



**IPCC WGII
Fourth Assessment Report
Climate Change Impacts, Adaptation and Vulnerability
*Government and Expert Review of Second Order Draft***

Specific Comments

GOVERNMENT REVIEW COMMENTS

Chapter 12

August 2006

Discussion of Government 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 AUGUST

Substantive comments

- The chapter writing team should discuss all substantive Govt review comments, by email and/or at Cape Town.
- 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 should be kept in this document, ideally electronically.
- 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 **8th December 2006**.

IPCC WGII AR4 SOD *GOVERNMENT* Review Comments

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
G-12-1	A	0	0	0	0	<p>We have looked through the part of the report describing the freshwater resources, in Chapter 12 – Europe and in this comment we will focus on observed and projected changes in Norway, versus the changes described in the report and are given as general comments rather than as propositions for changes of specific parts of the text. Generally we find that the direction of most of the trends and projections agree for Norway as described for Northern Europe, but we will point out some differences caused by the more small scale regional differences in Norway. Norway is characterised with high regional variability in rainfall and runoff. The distribution is strongly dependent on the dominant atmospheric circulation because of long mountain ranges parallell with the coast with pronounced orographic reinforcement of the precipitation on the windward side and rain shadows on the lee side of the mountain ranges. We see that the difference between West Norway and the rest of the boreal zone is mentioned in Chaper 12. This regional variability introduces differences in trends in the observed series which may differ from the overall coarser picture. The runoff regime in Norway as well as in Sweden and Finland is much related to changes in the accumulation and melting of snow in the winter season. The observed changes in Norway are more pronounced in the seasonal data than in the annual values, and are more related to the temperature signal than changes in the precipitation. We agree therefore that the climate-driven changes are attributed to increase in the temperature as mentioned in Chapter 1. There are no obvious increase in the flood magnitude based on long term flood series as well as information of floods prior to the instrumental period. We find however that floods of different causes tend to cluster depending on the climatic conditions. There are evidence for huge floods prior to or at the end of the most severe spells of the Little Ice Age of magnitudes not observed afterwards. These floods are caused by intensive rainfall often in combination with snowmelt, and seem to occur during brief warm spells. The atmospheric circulation causing some of these events are fairly rare, but is known to have caused extreme floods on the European mainland. Summer and early autumn floods caused by intensive rainfall are dominant in warm decades, while large combined snowmelt rainfall floods are dominating the cooler decades. We see however a shift towards earlier spring floods and later start of the winter season. Many of the changes are related to urbanisation and other land use changes, which are mostly not climate-driven. Hydropower reservoirs and diversions can easily have a larger effect on the magnitude and seasonality of the extremes than the climate-driven changes. Afforestation is increasing in parts of Norway, mostly as a consequence of the termination of grazing by farm animals, but also to some extent as a consequence of</p>	<p>This information is useful and has been noted.</p>

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						a gradual increase in the tree-limit in mountainous areas. This is likely to have some consequences for the water balance, but has so far not been included in our model runs. (Government of Norway)	
G-12-2	A	0				I have no specific remarks concerning Chapter 3 and 12. There is only one general comment concerning inserting a list of acronyms in the end of the report. It would improve understanding of the report, which is written clearly and concisely, taking into account all issues comprehensively. A number of existing figures and charts facilitate understanding of the text and illustrate mentioned problems summing them up in clear way. A lot of references reflect comprehensive recognition of problems taking into consideration in Chapters 3 and 12. The comprehensive presentation of problems concerning impact of climate change and its variability to water environment in global as well as regional and local scale emphasizes broad scope of application of the report. (Government of Poland)	We expect that this is at least partly covered by the glossary.
G-12-3	A	0	0	0	0	An important reference is missing: EEA, 2005. Vulnerability and Adaptation to Climate Change in Europe. Technical report No 7/2005 which can provide additional information in various areas. E.g. on page 9, section 12.2.3, it can be used to expand and enrich the text. Also the Arctic Climate Impacts Assessment has information about possible impacts in northern Europe that is not yet reflected in the chapter. (European Union)	A reference to EEA (2005) is made in section 12.4.5 on wetlands
G-12-4	A	0	0			The chapter should include a discussion on the importance of land use and different soil parameters on the emission of green house gases. (Government of Sweden)	This is covered in WG III report.
G-12-5	A	0	0			A discussion on the effects of increased use of biomass for energy production on land use should be added (Government of Sweden)	This is material that falls under WG III.
G-12-6	A	0	0			A discussion on peatlands should be added since these probably will increase as a result of increased precipitation in northern Europe (Government of Sweden)	Now addressed in 12.4.5
G-12-7	A	0				With the exception of Section 12.6.2, the chapter largely ignores the risk of large-scale abrupt climate change. I suggest that the results of the research project "ATLANTIS - Atlantic Sea Level Rise: Adaptation to Imaginable Worst Case Climate Change" are mentioned, possibly in a separate short Section 19.6.3. Caveats would be necessary since most of the work has not been published in the	Section 12.6.2 addresses impacts of circulation change. In addition, adaptation to sea level rise addressed in 12.5.2 We cannot expand these sections because of space limitations.

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						peer-reviewed literature but the enormous amount of informaton available in the documents at http://www.uni-hamburg.de/Wiss/FB/15/Sustainability/atlantis.htm should warrant some attention in this chapter. (European Union)	
G-12-8	A	0				This chapter does not consider, the results of the "INTEGRATION - Integrated Assessment of Changes in the Thermohaline Circulation" project, which specifically addresses impacts of a decline or breakdown of the THC/MOC in different European regions and sectors. The findings are available on http://www.pik-potsdam.de/~stefan/Projects/integration/publications.html . Some of them, in particular on fisheries, have already been published in the peer-reviewed literature and therefore deserve attention. This work should be cited in Section 12.4.7. und 12.6.2. (European Union)	Section 12.6.2 addresses impacts of circulation change.
G-12-9	A	0				There seems to be too much focus on impacts and too little on adaptation. Europe is probably the furthest advanced of all regions in adaptation research, but this isn't adequately reflected here. There may be some reasons for this. First, a large proportion of the adaptation research involves and is often funded by stakeholders. As such, the reports of such work are often to be found only in grey literature, some of which is proprietry. It is very important to get feedback from some of the agencies and individuals who have been involved in such work (which is very likely to happen in this review). Second, the peer-reviewed scientific literature may also be problematic for this author team, because the journals in which some of this work is found can be quite different from those in which the bulk of the conventional impacts literature is located (generally more social science orientated). (Government of Finland)	Text follows format specified for WG II. One-third of text devoted to adapation.
G-12-10	A	0				The following important reference has not been considered and should be discussed: O'Brien, K.L., Sygna, L. and J.E. Haugen. 2004. Resilient of Vulnerable? A Multi-Scale Assessment of Climate Impacts and Vulnerability in Norway. Climatic Change 64: 193-225. (European Union)	While this is an important reference, we must maintain a balance in this chapter between different parts of Europe. Cannot afford to concentrate on a particular country.
G-12-11	A	0				The following important reference has not been considered and should be discussed in Section 12.4.2 and 12.6.2: Levermann, A., Griesel, A., Hofmann, M., Montoya, M., and Rahmstorf, S., 2005: Dynamic sea level changes following changes in the thermohaline circulation, Climate Dynamics, 24, 347. This article shows that a breakdown of the MOC would lead to regional sea-level rise up to 1m within a few decades.	Included

