sequestration will depend upon two variables: increase of the length of period and productivity of these older forests
12-924	A	29	27	29	27	The sentence about prescribed burning is probably too general -where, when and why is this true? Certainly not everywhere and always!? (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK
12-925	A	29	27	29	28	"prescribed burning…" - could you be more specific? (Jan Pretel, Czech Hydrometeorological Institute)	OK (
12-926	A	29	27	29	27	Although prescribed burning may be a possible adaptation option, its introduction here is not justified - why, where, when, with which objectives - furthermore it is a risky technique and doesn't have a consensus. Why specifying it here? (Filipe Santos, University of Lisbon)	OK, also see 12-924-12-925
12-927	A	29	31	29	32	Repeat of p19 ln 4 (Jo Hossell, ADAS)	Will be harmonized
12-928	A	29	31	29	31	Productive grasslands on no-tillage regimes may be important carbon sinks. May be we should advise no-tillage and also methods to avoid shrub encroachment and grassland degradation. (Filipe Santos, University of Lisbon)	This is speculation only
12-929	A	29	32	29	33	Irrigation of grassland is not economic excepted in where other adaptations are restricted in the UK (Hossell, JE, Temple, ML, Finlay, I, Gay, A, Oakley, J, Symmonds, W and Moorhouse, D (2002). Identifying and costing agricultural responses under climate change scenarios (ICARUS). Final report to DEFRA on project cc0357, ADAS, Wolverhampton.) Changing the timing of cutting regimes is also likely to be an effective adaptation, due to the extension of the growing season in the UK (Jo Hossell, ADAS)	Irrigation of grasslands is practiced in some parts of Europe, depending local water availability and profitability of the practice. The change in cutting frequency is already mentioned
12-930	A	29	32	29	32	The application of irrigation to reduce climate risks to fodder production is too specific and, when introduced anew, might change biodiversity. Its mention should be deleted. (Filipe Santos, University of Lisbon)	The mention of irrigation is now confined to intensive grasslands
12-931	A	29	38		41	This could be slightly reformulated: "...better management practices... including... less intensive farming (?), and re-establishing buffer zones as sinks for nutrients." I would think that buffer zones would also be 'better management practices'. (Raija Laiho, University of Helsinki)	OK, with this reformulation

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
12-932	A	29	38	30	3	Again, how about the future of peatlands, those C hot spots... (Raija Laiho, University of Helsinki)	See comments to 12-649
12-933	A	29	40	29	40	"less intensive farming". Instead, better selection of areas of intensive farming (Helena Freitas, University of Coimbra)	OK with these changes
12-934	A	29	40	12	41	Comment: Reestablishing wetland areas may also be seen as an adaptive measure to prevent flooding. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	OK to be included
12-935	A	29	41		43	e.g. utilizing constructed wetlands for wastewater treatment in rural areas to a larger extent? (Raija Laiho, University of Helsinki)	I would not recommend that – nutrients have to reduced at the source level if possible
12-936	A	29	50	29	50	improve the role of wetlands protection (Ramsar Convention) (Helena Freitas, University of Coimbra)	OK to be included
12-937	A	30	5			Section 12.5.6: What about the importance of integrating biodiversity conservation into other policy sectors to assist species to adapt, particularly agricultural land use/ management practices as the wider countryside outside of protected areas will become more important as species try to transit across these landscapes. There is a discussion of these issues in the Berry et al and Harrison et al papers cited in rows 26 and 25. (Paula Harrison, University of Oxford)	Good point.
12-938	A	30	5			12.5.6. Biodiversity: there is no mention here to off reserve conservation. This should be a key element of adaptation (as mentioned in chapter 4). (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	Good point.
12-939	A	30	5	30	27	The BIOCLIME PROJECT (http://www.ceh.ac.uk/sections/ed/BIOCLIME.html), recently reviewed this area across Europe to feed into the European Platform for Biodiversity Research Strategy. I am also aware of other UK studies that could be cited. They are mostly government agency reports and are authorative even if not in SCI journals (e.g. Hossell et al. 2000. Climate change and UK Nature Conservation: A review of the impact of climate change on UK species and habitat conservation policy. Report to DETR. ADAS.) There is probably other similar literature from other countries. One strategy that is regularly discussed is that of larger, more heterogeneous nature reserves would improve chances of populations persisting in patches of suitable microclimate. (Michael Morecroft, Centre for Ecology & Hydrology)	If space allows I am keen to add a few sentences, although it would help if we decided whether we should be including information from unpublished reports. I personally think this is not a very good idea, but…
12-940	A	30	7	30	13	Some policy options are discussed in Hossell, JE, Ellis, N, Harley, M and Hepburn, IR (2003). "Climate change and nature conservation: Implications for policy and practice in Britain and Ireland." Journal for Nature Conservation 11: 67-73. (Jo Hossell, ADAS)	We could cite the reference to support statement in lines 11-13.