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						(European Union)	
G-12-12	A	0				The chapter often lists sensitivities or impacts of single sectors only. An assessments of the reported impacts is often missing. Moreover a comprehensive integrated assessment of the vulnerability is missing. In those cases impacts have been assessed these assessments lack transparency as the criteria used have not been explained. Therefore IPCC should clarify assessment criteria used and put more effort into a transparent assessment of impacts, adaptive capacity and vulnerability. After a transparent assessment the future risks have to be shown/presented more prominently as they are relevant for activities, e.g. the identification and implementation of mitigation and adaptation measures. (Government of Germany)	IPCC not charged with doing new analyses. Must review published work. Will review this work when available.
G-12-13	A	0				The chapter covers most of the literature on climate impacts, vulnerability and adaptation in Europe, with some important exceptions in the area of large-scale / abrupt climate change. Most impact statements are only qualitative. They do not distinguish between low and high emission scenarios. This significantly limits the usefulness of the chapter for decision-makers concerned with mitigation of climate change. Also, there is a lack of estimates of the costs of market impacts. Authors should state that such cost estimates are not available from the literature. If they believe that such estimates could, in principle, be made they may wish to highlight this point in Section 12.8 as a research priority. (European Union)	Scenarios not compared for following reasons: 1. Space not available 2. Often this information not reported in the literature 3. Often not large differences between non-mitigation scenarios
G-12-14	A	0				New reference: Lind, B.B., Andersson-Sköld, Y., Hultén, C., Nilsson, G. 2006. Safe roads in times of changing climate. Proceedings, Transport Research Arena Europé 2006, Göteborg, Sweden, June 12th-15th 2006. (Government of Sweden)	Noted
G-12-15	A	0				Lack information (proxi data etc) on past global change, past 20 000 years and older (Government of Sweden)	Not within scope of chapter
G-12-16	A	0				Key hotspots should be included for Northern and Southern Europe as in chapter 11, figure 11.6 (Government of Finland)	Figure 12.1 imparts a similar message and space is not available for a second map.
G-12-17	A	0				Great improvement from FOD - congratulation! (Government of Czech Republic)	Noted
G-12-18	A	0				Generally, efforts should be made to include more statistics from non-EU countries. (Government of Norway)	Great effort made to assess available reports from non-EU countries. Far fewer available from these countries compared to EU.
G-12-	A	0				General conclusions for all South of Europe are extracted in basis to very local	

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19						studies that are not representative enough for all region. For a great part of the Mediterranean region, spring and autumn are the seasons with the highest contribution to annual rainfall, and, until this moment no conclusive results have been obtained for these seasons (Government of Spain)	The conclusions are based on projections based on GCM and RCM. There are other lines of research that, apparently, may bring different perspectives in some parts of the Mediterranean, but these results are not out yet
G-12-20	A	0				Chapter length is fairly well on target. It exceeds the 31 page indicative length by only 0.5 pages (excluding 2 contents pages) (Government of Finland)	Noted
G-12-21	A	1	15	1	15	Phil Graham is based in Sweden (Government of Finland)	Changed
G-12-22	A	3	0	4		In the summary something should be added about the fact that many climate change impacts exacerbate stresses from other pressures, and the degree to which climatic factors play a role varies from small to dominant. Now it is implicitly suggested in the summary that the impacts are stand-alone impacts not related to any other stresses. (European Union)	Noted. Phrase added: "The adaptive capacity of ecosystems can be enhanced by reducing human stresses."
G-12-23	A	3	0	4		In the summary something about human health should be added beyond just mentioning heatwaves, including the link with air quality (European Union)	The new summary has expanded the issues related to health, focussin on positive and negative aspects of temperature. Projections of air quality issues were not much developed in the chapter, based on the reviewd literature.
G-12-24	A	3	0	4		In many places "high" or even "very high" confidence is combined with "may" in the text, while the word "will" in other places suggests complete knowledge. It is not always clear if the statements are about vulnerability or about impacts. The figure rightly shows vulnerability, but much of the text suggests (impacts "will" occur) that there will be no adaptation. Where there are options to reduce vulnerability and adapt (agriculture, tourism (artificial snowmaking), coastal protection) this should be noted. (European Union)	All authors have addressed this.
G-12-25	A	3	1	4	47	The executive summary should include text about effects on pollution and air quality of climate change e.g. effects on ozone, changes in long range transport of air pollution etc. (Government of Norway)	Inadequate room to add an additional point to the Executive Summary

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G-12-26	A	3	1	4	47	Executive summary needs careful editing; There are hardly any confidence statements in the executive summary re. future impacts. The authors may wish to add reasonable confidence estimates. The first bullet point in the executive summary is unclear and deserves rephrasing (why and to what extent has our understanding increased; why is mitigation not being taken into account). To reflect the chapter structure, one or two bullet points at the beginning should highlight impacts of observed climate variability and change (incl. extreme events) and evidence for adaptation to these impacts. Currently, the findings from Section 12.2 are not reflected at all in the executive summary. Also add a separate bullet point stating that virtually all negative impacts of climate change can be reduced by mitigating greenhouse gas emissions and to add some references from regional and/or global impact studies in the text to support this statement. (European Union)	Exec Summary extensively revised.
G-12-27	A	3	1	4	47	A lot of key findings in the ES seem to be much the same as those in the TAR. Perhaps this is the reality of the situation, but I would have thought that there have been some new advances (especially in adaptation research) that are different from those in the TAR. (Government of Finland)	All new advances highlighted in revised ES
G-12-28	A	3	2	3	5	Our impression is that the research not only has advanced our understanding but also reinforced the conclusions in the TAR. Please indicate how we look at the conclusions from TAR now. (Government of Norway)	This is discussed in Section 12.1.1
G-12-29	A	3	4	3	5	Are there no results reporting studies that use low SRES emissions scenarios as surrogates for stabilisation scenarios (in terms of emissions and related climate change)? (Government of Finland)	Very few, and usually the distinction between scenarios is not emphasized.
G-12-30	A	3	7	3	8	Winter and summer are the seasons usually analysed. Results from different scenarios as well as results from empirical data do not allow to extract any conclusion with a "very high confidence" degree regarding spring and autumn. Annual rainfall precipitation has a bimodal behaviour in Western Mediterranean with a main maximum registered in autumn and a secondary one in spring, and it would be necessary to have more information about them in order to have any conclusion. However, only one sentence is found about these seasons in chapter 12, p. 10, l. 24-25, that says: "Relatively small precipitation changes were found for spring and autumn seasons", and results of WGI are also centered in summer and winter. Proposal: substitute in the headline "among seasons" by "winter and summer"	Text changed extensively. We now emphasize that it is the regional differences that have "very high confidence" rather than the specific climate changes within a region that have "very high confidence".

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						(Government of Spain)	
G-12-31	A	3	7	3	14	The bold text refers to the future (21st century) but the non-bold text refers to observations and uses present tense. This apparent contradiction needs to be clarified. (European Union)	Wording modified in text.
G-12-32	A	3	10	3	10	Wording needs to be tightened up. Climate scenarios indicate significant warming, greater in winter in the north and greater in summer in S. and Central Europe. (Government of Finland)	Wording modified in the text
G-12-33	A	3	12	3	13	It is not possible to assess that summer precipitation decreases very substantially along the Mediterranean. Reliable studies have found an increasing trend in summer precipitation. Barrera et al (in prep) show after the analysis of 106 series available for the period 1897/98-1997/98 that no significant trend has been found in Spain, with the exception of the Balearic Islands, that have a negative trend. Mosmann et al (2004) find that convective precipitation will increase in summer in mainland Iberian Peninsula. Altava and Llasat (in prep) have found that summer precipitation is increasing in West and Central Mediterranean, studying 17 stations with more than 80 years. Polemio and Casarano (2004) also show the increase occurrence of short-period intense precipitation in summer although it cannot balance the negative effects over the annual precipitation in Italy. Proposal: delete "the Mediterranean" in this sentence and add a new sentence according with this fact, adding new references if you would like. References: Barrera, A, Llasat, M.C. (in prep.) Temporal evolution of regional precipitation in Spain and NAO influence. To be submitted in IJC. Altava, V., Llasat. M.C. (in prep) Flash floods and increase summer precipitation in Central and Western Mediterranean. To be submitted in NHESS. Mosmann, V., Castro, A., Fraile, R., Dessens, J., Sánchez, J.L. 2004. Detection of statistically significant trends in the summer precipitation of mainland Spain. Atmospheric Research, 70(2004) 43-53. Polemio, M., and Casarano, D., 2004. Rainfall and drought in southern Italy (1821-2001). UNESCO/IAHS/IWHA. Publ. 286, 2004. (Government of Spain)	This sentence in the ES refers to climate scenarios from model results and not to observed present trends. Decrease in summer precip in the Med is indeed indicated by regional climate modelling studies.
G-12-34	A	3	17			How can the confidence level be high if the statement itself uses rather uncertain terminology ("may become", "may be reduced")? (European Union)	Terminology improved in new ES
G-12-35	A	3	19	3	21	Please combine both statements and draw a conclusion: "a water availability may be reduced by 80% during summer in S Europe" and "increasing irrigation requirement". What about the adaptive capacity?	ES revised

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						(Government of Germany)	
G-12-36	A	3	19	3	21	Following my previous comment about summer precipitation, and the information about the South of Europe in which chapter 12 is based it would not be possible to say with an high confidence degree that "water availability during summer in S. Europe may be reduced by 80% or more, leading to water shortages". This figure is very high and it has been obtained only for one Atlantic river. Besides this, summer water availability also depends of the water storage in reservoirs, that, in most places depends on the spring and autumn rivers. (Government of Spain)	Text changed
G-12-37	A	3	25	3	32	What time horizon is implied here? For instance, surely there are differences between the 2030s and 2100? (Government of Finland)	Statement added at beginning of ES
G-12-38	A	3	25	3	26	Unclear statement. Replace "overall" by "total"? And add "significantly", because changes are expected. Or do the authors have high confidence that e.g. the expansion of forests in the north is exactly compensated by losses in the south? (European Union)	This conclusion as written has been eliminated from the new ES.
G-12-39	A	3	26	3	32	"greater differences will arise between countries" is very important with regard to adaptation. Please assess the adaptive capacity and the vulnerability of SE Europe explicitly. Add some text from section 12.6.1 in order to show risks caused by extreme wheter events on an increasing variability of yields. Insert a further sentence describing possible risks for livestock. (Government of Germany)	Inadequate literature available on adaptive capacity and vulnerability of SE Europe to make definitive statements.
G-12-40	A	3	30			"will" ? Or "is likely" like the other findings? (European Union)	ES wording has been revised
G-12-41	A	3	34	3	35	Change "although ... regions" into "but with significant variation across hazards and regions". Add "Most" at the beginning of the sentence. (European Union)	Text extensively modified.
G-12-42	A	3	35	3	37	Why are snow-melt related floods not expected in Northern Europe? Winter temperatures are expected to rise in the north. (Government of Finland)	It is stated in the chapter that flood risk is also likely to increase in N Europe.
G-12-43	A	3	35			How can the authors have very high confidence (9 out of 10 chance) in the increase of natural hazards, if the future development of some climate extremes itself is still under debate? The word "will" is used several times, which is even stronger that the 99% "virtual certainty" of the likelihood scale. The text (e.g. page 11) is more uncertain, e.g. for extreme winds "results are not robust". (European Union)	Text modified
G-12-	A	3	37	3	39	Last decades have shown that extreme events can cause big economic losses,	

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44						injuries, threats for water quality and other assets. If future scenarios show an increasing number and intensity of storms IPCC should explicitly assess the risks connected with these storms. Therefore please include an assessment of risks caused by climate-related natural hazards in the executive summary and supplement this assessment with appropriate adaptation measures. (Government of Germany)	Studies are not yet available to be reviewed by the IPCC.
G-12-45	A	3	38	3	39	Studies do not offer enough proofs to assess with a very high confidence degree that "storminess and wind intensity may decline along the Mediterranean". On the contrary, the temperature increase could favour the severe weather increase in this region. (Government of Spain)	Statement on storminess and wind intensity deleted from ES.
G-12-46	A	3	40	3	40	the increase in insurance cost by 2% to 4% might be a result of decisions from companies to cover more damages or from users to build deliberately and constantly in dangerous areas. This is not a consequence of climate change, and such a sentence has not its place in an executive summary of a scientific document. The consequence of climate change is floods, not damages. Such percentages are an incitation or a justification to raise the cost of today insurance. (Government of France)	Deleted from ES
G-12-47	A	3	40	3	41	It is not clear whether the flooding risk (2.5 million people each year) refers to current conditions, to future conditions, or to the added risk under future conditions. (European Union)	ES text now begins with the statement "Results reported here are based on a range of emission scenarios extending up to 2100 which assume no specific climate policies to mitigate greenhouse gas emissions. "
G-12-48	A	3	40	3	40	Add new sentence: "In regions where an increase in precipitation is predicted, increases in erosion and landslides are likely (Lind et.al., 2006)". (Government of Sweden)	The issue of erosion was not included as the chapter did not focus on soil processes. Most of what is known about torrential rain impacts is in the Med region, and their the projections about torretiality are being debated. The issue of landslide is much less known and was not covered in the chapter. Given the limited space we had to make choices and these issues remained uncovered.
G-12-49	A	3	43	3	43	The phrasing of the sentence is misleading. It should read something similar to (addition capitalized) "Reduced snow cover and LONGER frost-free periods increase water logging and floods in northern forests." (Government of Finland)	Deleted in ES