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12-941	A	30	11	30	11	Delete "to our knowledge" - not appropriate for an IPCC report, I think. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Good point. This can actually be supported by previous reference
12-942	A	30	14	30	14	Long term ecological research sites would help the define these scenarios (Helena Freitas, University of Coimbra)	
12-943	A	30	15	30	18	Delete or move somewhere else - this is not about adaptation. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	It is a justification for adaptation. But it can be deleted.
12-944	A	30	16		18	The sentence on climate change impact on biodiversity seems to be more appropriate in the correspondent section (e.g., pg. 17) (Andrei Kirilenko, Purdue University)	The sentence was provided as a justification for adaptation. But it can be deleted
12-945	A	30	18			Araujo, 2004 is not quoted in the references (Michele Colacino, ISAC-CNR)	It is Araújo et al. 2004
12-946	A	30	28			Connectivity: need to emphasize connectivity crucial on land, less important in coasts, not important for plankton (Stephen J. Hawkins, The Marine Biological Association of the UK)	
12-947	A	30	32			12.5.7.1. Agriculture: CAP may play a key role in 'marginal' areas. This deserves a special mention. (Sandra LAVOREL, Laboratoire d'Ecologie Alpine, CNRS)	OK, will be mentioned in SOD
12-948	A	30	34	31	3	This is the only section that makes a distincition between short-term and long-term adaptation (which is good) - though these time frames are not defined. Autonomous adaptation is also mentioned in passing. Though here and elsewhere there is no discussion of different types of adaptation - autonomous, planned, anticipatory, reactive etc. (Clare Goodess, University of East Anglia)	OK, this kind of information is already reported in Chapter 4
12-949	A	30	37	30	38	There are also issues of low light levels to be considered for early planting of crops at more northerly latitudes (Jo Hossell, ADAS)	OK, will be mentioned in SOD
12-950	A	30	43	30	43	scenarios scenarios - misprint (Filipe Santos, University of Lisbon)	OK
12-951	A	30	43	30	43	The word "scenarios" has been repeated twice. Please remove one of them. (Serhat Sensoy, Turkish State Meteorological Service)	OK
12-952	A	30	47	31	3	could' is mispelt in ln. 51, but the more important point is that any redesigned CAP will have a much greater effect on European agriculture than climate change and this needs to be mentioned. (John R Porter, KVL)	OK, will be mentioned in SOD. See also 12-947
12-953	A	31	10	31	10	This is a hot topic in the chapter and should be improved. (Helena Freitas, University of Coimbra)	Will be improved
12-954	A	31	10			Transport is not discussed in this section - should it be energy distribution?	Transport is not included in impact section

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						(Clare Goodess, University of East Anglia)	
12-955	A	31	10			Section 12.5.8 Energy and transport> not transport itself, the title should be something like Energy and its transport or Energy and its distribution … (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Transport is not included in impact section
12-956	A	31	10			What are the renewable low-carbon fuels potentials? (Sten Nilsson, International Institute for Applied Systems Analysis (IIASA))	Text will be added
12-957	A	31	12	31	22	A number of examples are given here of possible adaptive responses - are there any examples of these being implemented in Europe? (Clare Goodess, University of East Anglia)	No example is found in literature
12-958	A	31	12	35	16	Section 12.5.8 - no mention of the implications of increasing energy costs that might lead to underinvestment in the energy sector making it more vulnerable to future climate extremes. (Matthew Livermore, University of East Anglia)	Will be mentioned
12-959	A	31	14			How might this 'overall robustness' be increased? (Clare Goodess, University of East Anglia)	Will be explained
12-960	A	31	16	31	17	Idea of laying supply lines underground is okay but what about the potential problems on increase subsidence during summer droughts and increase vulnerability from more frequent winter-time flooding. (Matthew Livermore, University of East Anglia)	
12-961	A	31	16	31	17	It should be mentioned that enhancing the interconnection capacity of the European electricity grids (current EU policy) would increase its capacity to cope with climate change. (Yannis Sarafidis, National Observatory of Athens)	Will be mentioned
12-962	A	31	17		17	I couldn't check the reference to this online publication: at this time (Nov. 2, 2005) the site of EarthEd magazine is either hacked or abandoned. Otherwise, this adaptation measure doesn't look very promising as compared to high uncertainty of the effect. As I have already mentioned earlier, climate change impact on power grids is highly uncertain. You might want to mention new technologies, using more efficient decentralized electric generation systems, new alloys, etc. (Andrei Kirilenko, Purdue University)	Text will be reworded
12-963	A	31	18	31	22	Anyway the question of peak load remains open. Higherthe amplitude temperature wise, more excessive capacity of energy production is necessary. (Alexander Golub, Environmental Defense)	This is not a question of adaptation measures
12-964	A	31	24	31	32	Non-climatic barriers to adaptation should also be noted, e.g., the short time scales imposed by energy market trading. (Clare Goodess, University of East Anglia)	Only mentioned climate-related measures