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G-12-50	A	3	43	3	43	The is the first reference I have come across to "floods in northern forests". Is this intended? (Government of Finland)	Deleted in ES
G-12-51	A	3	45	3	46	This is fairly vague language. What type of variability is described here? For some variables and time steps climatic variability is already high in Parts of Europe. (Government of Finland)	Deleted in ES
G-12-52	A	3	45	3	47	The summer 2003 showed that heat waves and dry periods can cause big economic losses, decreasing yields, increasing number of forest fires, threats for water quality, increasing mortality and other risks. If future scenarios show an increasing number and intensity of heat waves and dry periods IPCC should explicitly assess the risks connected with these meteorological phenomena. Therefore please include an assessment of risks caused by these events in the executive summary and supplement this assessment with appropriate adaptation measures. (Government of Germany)	Risk studies not available to be reviewed.
G-12-53	A	3	46	3	47	Don't these regions already have a recurring dry period? (Government of Finland)	Deleted in ES
G-12-54	A	4	1	4	2	Again, when are these impacts supposed to occur? (Government of Finland)	Elaborated in revised ES
G-12-55	A	4	7	4	8	Warming may also increase risk of algal blooms and growth of toxic cyanobacteria in the sea, esp. the Baltic Sea (Government of Finland)	This issue is covered in 12.4.5
G-12-56	A	4	7	4	8	There are no comments about the risk of algal blooms in brackish water estuaries like the Baltic! Maybe these areas are included in lakes? (Government of Finland)	See above
G-12-57	A	4	11	4	11	Is all European biodiversity severely threatened? There will probably be gains in some regions too (as mentioned later) (Government of Finland)	Yes, it is mentioned. However this might depend on dispersal abilities. References are given in regard to this in section 12.4.6
G-12-58	A	4	21	4	28	What kind are the challenges to many economic sectors? Are they prepared to react? What can be said about adaptive capacity and vulnerability of these sectors. How can these sectors adapt, are there adaptation options available? Are these options in a phase of implementation already? What can be said about energy, transport, fishery, agriculture and fishery. European economy is more than tourism. Please specify and assess in a way which is not so neutral. (Government of Germany)	Text changed
G-12-59	A	4	35			"or even positive in Central Europe" based on our knowledge we disagree this statement unless IPCC makes its assessment criteria transparent (Zebisch, M., T. Grothmann, D. Schröter, C. Haße, U. Fritsch, W, Cramer (2005): Climate Change	

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						in Germany – Vulnerability and Adaptation of climate sensitive Sectors. Umweltbundesamt Climate Change 10/05 (UFOPLAN 201 41 253). ISSN 1611-8855. Dessau 2005. pp 205. (http://www.umweltdaten.de/publikationen/fpdf-1/2974.pdf) . (Government of Germany)	Text deleted
G-12-60	A	5	1	5	27	Fig 12.1 does not include key vulnerabilities for UK, Scandinavia and the North-Atlantic ocean. Please consider including vulnerabilities for these area if they are identified in the literature. Furthermore it would be better if the colours in the figure where also used as colours in the description in the figure text. (Government of Norway)	Vunerabilites have not been included for specific countries, but for biogeographic regions. We experimented with different colours and thought that this was the best choice
G-12-61	A	5	2	5	31	Nice map (Government of Finland)	Noted
G-12-62	A	5	24	5	28	"SLR" should be explained in the caption; change caption text to (addition capitalized) "Key vulnerabilities of European ECO-systems and sectors ..." (Government of Finland)	SLR is spelled out in the figure. We prefer to leave systems, not ecosystem, even if hyphenated, not nos mislead the readed that we are referring to a wider range of systems.
G-12-63	A	5	35			It would be useful to provide a definition of the region covered in this chapter on Europe. (Government of Finland)	Done
G-12-64	A	5	39	5	41	The authors could reference chapter 3 in the Working Group I report (after checking the details, of course) (Government of Finland)	This section is summary of knowledge in TAR rather than update of latest information.
G-12-65	A	5	44			Is the given range of temperature change due to different emission scenarios and/or different modelling results? Please explain (Government of Germany)	Text changed
G-12-66	A	5				Map BO. Add new sentence: "Decrease of soil stability in fine grained sediments". (Government of Sweden)	Noted
G-12-67	A	6	5	6	5	What about sea level? (Government of Finland)	Sea level added
G-12-68	A	6	10	6	11	This sentence suggests that adaptive capacity is largely equivalent with economic development. This is a gross oversimplification that should not be passed on uncritically (see Section 17.3.1 for a detailed discussion of this topic). (European Union)	Sentence changed to “which is often related to”.
G-12-69	A	6	23	6	23	Here is would be useful to have a summary of the major new findings since the TAR prior to describing them in more detail. This device was used rather successfully in the North America chapter. (Government of Finland)	Covered in executive summary of chapter.

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Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
G-12-70	A	6	25			The titles of Section 12.2. and subsections are unclear and/or not reflecting the contained text. I suggest the following changes: 12.2 "Observed changes in climate-sensitive sectors and systems", 12.2.1 "Changes in climate factors", 12.2.2 "Changes in non-climate factors", 12.2.3 "Observed impacts and adaptations" (European Union)	Titles are imposed to be coherent with other chapters
G-12-71	A	6	25			Section 12.2.1 , comment: In general: An assessment of the already observed changes on ecological and / or socio-economic systems is missing. In other words: Do we already see risks caused by weather- or climate driven changes, especially with regard to extreme events? Or are the observed changes rather beneficial with regard to development objectives (e.g. the capability of sustainable economic growth with a growth rate of around 3% (Lisbon Strategy) or the hold of losses of biodiversity by 2010)? Please add an assessment e.g. similar to table 12.7. (Government of Germany)	Systems and sectors are already vulnerable to extreme events. Some of your suggestions are treated in 12.3. We must recognize that the chapter is mainly directed toward impacts on the 21 st century, not on observed changes and on the attribution to climate change (topic of WG1 and also in chapter 1, this WG), the table you propose can hardly be constructed, because of lack of space for that in the chapter and because of lack of supporting literature
G-12-72	A	6	31	6	31	3 decimal places is excessive given the uncertainties in observations. Perhaps some error bands should be given (using the latest information referenced in the WG I report. (Government of Finland)	3 decimal correspond to the reference, but is reduced to 2. The number is statistically significant (this why it is presented here) (this for the error band comment).
G-12-73	A	6	41	6	42	What does "some recent aspects of Europe" mean? Furthermore I am not sure whether marine systems really react on precipitation changes or rather on changes of the whole climate regime. The reader will better understand the following wording as it is familiar from the TAR : "Some ecological and socio-economic systems (for example marine and terrestrial ecosystems) have already shown significant changes to recent trends in climate change." (Government of Germany)	A word is missing, the sentence is corrected In table 12.1, impacts are mainly related to changes in temperature.
G-12-74	A	7	1			Table 12.1: The work of A. Menzel and colleagues on the link between regional climate change and phenology in Europe is completely ignored here whereas Chapter 1 provides 16 references to it. (European Union)	Reference added
G-12-75	A	7	2	7	3	Table 12.1 refers to palsa mires in a region labelled "Fennoscandian mountains". This is not quite correct as palsas can occur outside mountain regions. I suggest to call the region "Fennoscandian mountains and subarctic"; this would also be a little more consistent with Table 12.6. (Government of Finland)	Accepted, table corrected
G-12-76	A	7	2	7	2	In Table 12.1 it would be useful to describe which climatic variables are implicated in these observed changes, temperature, precipitation, both or some other	Accepted, The text precise that changes are mainly linked to temperature changes

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						variable(s). (Government of Finland)	
G-12-77	A	7	5			Section 12.2.2 is too general. Sectors are banded together or muddled around with no clear coherence or sense. It's not clear what it's purpose is and how it relates to impacts, adaptation and vulnerability. There is a need for a descriptive base of some sort - building on this, but it needs to be clear that it is for context setting and that many of these issues impact on/exacerbate/are impacted by climate change and adaptive capacity. (Government of UK)	The section has been restructured to better reflect the relationship to the section on impacts and vulnerability, and text on European energy use has been included.
G-12-78	A	7	7	7	17	Not a very informative section, with statistics that are very difficult to interpret (what is N.Europ, what S. Europe; what is meant by variable economic conditions... within the EU these are also huge). Either the section should be more general: Europe is diverse, difference between EU and non-EU, position Europe in the world in terms of GDP / agriculture etc. Or it should be more specific, and include a table with information for the different European countries. (Government of Netherlands)	The text has been restructured to better reflect the relationship to the sections on impacts and vulnerability, but the description of diversity in Europe has been maintained.
G-12-79	A	7	7			Is there a more updated population figure? (Government of Norway)	The text on population number has been removed to save space.
G-12-80	A	7	7			Could the text specify the European countries that are not part of the EU-25? (Government of Norway)	No space available
G-12-81	A	7	11	7	12	GDP and MER may not be familiar acronyms to all readers (Government of Finland)	MER has been spelled out, but it is believed that GDP is a commonly known phrase
G-12-82	A	7	19	7	22	Rephrase paragraph; the paragraph -wrongly- suggests that Russia has been integrated in the EU and NATO. Is GDP growth due to NATO membership? (European Union)	NATO has been omitted from the sentence
G-12-83	A	7	0			Table 12.1: During the last decades several systems have shown sensitivity to trends of extreme events as heat waves or heavy precipitation. Therefore the impacts of extreme events should be included. I recommend to insert text from page 29: For "Agriculture": Region Central Europe / Observed change: Reduced agricultural production and increased production costs due to heat wave accompanied by drought led to 11 billion €losses. / reference: Olesen and Bindi, 2003. (Government of Germany)	Noted
G-12-84	A	7	0			Table 12.1: Baltic Sea should be included in the table (Government of Finland)	Noted
G-12-85	A	7	0			Section 12.2.2, whilst important, seems to be stuck in for the sake of completeness. There is no explanation of why these so called non-climate factors (although the	Conforms with structure prescribed for IPCC report

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						discussion on forests and soil carbon seem very climate related) are important in the context of this chapter, it is just a list of issues currently facing Europe's natural resources and environment. This needs some context to explain how it affects sensitivity and vulnerability. (Government of UK)	
G-12-86	A	8	7			Is it not too simplistic to say that CAP reform is going to lead to larger and fewer farms? With current focus on environmental stewardship and also the trend for organics, this picture is complicated. There should perhaps be mention of the uncertainty over CAP reform and where it might take us in the future. (Government of UK)	The scale of economics will lead to larger and fewer farms, irrespective of whether these are organic or not. The reform of the CAP will only modify the speed of this process, not fundamentally change it.
G-12-87	A	8	10	8	10	lower then what... or hould in be decreasing? Then at what rate, since when, and with what distribution (Government of Netherlands)	The text has been modified to reflect that this refers to sustainable levels of fellings
G-12-88	A	8	10	8	10	Change "lower" into "decreasing" since this sentence seems to report a trend. (European Union)	The text has been modified to reflect that this refers to sustainable levels of fellings
G-12-89	A	8	24	8	25	Change the text in brackets to "ranging from 5 t CO2 per capita in Latvia to 24 t in Luxemburg" to avoid misunderstandings. (European Union)	The text has been rephrased, and now does not compare individual countries.
G-12-90	A	8	24			What is the average per capita GHG emission for Europe as a whole? (Government of Norway)	This estimate is now given for EU25.
G-12-91	A	8	24			Talk of emissions reduction targets is certainly not a 'non-climate factor and trend'. (Government of UK)	Non-climatic factors and trends refer to those not affected by climate change, and emission reduction targets are in this context not impacts of climate change.
G-12-92	A	8	27	8	28	What is the overall trend for GHG emissions between 1990 to 2002 for the EU-25 and Europe as a whole? (Government of Norway)	These trends are now mentioned.
G-12-93	A	8	31	8	31	Delete bracketed text as it is not clear what means "additional countries" (Government of Czech Republic)	The text has been rephrased to adjacent countries
G-12-94	A	8	31			Please specify the 5 non-EU countries (Government of Norway)	No space available
G-12-95	A	8	43	8	49	Delete text starting the sentence "European countries...." as given detailed information seems to be superfluous and unnecessary (Government of Czech Republic)	The sentence has been deleted.
G-12-96	A	8	48			Please explain the abbreviation "CEE" once at least. (Government of Germany)	CEE is explained in the first paragraph of section 12.2.2
G-12-	A	9	3	9	37	There is very little in this section on adaptation that has already been implemented	

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97						to cope with climate variability and/or in anticipation of climate change. The authors could ask someone from the Tyndall Centre to draft this, or from UKCIP, or Richenda Connell (formerly UKCIP now in the private sector). (Government of Finland)	Adaptation is extensively covered in Section 12.5 of this chapter.
G-12-98	A	9	5			An assessment of already observed or current effects can clearly be made. We do not speak about any future projections. Therefore delete "expected to be". (Government of Germany)	Text changed
G-12-99	A	9	7			12.2.3 reference Commission Communication 'Winning the Battle against Global Climate Change' (Oct 2005) - more up to date expression of need to adapt. (Government of UK)	Noted
G-12-100	A	9	19	9	28	What can be said about current adaptation and the adaptive capacity of threatened managed systems (see figure 12.1)? Which adaptation priorities exist in different regions? What nature are most of the measures (technical / institutional / legal)? (Government of Germany)	Addressed in Section 12.5
G-12-101	A	9	21	9	21	decades or longer! (Government of Finland)	Text changed
G-12-102	A	9	22	9	28	This describes future change and isn't relevant in this section. What about describing ongoing adaptation to climate change (e.g. in agriculture). (Government of Finland)	Text changed so it clearly refers to current adaptive capacity
G-12-103	A	9	30	9	37	Incorporate information that Czech Republic also have begun to integrate plans for climate change adaptation into flood defense focused in particular on flood protection and integrated warning system (as consequence of floods in 1997, 1998, 2002, 2004 and 2005 in large and small catchments) (Government of Czech Republic)	Text changed
G-12-104	A	9	32	9	32	Great Britain -> UK (Government of Finland)	Changed
G-12-105	A	9	42			Section 12.3.1 is too long and is not properly related to the impacts reported later in the chapter. I suggest cutting the length by half and using a summary table. The section needs to make reference to the TAR projections presented in Chapter 2 but focusing on Europe, and then comment if more recent model projections are different from the TAR projections. There is a whole section on Europe in Chapter 11 of WG I which should be cited and the main points pulled out. There also seems to be too much emphasis on projections from a few models. This is reasonable only if these models results are applied in the impact studies that are reported in this chapter. (Government of Finland)	Noted
G-12-	A	9	44	10	27	The paragraph describing projected changes in mean climate seems to focus	All information available was reviewed