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12-965	A	31	28	31	31	The meaning of this sentence is not clear. For me it implies that economic growth would continue be the main driver of energy demand and climate change represents an additional but minor issue. Alhtough this may be the case, no references are provided for such an issue that seems to be of major importance. (Yannis Sarafidis, National Observatory of Athens)	References will be provided
12-966	A	31	35	32	3	This section is based only on grey literature. It is thus an obvious research gap. (Filipe Santos, University of Lisbon)	Only grey literature was found
12-967	A	31	37			Delete sentence -- it is obvious (Allen Perry, University of Wales Swansea)	Will be explained
12-968	A	31	37	31	39	This is a statement that needs to be backed by a reference. (Filipe Santos, University of Lisbon)	References will be provided
12-969	A	31	38			Rephrase ' shifting of conditions for tourism'. (Clare Goodess, University of East Anglia)	Will be reworded
12-970	A	31	38	31	39	The example given is not well substantiated on page 24, yet is given very high confidence here. (Daniel Scott, University of Waterloo)	The example on page 24 is well substantiated
12-971	A	31	42	31	43	"May or may not be economic"... would add : given to the current debts of many ski resorts, and depends on the availability of water resources in winter, as well as on the existence of cold temperatures. Alternative options could be reached. As chapter 9 (Asia) states "New leisure industries, e.g., grass-skiing, hiking, residential lodging, eco-tourism could be considered to compensate for the income decrease due to snow deterioration (Fukushima et al., 2002)" (Ghislain Dubois, Tourism Environment Consultants (TEC))	Ecotourism will be added
12-972	A	31	43	31	43	Replace "This adaptation may or may not be economic" (which doesn't say much!) with "This adaptation is likely to be economic only in the short term, or in the case of very high-elevation resorts in mountain regions.". (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Text replaced
12-973	A	32	1	32	1	Replace "Promoting a change in the pattern..." by "Promoting a change in the temporal pattern..." (i.e., be more specific). (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Text replaced
12-974	A	32	4			Insert: “Developing prevention strategies against structural failures and remedial measures for damages derived from weather action and related disaster” (Michele Colacino, ISAC-CNR)	Actually relates to line 14! Relevant, and could be added on by the word "including.."Text will be added
12-975	A	32	6			Property insurance (Clare Goodess, University of East Anglia)	The section is slightly broader, but it is probably more accurate to say "Property

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							insurance" as suggested
12-976	A	32	8	32	29	It look smore like mitigation of insurance cost than adaptation. (Alexander Golub, Environmental Defense)	I disagree. Mitigating or reducing and avoiding cost IS adaptation.
12-977	A	32	8	32	28	Doesn't mention red-lining, i.e., refusing insurance cover in some regions. Or changes in planning - i.e., stop building on flood plains. (Clare Goodess, University of East Anglia)	Agreed. An important point to include. By refusing cover, insurers leave other sectors/stakeholders to face the cost of climate impacts. It could grow in importance if climate change continues.
12-978	A	32	9	32	13	Although primary responsibility for sustainable development lies within each country as stated in this paragraph, however, the role of business should also be included. Hart argues that that sustainability goals will not be successful unless business, with its resources and global impact, is actively engaged (Hart, S. Beyond greening: Strategies for a sustainable world. Harvard Business Review 1997;75(1): 66-76). (Eva Collins, University of Waikato)	This comment does not relate to this section. There is no reference to responsibility for sustainable development here.
12-979	A	32	21	32	21	… these funds are inadequate … (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	Agreed
12-980	A	32	21	32	21	"funds inadequate" to "funds are inadequate" (Filipe Santos, University of Lisbon)	Agreed
12-981	A	32	34	33	22	Adaptation measures mentioned here were those for heatwaves and floods. Nothing is said for those indirect impacts (i.e. vector-borne, air pollution, water borne etc.) which have the potential to affect more people and for which early observational changes have already been detected. (Filipe Santos, University of Lisbon)	These question is addressed in Chapter 8. The content of this section is restricted by the permitted volume and proposed adaptations measures are mainly a response to the last years weather extremes in Europe
12-982	A	32	36	32	38	A very controversial statement. Extreme temperature does matter as well as the mean. (Alexander Golub, Environmental Defense)	Read next sentences "To ameliorate the situation society needs to prepare for an increased frequency of heat waves and other risks"
12-983	A	32	36	32	38	Summer 2003 suggests this may not be true. (Clare Goodess, University of East Anglia)	Addressed
12-984	A	32	36	32	38	There is only a partial (i.e. not "successful") adjustion. Otherwise we would not observe seasonality in health data. (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	OK, The word 'Successful' is removed
12-985	A	32	36	32	36	How do we judge whether we have adjusted successfully? -- Drop 'successfully' from this sentence! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK, see 12-984
12-986	A	32	36	32	38	better to use rounded figures for mean summer European temperatures	OK, from 13 to 24 C