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106						entirely on results from Regional Climate Models. However, these present a limited part of the uncertainty range, as the RCM studies cited only use a small number of driving GCMs. AOGCM results should be better incorporated into this section. Furthermore, probably only very few of the impact studies reported in chapter 12 use the RCM information that are described in relative detail. Mean changes in temperature and precipitation could summarize the information from other chapters of AR4: Chapter 2 (2.3.1.2) of WG II and Chapter 11 (11.3.3.3) of WG I. (Government of Finland)	
G-12-107	A	9				Chapter 12.3.1. Add a new chapter regarding the trends of precipitation. (Government of Sweden)	Precipitation already described in subsection 12.3.1.1
G-12-108	A	10	9	10	14	The Räisänen reference is not a PRUDENCE paper. The correct general reference should be to Christensen et al. (submitted). Christensen, J.H., T.R. Carter and M. Rummukainen, submitted: Evaluating the performance and utility of regional climate models: the PRUDENCE project. Climatic Change. (Government of Finland)	Reference changed
G-12-109	A	10	23	10	23	The use of a "95% confidence level" should be replaced with the standard AR4 notation of "very high confidence". (Government of Australia)	Confidence level replaced with standard AR4 notation
G-12-110	A	10	37	10	46	This paragraph is one of many examples where quantitative impact estimates (8% increase in windiness) are cited without specification of the emission scenario and point in time or the magnitude of regional climate change. It is important to present this context clearly - here and elsewhere in the chapter. (European Union)	Scenario specifically cited
G-12-111	A	11	10	11	14	Summer precipitation in Mediterranean region is mainly produced by short (it rarely takes more than 2 days) but intense convective events (Llasat, 2001) the number of rainfall days during this season is less than 20%; if the number of wet days would decrease but the amount of precipitation per day would increase, the impact over the total summer precipitation would not be clear with the provided references. The works quoted do not show any robust negative trend in Mediterranean area for summer precipitation (i.e., see the exceptions of Iberian Peninsula and Balkanic region) Proposal: Cut "and the Mediterranean region during summer and add "Impact over Mediterranean region is not clear due to the strong convective component in summer rainfall and its great space variability". Reference: Llasat, M.C. (2001) An objective classification of rainfall events on the basis of their convective features: application to rainfall intensity in the Northeast of Spain. International Journal of Climatology 21: 1385-1400. (Government of Spain)	Suggestion followed and text changed accordingly

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G-12-112	A	11	26	11	26	West Mediterranean Area also currently has a regularly recurring dry periods. Dry periods are a climatic signature of the region. Proposal: it would be better to substitute the sentence by "The Mediterranean and even much of E. Europe may experience an increase of dry periods by the late 21st century". You could add the cite of Polemio and Casarano (2004). Polemio,M., and Casarano, D., 2004. Rainfall and drought in southern Italy (1821-2001). UNESCO/IAHS/IWHA. Publ. 286, 2004. (Government of Spain)	Text substituted by proposal
G-12-113	A	11	31	11	34	For communication purposes it would be better to substitute "although the changes were not statistically significant in all months of the year" by a statement giving the statistically significant months of the year explicitly. For example: "... found an increase in extreme wind speeds for... in January and February." (Government of Germany)	Noted
G-12-114	A	11	46	11	47	Change "negative net birth rate" to "surplus of deaths over births" or "negative birth surplus". (European Union)	Addressed
G-12-115	A	12	4	12	5	Again, reference to Chapter 2, which describes the SRES socio-economic scenarios and methods used to downscale them (especially in Europe), would be useful here. (Government of Finland)	A reference to section 2.3.1 has been included.
G-12-116	A	12	24	23		Section 12.4 is about impacts and vulnerability and section 12.5 about adaptation. This is confusing since impacts suggest that adaptation is taken into account which is often not the case. Drop impacts from the section title and edit the section accordingly, or clearly mention to what extent adaptation is taken into account throughout the text of 12.4. Another option is to have "potential impacts" in the title and define this as impacts without adaptation (e.g. replace "expected" by "possible if there would be no adaptation" on page 12, line 26). (European Union)	The headings are fixed by the TSU. In all cases, impacts are without adaptation. This is explicitly mentioned in the summarizing figure.
G-12-117	A	12	24	23		Also, the impacts depend on changes other than climate change, in some cases more than in others. E.g. vector-borne diseases are more influenced by human behaviour than by climate change, flooding damage more by siting of new developments than by run-off. This link to adaptation or non-adaptation/risk management should be made clear through out chapter. (European Union)	See above
G-12-118	A	12	24			How have statements of uncertainty/confidence been used in this section and elsewhere in the text? This probably needs some attention ahead of the TOD. (Government of Finland)	This will be done
G-12-	A	12	35	12	36	Precisely, so why report RCM projections in so much detail in section 12.3.1?	We use what is available down to the largest

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119						(Government of Finland)	scale whenever available
G-12-120	A	12	42	12	43	The work of Santos et al, 2002 refers only to Portugal. To assure that "the volume of summer low flow may decrease by up to 50% around the Mediterranean" only in basis on to this work is not correct. Besides this, Portugal is the less Mediterranean region of the South of Europe. (Government of Spain)	Will be reworded: The volume of summer low flow may decrease and by up to 80% in the river basins of Portugal (<i>Santos et al.</i> , 2002)
G-12-121	A	12	48	12	49	The paper of Ludwig et al, 2003, refers only to the river Tet. Extreme precipitation events (and mainly short-time precipitation) in Mediterranean region has an high degree of variability both spacial and temporal, and usually are recorded in autumn and spring. Until present there are no work that drives with enough confidence to a general conclusion of the increase in extreme, short-time precipitation events that could drive flash floods. Benito et al (2005) shows that no conclusive results could be obtained for Mediterranean floods. Benito, G., Barriendos, M., Llasat, M.C., Machado, M., Thorndycraft, V., 2005. Impactos sobre los riesgos naturales de origen climático: Riesgo de crecidas fluviales. In: Evaluación Preliminar de los Impactos en España por efecto del Cambio Climático [Moreno, J.M. (ed.)], 527-548. Ministerio de Medio Ambiente, Madrid, Spain (Government of Spain)	It is true. The investigation how the climate change will affect short-time precipitation found that short-time precipitation would substantially increase during the summer even for areas with a decrease in mean precipitation, such as Mediterranean region. This suggests that risk of flash floods also would increase. On the other according to EEA Briefing 2005/1 extreme river floods created by increasing intensity of heavy rainfall is projected to rise mainly in C, N and NE Europe. It is accepted that in Mediterranean region having a high spatial and temporal variability in short-time precipitation (especially in autumn and spring) the confidence of how these precipitation would change is not very high. The paper of Ludwig et al, 2003 will be presented as only example, and on the other hand will be emphasised the importance of research work in this way
G-12-122	A	13	1			Figure 12.2: For the 2030s, the pattern of change is likely to be affected as much by inter-decadal variability as by climate change. Thus maps based on single scenario outcomes (as opposed to ensembles, which filter out some of the natural variability) for a near-term future period have to be treated with considerable caution, including comparisons between different scenarios. By the 2070s, the signal of climate change is likely to be more apparent relative to natural variability. (Government of Finland)	In the Table 12.2. for the time slice 2020s it is written: small changes (from -5 to +5%) in annual runoff is expected. This statement may be interpreted as 'no change'. More substantial is the change in timing of annual runoff
G-12-123	A	13	17	13	17	Change text to "Change in annual river..." (European Union)	Accepted
G-12-	A	13	22			Table 12.2: Nice table, but the entries need polishing	Ok

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124						(Government of Finland)	
G-12-125	A	13	32	13	32	Add new sentence: "In regions with a predicted increase in precipitation, the spreading of pollutants from contaminated areas and waste dumps may increase". (Government of Sweden)	Noted
G-12-126	A	14	3	14	4	Water stress may increase in some parts of E.Germany also (Zebisch, M., T. Grothmann, D. Schröter, C. Haße, U. Fritsch, W, Cramer (2005): Climate Change in Germany – Vulnerability and Adaptation of climate sensitive Sectors. Umweltbundesamt Climate Change 10/05 (UFOPLAN 201 41 253). ISSN 1611-8855. Dessau 2005. pp 205. (http://www.umweltdaten.de/publikationen/fpdf-1/2974.pdf)) Therefore substitute "Germany" by "W.Germany". (Government of Germany)	Accepted
G-12-127	A	14	6			Please explain "the 100-year deficit volumes" shortly. (Government of Germany)	Will be done
G-12-128	A	14	9	14	10	CAP applies only to the EU countries (Government of Finland)	Will be done
G-12-129	A	14	12	14	12	Hungarian steppes (Government of Finland)	Accepted
G-12-130	A	14	16	14	16	NAO is not familiar to all readers (Government of Finland)	Explanation will be in the glossary
G-12-131	A	14	16	15	21	Specification of the Baltic Sea would be needed due to its critical status today in many parts. (Government of Finland)	Text will added to clarify Baltic status
G-12-132	A	14	22	14	22	What is implied by "a continuation of the NAO"? (Government of Finland)	Text will be clarified
G-12-133	A	14	22	14	22	Change "into" to "during" or "throughout" (European Union)	No, into is correct, by that is meant that simulation are showing the first 20 years
G-12-134	A	14	28			editorial remark: line can be deleted. (Government of Germany)	OK
G-12-135	A	14	29	14	30	These increases, for a near-term projection, could simply be a result of decadal-scale natural variability (Government of Finland)	The simulations show that it is not only interdecadal
G-12-136	A	14	30	14	30	Should it be "2011-2030" instead of "2010-2030"? (Government of Finland)	Will be checked and, eventually, corrected
G-12-137	A	14	36	14	37	Rising values of what? (Government of Finland)	Text is grammatically correct. However, it will be modified to help the reader
G-12-138	A	14	45			I cannot understand the reference: IPCC 2007. That is a bit strange - a chapter refers to the whole report to which it belongs?? Please give the primary literature	Reference to chapter authors will be inserted, following TSU guidance

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						source. (Government of Germany)	
G-12-139	A	15	1	15	10	As e.g. the study of Schmidt-Thomé et al. (2006) indicates, there would be regional differences within the Baltic Sea region with respect to SLR: because of relative land uplift the sea-level rise would be lower in the northern part of the Baltic Sea than in the south. There a sources of point loading along the coast, e.g. the dumping site of the former uranium enrichment plant in Sillamäe in Estonia, which are situated very close to the coastline and can be easily influenced during storms (Kont et al. 2003). (Government of Finland)	Addressed under point G-12-131
G-12-140	A	15	1			There is the need to go more into details of the table 12.3. Obviously the impacts as well as adaptation costs has been quantified. Instead of the very poor interpretation "SLR can have a wide variety of impacts" IPCC should go further into the these figures and assess key vulnerabilities. (Government of Germany)	Table 12.3 will be deleted and source referenced quoted
G-12-141	A	15	15	15	17	I was unable to locate these figures in Nicholls (2004), for example in Table 14 of that article. In any case, the statistics in that paper describe "additional people at risk", and that concept doesn't seem to to come through here. (Government of Finland)	Will double-check the quotation
G-12-142	A	15	18	15	21	I do not understand why SLR have impacts on eutrophication. I think that eutrophication problems are due to higher runoff because of higher precipitation. (Government of Finland)	Text to be changed to make meaning clear
G-12-143	A	15	18	15	21	Fish population in the Baltic Sea is adapted to special saline conditions (e.g. Ojaveer and Kalejs, 2005). Changed inflow of freshwater (ref. Chapter 3) and sea level fluctuations in the Kattegat might affect e.g. reproduction of fish species in the Baltic Sea. (Government of Finland)	OK. The comment is well taken but there is no room to ellaborate the chaper at this detail
G-12-144	A	15	20	15	21	References missing for SEPA 2005 and SEEG 2006 (Government of Finland)	Will check
G-12-145	A	15	23			Table 12.3: The headings of some columns are unclear or erroneous. First, "#(k)" is not defined. Second, there is confusion around annual vs. one-time monetary figures (or, in system terms, between flow and stock variables). Capital value loss and adaptation costs (in 10 ⁹ US\$) can, in principle, be one-time or annual. Table would benefit from separating the adaptation cost column into two columns, with appropriate headings. GNP (or per capita income etc.) always has to be specified with reference to a time period, e.g. 500*10 ⁹ US\$ per year. However, this table wrongly suggests that GNP is a one-time figure. The column "%GNP" under	Table 12.3 will be deleted