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Jan Pretel, Czech Hydrometeorological Institute)	
12-987	A	32	37	32	37	Comment: 13.5C is a too high number for parts of Europe. Northern Sweden for instance, has a summer mean temperature of below 13C as an average and well below 13 in high-elevation sites. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Addressed
12-988	A	33	0	0	0	Section 12.6: The Executive summary (CH.12, P.3, L.30-34) also mentions Iberian forest fires 2005 and Elbe flood 2002. These events need to be discussed in this section, or they should be removed from the executive summary. Furthermore, I am not convinced that the NATHC [that is a perennial part of any (in-)decent popular science piece on climate change] qualifies as a case study. (Lars Bärring, Lund University)	Consider & adapt if need.
12-989	A	33	0	0	0	Section 12.6.1: The 2003 heat wave was an extreme event that are likely to become more frequent in a future warmer world. However, in the future a similar event will not have the same disastrous impact on society for several reasons. One reason is that the age and health structure have been adapted. Very cynically speaking, the first cruel step towards such an adaptation was taken during the 2003 event. Another adaptation measure is of course that the event raised the awareness and resulted in various preparatory and planning measuresd by various authorities. (Lars Bärring, Lund University)	Point taken. Some examples of adaptation measures are mentioned.
12-990	A	33	7			Ballester et al., 2003 is not quoted in the references (Michele Colacino, ISAC-CNR)	
12-991	A	33	9	33	13	The Spanish Ministry of Health has an active warning system for all the cities of the country, more than 50. It includes warnimg through the media and active contact to the elderly population. It has been in action during the June-September season since 2004. This information has not been considered in the 12.5.11 section and should be included. Reference: Ministerio de Sanidad y Consumo (2004). Protocolo de actuaciones de los servicios sanitarios ante una ola de calor. Ministerio de Sanidad y Consumo. Madrid. 56pp (in Spanish). (Ricardo García-Herrera, Universidad Complutense de Madrid)	OK
12-992	A	33	11	33	13	"….and Lisbon had comprehensive ones in 2003. …….. development or meanwhile implemented in……Paris; Florence, Milano, and for whole Germany." (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	No space to include this detail
12-993	A	33	15	33	22	The health impacts section didn't say anything about flooding. And what about the mental health impacts of flooding? (Clare Goodess, University of East Anglia)	Flooding is not part of the case study
12-994	A	33	17	33	18	Dresden flood of 2002 (see below) … > I haven't see below (in Case studies expected)	The floods of 2002 have been removed from the case studies

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	
12-995	A	33	17	33	18	"The Dresden flood of 2002 (see below)..". There is nothing in the text below about these floods. (Filipe Santos, University of Lisbon)	The floods of 2002 have been removed from the case studies
12-996	A	33	25	35	16	Are the case studies necessary? I think that the two cases described and their impact are well known: therefore all the chapter can be eliminated without any problem. Only table 12.7 should be maintained and inserted at the end of Chapter 12.4 In addition in p 6 line 5 and p 33 line 17-18 is announced a detailed description of Dresden flood that actually is missing. (Michele Colacino, ISAC-CNR)	Case studies have been identified as important in the layout of the report. The floods of 2002 have been removed from the case studies
12-997	A	33	25			Section 12.6 : Moldau, Elbe and Donau rivers floods in 2002 could be mentioned (probably supposed, see comment above) (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	The floods of 2002 have been removed from the case studies
12-998	A	33	25			I think this section needs an introduction. E.g. to explain why/how the heat wave is connected to climate change etc. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK
12-999	A	33	27	34	10	12.6.1 I think it would be worth mentioning the situation with forests in 2003 - forest fires, tree mortality - and likely effect of increasing atmospheric CO2 concentrations (Michael Morecroft, Centre for Ecology & Hydrology)	The effects on GPP is now included, but there is no space to go into detail on effect of CO_2
12-1000	A	33	28	33	28	This case study should mention that the heat wave of 2003 in Europe strongly contributed to the loss of almost 10% of the portuguese forest (Helena Freitas, University of Coimbra)	Forest fires are now mentioned.
12-1001	A	33	28			Why is this subsection boxed?? (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Because the case studies are going to be boxes.
12-1002	A	33	30	33	45	Stott et al. 2004 also discuss changes in summer extreme temperatures. Stott, P.A., D.A. Stone and M.R. Allen, 2004: Human contribution to the European heatwave of 2003. Nature, 432, 610-614. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	OK
12-1003	A	33	35	33	35	add: 'It lead to historical records breaking of 500 hPa geopotential heights over an area centered over France (Trigo et al 2005). Reference: R. Trigo, R. García-Herrera, J. Díaz, I.F. Trigo, M. A. Valente (2005). How exceptional was the early August 2003 heatwave in France?. Geophysical Research Letters doi:10.1029/2005GL022410. (Ricardo García-Herrera, Universidad Complutense de Madrid)	Text has been restructured
12-	A	33	41			Figs now available for amount of lost agricultural productioN	OK

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1004						(Allen Perry, University of Wales Swansea)	
12-1005	A	33	44	33	44	Please introduce " Atmospheric circulation over Europe in 2003 led to the very low discharge level of the Danube on the Romanian territory. In September 2003, discharge level in the Danube inferior basin reached absolute minimum since 1840. This extreme event affected natural ecosystems, agriculture, water supply, energy demand, navigation, etc. (Mares et al., 2005)" before " Elevated temperatures led to..." (Ileana Mares, ROMANIAN ACADEMY OF TECHNICAL SCIENCES)	There is no space for this detail.
12-1006	A	33	48			Delete Valleron… add Kosatsky, 2005 (see comment No 1) (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	OK
12-1007	A	33	49			Change 3100 in Italy (Conti….) into 19,780 in Italy country-wide in June to September (in Kosatsky, 2005) (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	OK
12-1008	A	34	3			Add: Meanwhile the overall death toll during the hot summer 2003 is estimated to about 45-50,000 (Kosatsky,2005) which means the biggest environmental disaster Europe was faced since the catastrophies in the late middle ages when the North Sea flooded parts of northern Germany and The Netherlands. (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	OK
12-1009	A	34	5	34	10	This para should be moved to the beginning of this section! (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	The text has now been restructured
12-1010	A	34	10	34	10	I think it would be worth while to mention the carbon cycling implications of the 2003 heat wave, which offset several years of carbon sequestration (i.e., it was a large sink). See recent Nature paper: P. Ciais et al. (2005), Nature 437: 529-533. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	This is now included
12-1011	A	34	10	34	10	Comment: Site also Schär et al (Nature, 2004). (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	OK
12-1012	A	34	11			add Cias et al. 2005:Europe-wide reduction in primary productivity caused by the heat and drought in 2003, Nature 437, 22 sept 2005. this paper documents the heat wave impacts on NPP. Striking result is that the drop in NPP counteracted several years of increases in NPP that were observed since the early 1990s. (Marcus Lindner, European Forest Institute)	This is now included
12-1013	A	34	14	35	16	It is misleading to present a dire set of forecast for shutdown of the NATHC first, then finish with the statement "Most experts surveyed considered the likehood of NATHC-type evnt even after 2100 to be less than 1% (Arnell, 2004)." That statement should appear earlier in the section and certainly before Table 12.7. The negative consequences presented in Table 12.7 are highly unlikely.	RD _ THC Case Study: how treat? Comments 1013-1033. Consider treatment

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						(Lenny Bernstein, IPIECA)	
12-1014	A	34	14			I am somewhat surprised to see no references to Stefan Rahmstorf's work in this section - I am not an expert on the thermohaline circulation at all, but I do believe that Rahmstorf contributed significant new insights on this issue since the publication of the TAR. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	
12-1015	A	34	14			I suggest that this title be shortened to read something along the lines of "Possible consequences of abrupt climate changes in Europe" (Timothy Carter, Finnish Environment Institute)	Consider
12-1016	A	34	14			An entire EU project (ATLANTIS) was devoted to the possible consequences of an abrupt sea level rise in Europe. The draft papers can be found at: http://www.unihamburg.de/Wiss/FB/15/Sustainability/atlantis.htm and have been submitted to International Journal of Water Resources Development. (Timothy Carter, Finnish Environment Institute)	Aware_ refs_ check.
12-1017	A	34	14			Need some introduction to "other abrupt climate changes" before they are mentioned in the table 12.7 (Jo Hossell, ADAS)	Modifying study as is_ will consider.
12-1018	A	34	14	35	16	None of the AR4 AOGCMs show a collapse of the MOC - Meridional Overturning Circulation (a better, than NATHC, term and acronym to use for the phenomenon) - in the 21st century (however, none of them has interactive ice sheets). I think this should be mentioned in the section, otherwise the discussion of shutdown produces an impression that it is likely in the 21st century. Additionally, while the title of the section 12.6.2 includes "other abrupt climate changes", those "other" changes apper only in the table, and not in the text. (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	Consider points & as for 1017
12-1019	A	34	14			I think that 'other abrupt climate changes in Europe' should be deleted form this section. It is only dealt with spuriously in Table 12-7. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	As for 1017
12-1020	A	34	16	34	19	NATHC shutdown (more accurately slow-down) is driven by both regional heating and additional fresh-water input from an enhanced hydrological cycle in the winter storm track, melting sea-ice and possibly enhanced fresh-water input from river runoff. While rapid palaeoclimate changes have been linked to disruptions to the NATHC, these were likely to have occurred under very different climate conditions to today and do no provide analogues to potential future rapid change. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	Consider statement
12-1021	A	34	17	34	17	I suggest to introduce as reference "Marotzke, 2000 ", after "1999". (Ileana Mares, ROMANIAN ACADEMY OF TECHNICAL SCIENCES)	

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12-1022	A	34	29	34	32	Comment: "An experiment with the HadCM3 model". Which experiment? Reference? Also, "cooling of Northern coastal Europe by 0.5-3.5C" compared to what? todays climate? Or the situation just before the shutdown? I believe there has been more work done on this in connection to the IPCC AR4 simulations, this should be investigated. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Clarify & check
12-1023	A	34	32	34	32	The net temperature change of -0.5 to -3.5 C from the GHG warming plus a NATHC shutdown could be put in the context of the reconstructed temperature variations for the last (several) millennium(-a) and changes after the last Ice age. What influence would this regional temperature change have on the global mean temperature. (Lars Bärring, Lund University)	This is addressed_ check as clear
12-1024	A	34	32	34	32	If this is true indeed, the implications would be that a shut-off of the thermohaline circulation would help to maintain - by and large - the climatic conditions prevailing in Europe today. Thus, would the collapse of the thermohaline circulation be desirable from the point of view of Europe's climate? I think the current wording of the section is easily leading to such (mis)interpretations. More care must be taken to make sure the real scientific message gets across. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Check wording
12-1025	A	34	35			Table 12.7, first part on THC. At what degree of cooling are these implications possible? Is it the 0.5-3.5K discussed on p34l32? Other numbers? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Check
12-1026	A	34	35	34	36	Table 12.7: "Accelerated climate change": What does it mean? The consequences are (not surprisingly) that everything is going to happen faster ("Major …"). I suggest to dump this and also the "Rapid sea-level rise" entry, unless they are also meaningfully discussed in the text. (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	Consider
12-1027	A	34	36			Table 12.7, typo in "Major changes in temperature...": replace "temperature" by "temperate". (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Check
12-1028	A	34	36			Table 12.7: skip the second and third part of the Table or discuss the possibilities of these two kind of abrupt changes in more detailes in the Section 12.6.2. with possible causes and relation to the regional development of the warming (otherwise rather speculation) (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	As for 1026
12-1029	A	35	0			Table 12.7. Can probably delete last two sections of table as case-study only relates to NATHC.	As for 1026

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						(Clare Goodess, University of East Anglia)	
12-1030	A	35	7	35	7	Manning et al., 2004 is absent from the reference list (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	Check
12-1031	A	35	9	35	16	Comment: Relate to WGI results. Is there any discussion on this in there? (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	Check
12-1032	A	35	12			What type of climate/ocean model was used by Link and tol? (Clare Goodess, University of East Anglia)	Check
12-1033	A	35	12	35	16	In my opinion the likelihood of THC shutdown should be stated at the start of this section not the end. (Matthew Livermore, University of East Anglia)	Consider wording
12-1034	A	35	19	36	27	This chapter is OK! (Michele Colacino, ISAC-CNR)	OK
12-1035	A	35	21		24	The first paragraph could be left out. It is, again, background. (Raija Laiho, University of Helsinki)	OK. Reworded
12-1036	A	35	22			t C/cap-a - not an easy unit to understand - tonnes of carbon per capita per annum? (Matthew Livermore, University of East Anglia)	It is correct: t C/cap/a
12-1037	A	35	26	36	8	Nice section. (Timothy Carter, Finnish Environment Institute)	Thanks
12-1038	A	35	26	35	26	I suppose it is 'Western' versus 'Central and Eastern' Europe (not the other way round). (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	It is correct. That is what the text says.
12-1039	A	36	7	36	11	I don't think this material adds much to the message of the chapter - delete? Basically, I think it is wrong to claim that we are forecasting anything with impact models - we are using them in scenario mode, and there is no way we could attach real probabilities to any of the simulated trajectories. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Comment does not apply. There must be a mismatch in lines/pages
12-1040	A	36	7	36	8	Add Schröter et al., 2005 here. (Timothy Carter, Finnish Environment Institute)	OK. Added. It was not out when this was written
12-1041	A	36	13	36	24	I think it would be valuable to add a sentence or two on the problem of getting adequate long-term data for testing impact models, emphasizing that such data collection efforts are important in Global Change science even if "monitoring" as a term has a pretty negative connotation these days. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	Comment does not apply. Must correspond to a different section.
12-1042	A	36	23	36	28	Something should be mentioned about FSU since these countries have different challenges and different capacity for adaptation comparing to EU. (Alexander Golub, Environmental Defense)	It is implicit in CEE since this subregion comprehends European FSU. Further differentiation is not possible
12-	A	36	25			Section 12.8: What about integrated assessments which assess the inter-	Reference will be taken account

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1043						connectedness of impacts and adaptation between sectors - see Holman et al (2005) climate change, 70, 43-73 and Berry et al cited on row 26. (Paula Harrison, University of Oxford)	
12-1044	A	36	25	37		Give the key uncertainties a proper place in the summary (Kwadijk Jaap, WL Delfthydraulics)	OK
12-1045	A	36	25			Section 12.8 - in the list of uncertainties no mention is made about the potential uncertainties surrounding future politcal and socio-economic development. There could have a much greater impact on our way of life than future climate change. (Matthew Livermore, University of East Anglia)	Will be mentioned.Good point, but can we do anything about it?
12-1046	A	36	30	37	34	This chapter is OK! (Michele Colacino, ISAC-CNR)	Thanks
12-1047	A	36	30	37	34	This section is all rather general. Are there any specifically European issues that can be drawn out? (Clare Goodess, University of East Anglia)	Uncertainties specific to Europe will examined As far as biodiversity is concerned the main specific uncertainty in Europe is what is going to happen in the southern boundaries of species ranges, especially those occurring in the south of Europe. Should we write something about it? Do we have space?
12-1048	A	36	30	37	33	This does not correspond well to the title. I think that "key" uncertainties and research priorities are not really pointed at, and the section does not result in clear conclusions yet. This should be focused more. (Raija Laiho, University of Helsinki)	The section deal with uncertainties and does not with conclusions
12-1049	A	36	30			Section 12.8: Two things should be added to the research priorities, (1) ecophysiological process studies to better understand and quantify bioclimatic limitations of prevalent plant species, eg in the face of heat stress, reduced chilling, increased production, changed allocation etc. (2) numerical studies of chains of processes and their feedbacks that in the balance determine ecosystem structure and composition (see the list of positive and negative effects assembled in table 12.4), e.g. the interaction between vegetation growth, soil moisture and disturbance in a changed climate (Wolfgang Lucht, Potsdam Institute for Climate Impact Research)	We are going to give prominent weight to plants we should probably justify it.
12-1050	A	36	32	36	35	What is the source of this information? To be consistent with other regional chapters, it should probably be Ruosteenoja, K., Carter, T.R., Jylhä, K. and Tuomenvirta, H. 2003. Future climate in world regions: an intercomparison of model-based projections for the new IPCC emissions scenarios. The Finnish Environment 644, Finnish Environment Institute, 83 pp. (scatter diagrams	True, the source is was the project of Ruosteenoja et al.

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						discussed in the WG II author meetings and introduced in the Green Book of Supporting Material in Vienna. (Timothy Carter, Finnish Environment Institute)	
12-1051	A	36	32	37	34	This section is heavy on uncertainties but rather light on the research priorities need to reduce those uncertainties. Is there, for example, a greater need for climate modellers to reduce uncertainties in the variables which are used to drive impact models, or are the main uncertainties attached to the impact models? Are ensemble and probabilistic approaches the best way to approach the uncertainty question for the next IPCC report? Setting out such priorities is very important as IPCC recommendations to tend to have great influence. (Matthew Collins, Hadley Centre for Climate Prediction and Research)	The list of research need will be enhanced I think ensemble forecasting is indeed one of the main strategies to address uncertainty. Should we emphasise it more?
12-1052	A	36	32	36	44	Comment: In the discussion of uncertainties I think that some of the PRUDENCE work should be cited. For instance the papers by Déqué and coworkers (Clim Dyn, published online August 2005) and the paper intended for the PRUDENCE special issue in Climatic Change. These papers try to assess uncertainties due to choice of global model, regional model, emission scenario, and also to some extent internal variability in the models. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	**PRUDENCE works trying to assess uncertainties due to choice of climate models and emission scenarios. will be used**
12-1053	A	36	34	36	35	These ranges of the warming, where are they taken from? TAR GCMs? GCMs plus RCMs? Give a reference. (Vladimir Kattsov, Voeikov Main Geophysical Observatory)	Source is the project of Ruosteenoja et al. (2003)
12-1054	A	36	36			"Time frame" instead of "year" (Jo Hossell, ADAS)	OK
12-1055	A	36	50	36	50	I have nothing against J. Moreno whatsoever, but I think the two Moreno references (which are grey literature written in Spanish that are referring to "just" the Iberian Peninsula) are cited too often in this chapter - wherever possible, they should be replaced by more precise citations from the recent literature. (Harald Bugmann, Swiss Federal Institute of Technology Zurich)	OK
12-1056	A	37	5	37	5	At this point I would insert 2 sentence on the following lines: 'There is a need to improve monitoring to detect changes in biodiversity and ecosystem processes, as they start to occur, in order to develop more mechanistic models and to provide early information to inform policy and management responses. Further experimental research is needed to understand the interactions between climate change and other causes of change in ecosystems, particularly air pollution, which has been a major focus of European policy in recent decades. (Michael Morecroft, Centre for Ecology & Hydrology)	Will be taken account and the text will be reworded
12-	A	37	7	37	11	What about hindcasting using data from earlier periods in the 20th century or paleo	This is more available in Subsection of

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1057						datasets? (Paula Harrison, University of Oxford)	Current trends This is part of validation of models, which is part of model building. We can stress more the importance of validation simply by replacing some of the original text that I provided
12-1058	A	37	7	37	34	Most of the points made here are not specific to Europe. Would it be wise to move them to the sectoral chapters? I think it would be better to focus here only on those uncertainties which are important/specific for European data/models/case studies. (Marcus Lindner, European Forest Institute)	To show specifically European issues about key uncertainties requires a more carefully examination. Will be done
12-1059	A	37	7	37	11	The sentence regarding stating that it is not possible to test impacts models needs some clarification. A number of impacts assessments have examined the transient response of a sector to changes from 1990-2100, surely it is therefore possible to examine how these models have performed against the observed impacts that have occurred from 1990 - 2005. (David Viner, University of East Anglia)	Will be given a better explanation on verification problem of impacts models. The mentioned research work will be taken account, if they will be available
12-1060	A	37	11	37	11	Comment: It could be mentioned that this approach is currently being investigated within the EU project ENSEMBLES. (Erik Kjellström, Swedish Meteorological and Hydrological Institute)	OK, will be mentioned Agree, although we argue that ensembles should be used across a variety of model applications not only climate change prediction.
12-1061	A	37	17	37	20	This sentence provides a non-systematic nor exhaustive description of factors that influence health risk of climate change. Why are only respiratory infections mentioned? It is well known and recognised in Chapter 8, that cardiovasular diseases are responsible for most of the mortality associated to heat extremes. Nothing is mentioned on the rate of changes, a key issue for adaptation. Why clarifying these factors should reduce the risk?. The reduction of risk should be associated to prevention policies and not to the identification of these factors, some of them well studies, as is the case of meterorological variables. So, this sentence should contain a more systematic approach. The reference to Ballester is not included in the reference list (Ricardo García-Herrera, Universidad Complutense de Madrid)	Comment noted
12-1062	A	37	21	37	21	… (WHO, 2004). (Tomas Halenka, Charles University, Faculty of Mathematics and Physics)	OK
12-1063	A	37	26	37	34	Some impotant decisions should be taken today with regard to future risks and cost of adaptation, since economy could be locked in a particilar trajectory i.e. learning by doing may be not a feasible strategy. (Alexander Golub, Environmental Defense)	OK

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12-1064	A	38	0	58		Probable you know section " References" is not ready for revision (Ileana Mares, ROMANIAN ACADEMY OF TECHNICAL SCIENCES)	Will be checked and revised
12-1065	A	38	1	58	46	References should be reduced and a first my suggestion consists in elimination of papers quoted as submitted or in preparation. Besides it is difficult to evaluate redundancy because many works are indicated only as author, but without titles from which to draw an idea of the content. There are also many printing or spelling errors, but they will be corrected with the 2nd draft. (Michele Colacino, ISAC-CNR)	Addressed
12-1066	A	38	1			References: Not checked! See a few remarks above. Also Johansson&Goldemberg (page 56!) should be moved to their right place … (Maximilian Posch, Netherlands Environmental Assessment Agency (MNP))	OK
12-1067	A	38	9			Ad De Roo should read De Roo et al., 2003 consequently in the reference list De Roo, A.; G. Schmuck …. Plus alphabetical order (Gábor BÁLINT, VITUKI Environmental Protection and Water Management Research Institute)	OK
12-1068	A	38	28			Insert: Alpert, P., Ben-Gai T., Baharad A., Benjamini Y., Yekutieli D., Colacino M., Diodato L., Ramis C., Homar V., Romero R., Michaelides S. and Manes A.: The paradoxical increase of Mediterranean extreme daily rainfall in spite of decrease in total values - Geophys. Res. Lett., 29, 11, 31-1 - 31-4, 2002 (Michele Colacino, ISAC-CNR)	OK
12-1069	A	40	4			Insert: Brunetti, M., M. Maugeri, F. Monti, T. Nanni.: Changes in daily precipitation frequency and distribution in Italy over the last 120 years. J.G.R., 109, D05102, doi:1029/2003JD004296, 2004 (Michele Colacino, ISAC-CNR)	OK
12-1070	A	40	13			Insert: Camuffo D.,1998: Microclimate for cultural Heritage. Elsevier, Amsterdam, 415pp (Michele Colacino, ISAC-CNR)	OK
12-1071	A	40	43			Insert: Colacino M. (ed.), 2003: Proceedings of Workshop: Meteorologia, Microclima e Beni Culturali- Bollettino Geofisico (special issue) n. 1-2, Roma,144 pp (Michele Colacino, ISAC-CNR)	OK
12-1072	A	49	17			Maisch, not Maish (Rolf Buerki, PHS - College of Secondary Education of St. Gallen)	OK
12-1073	A	49	17	49	17	Maish is written with a "c": Maisch. (Lisette (E.J.) Klok, Royal Netherlands Meteorological Institute)	OK
12-1074	A	49	23	49	23	After this line please introduce the following references according to above mentions : Mares Ileana, C. Mares and Mihaela Mihailescu, 2002: NAO impact on	OK

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						the summer moisture variability across Europe. Physics and chemistry of the Earth, 27, 2002,1013-1017, ISSN 1474-7065. Mares C., Ileana Mares and Antoaneta Stanciu, 2005 : Extreme climatic events in the precipitation time series in Romania and their impact in the Danube inferior basin. European Geosciences General Assembly 2005, Vienna, Austria, 24-29 April 2005, Geophysical Research Abstracts (CD-edition). Marotzke, J., 2000: Abrupt climate change and thermohaline circulation: Mechanisms and predictability. Proceedings National Academy of Sciences (USA), 97, 1347-1350. (Ileana Mares, ROMANIAN ACADEMY OF TECHNICAL SCIENCES)	
12-1075	A	54	18	54	20	The reference of Schneeberger (2003) is incorrect. Volume and page numbers should be 282 and 145-163, respectively. (Lisette (E.J.) Klok, Royal Netherlands Meteorological Institute)	OK
12-1076	A	56	22			Johansson,T. and J. Goldberg (eds), 2002: "……" must be translated at p 46 line 17 (Michele Colacino, ISAC-CNR)	OK
12-1077	A	56	39	56	40	The proper reference is: Vermaat, J.E., Bouwer, L.M., Turner, R.K. & Salomons, W. (2005). Managing European Coasts: Past Present and Future. Springer Verlag, Berlin, 387 pp. (Laurens Bouwer, Institute for Environmental Studies, Vrije Universiteit)	OK
12-1078	A	58	11			http://www.wmo.ch/web/wcp/ccl/opag/terms3.html#3.7 Comment WMO-CCl is just (November 3-10) updating the TORs of the expert teams. So I suggest to refer to the new TORs because both expert teams will be merged. (Gerd Jendritzky PhD, Meteorological Institute, University of Freiburg)	OK