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						capital value loss should be renamed to "% annual GNP". Under adaptation costs, the last column should be split up into "% annual GDP" and "% loss of permanent GDP" or similar. The current units clearly need checking. (European Union)	
G-12-146	A	15	25			Nicolls and De la Vega-Leinert, 2006: I cannot find it in the reference list. (Government of Germany)	To be inserted in the list.
G-12-147	A	15	31	15	32	In which regions and at what altitude does this reduction apply? (Government of Finland)	Alps region (will be corrected)
G-12-148	A	15				Table 12.3: Check the header of column 2 and 3: unit "# (k)" is unclear. Last column: please use the same basis for the unit, either cumulative costs (please give the time period for the summation) or costs per year (Government of Germany)	Table is out.
G-12-149	A	16	2	16	3	The authors may consider to add a reference to the predicted disappearance of localized permafrost in palsa mires, e.g. (addition capitalized) "In the north of Europe, lowland permafrost (Haeberli and Burns, 2002) AND LOCALIZED PERMAFROST IN PALSA MIRES (FRONZEK ET AL., 2006) will eventually disappear." This would also make a sensible connection to the reported observed disappearance of palsa mires (cf. Table 12.1, page 7). Reporting both observed and projected loss of palsa mires would be well justified, as Europe is facing the total loss of these characteristic and unique feature of high latitude environments with many implications for biodiversity. Fronzek, S., M. Luoto and T.R. Carter (2006). Potential impact of climate change on the distribution of palsa mires in subarctic Fennoscandia. Climate Research, in press. (Government of Finland)	Noted
G-12-150	A	16	10	16	10	increased growing season -> lengthened growing season (Government of Finland)	Noted
G-12-151	A	16	12	16	13	Are these results projected or observed? (Government of Finland)	Observed
G-12-152	A	16	14	16	23	Alpine species are also found in the north, where projected shifts are northward (as well as upward in the mountains). In fact, there seems to be a lack of information about the subarctic regions of Europe. I am sure that this does not reflect the literature and I expect other colleagues from high latitudes will point this out and suggest references. (Government of Finland)	Noted.
G-12-153	A	16	26	18	3	Section 12.4.4 comment: the whole section seems to be a long description of (physiological) impacts of climate change. But an assessment with regard to risk	OK. It will be addressed and changes in the text made to accomodate this comment

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						resp. possible chances is definitely missing? Why does it matter if forest will be replaced by low productive grassy glades due to increased frequencies? Why and who should care? What services will change? Is it possible to quantify an overall effect? What can be said with regard to the adaptive capacity and about key vulnerabilities? Concluding remarks in this direction are missing. (Government of Germany)	
G-12-154	A	17	1	17	4	This is misleading. Is the C loss described here associated with forest or tundra? (Government of Finland)	Will be corrected
G-12-155	A	17	3			Please supplement some examples for such positive effects on wood properties. (Government of Germany)	Will be addressed
G-12-156	A	17	10	17	10	What is the meaning of LAI? (Government of Czech Republic)	It is described in the glossary
G-12-157	A	17	40	17	40	Giorgi et al. (2004) is a reference to climate projections NOT to erosion. This belongs in the climate section, not here. (Government of Finland)	The citation is correct. It is not referenced to erosion by to heavy rainfall.
G-12-158	A	18	8	18	11	This is not only a problem in lakes but also in brackish water estuaries situated in the north (Government of Finland)	It will be adressed
G-12-159	A	18	17	18	18	Add new sentence: "In regions with a predicted increase in precipitation, the spreading of pollutants from contaminated areas and waste dumps may increase". (Government of Sweden)	OK. We will look a reference to support this
G-12-160	A	18	34	19	25	Section 12.4.6 general comment: The extreme shortening of the text leads to a quality loss of the assessment. Example: page 19, L.21: "Invasive species may increase in the north." How does IPCC assess this change? As a risk? If yes, please explain explicitly why! (Government of Germany)	Noted. Text changed.
G-12-161	A	18	37	18	37	Use post-TAR references - there are quite enough of these without having to cite earlier references! (Government of Finland)	Agree. We should cite studies published during the reported period.
G-12-162	A	18	46	18	49	What about the introduction of new exotic species to regions of Europe? Are all responses likely to be negative, or are there positive responses too? (Government of Finland)	The extinction of a species is a negative outcome, whereas the expansion of a species into a region where it has not been present before may be positive or negative depending on feedback mechanisms with other species. Since we don't know what feedbacks might occur it might be judicious to avoid speculation.

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G-12-163	A	19	9			This doesn't recognise other limiting factors on ability of species to migrate. There are a number of limitations with the MONARCH work, and it is a simplistic model which only looks at the possible climate spaces, without an available habitat cover applied. This needs to be recognised as it has potentially enormous impacts for ability of species to adapt through migration. (Government of UK)	Agree. We suggest the following rewording: "Meanwhile species in the UK, southeastern Europe and southern Scandinavia were projected to benefit from a more suitable climate, although dispersal limitation may prevent species from occupying new suitable areas".
G-12-164	A	19	16	19	17	"Species richness....salinization." Is it a projection or an observation of recent changes? Please specify. (Government of Germany)	Observations
G-12-165	A	19	27			Figure 12.3: The differences between these figures seem to be quite subtle and are perhaps too small to show here for both 2050 and 2080 unless they can be properly explained. Perhaps representative figures from the set could be used, though I appreciate that it is also important to display the uncertainties across the SRES scenarios. On the other hand, those uncertainties are essentially only emissions-driven in these figures, as they originate from only one climate model, which gives similar patterns of change for different emissions scenarios. I don't think land use change was considered in these model simulations. (Government of Finland)	Differences between 2050 and 2080 are visible and striking, but it is true that differences among SRES scenarios are minor. We could easily select one out (e.g. A1) of 4 scenarios, but on the other hand it might be worth showing that modelers have been looking at different emission scenarios. Land use was not taken into account.
G-12-166	A	19	33	19	34	"Increasing intensities of blue indicate increasing species richness in the baseline period..." is not easily to understand. Is it the same as: "...indicate decreasing species richness in the future"? If yes, please use this wording as the reader will understand it easier. (Government of Germany)	Baseline refers to the present. See suggested rewording of legend by government of Finland (G-12-167)
G-12-167	A	19				Fig. 12.3 shows several maps where differences can hardly be depicted, at least between different scenarios for the same time slice. Showing only one map as an example or maybe two maps for the two time slices will give the same information. Adding a legend would make it easier to understand. Write "HadCM3" instead of "HadCm3" in the caption. The explanation of the colours in the caption could be made more clear, e.g. "Increasing intensities of blue indicate A DECREASE IN SPECIES RICHNESS (i.e. broad patterns of contraction) ..." What is meant with "broad patterns of contraction"? I would prefer a phrasing such as "contraction is dominating" or similar. (Government of Finland)	We can delete some maps as suggested. See also comment G-12-165. However, in doing so we cannot demonstrate how robust these results are to varying emission scenarios. We should change HadCm3 to HadCM3. Suggestions for rewording of legend are good and can be adopted.
G-12-168	A	20	5	20	18	The word "overall" is unclear. Please clarify the sentence as follows: "When summarizing all yield changes in Europe caused by climate change and increased atmospheric CO2 a small increase in European crop productivity is expected."	OK

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						Eliminate the second sentence ("However...outweight the effects..") as it contradicts the first sentence and continue with a regional analysis of yields (line 11 to 18): "Climate related increases in crop yields are only expected...SRES scenarios and climate models." After this general overview a detailed analysis of different crops can follow (wheat: L. 8-9, maize, sunflower etc.in L.20 ff.) In order to better convey and communicate possible future risks and opportunities, please insert a figure of projected crop productivity. (Government of Germany)	Not true, it does not contradict the previous one. No space for an additional figure
G-12-169	A	20	24	20	24	Expansion of maize suitability is not covered in Hilden et al, 2005. (Government of Finland)	I will check the reference
G-12-170	A	20	27	20	38	The statement "Tick distribution ... has been observed to have moved northward in Sweden" is hotly contested by Europe's foremost specialists in ticks and tick-borne infections. For example, Sarah Randolph, Professor of Parasite Ecology at Oxford University, who has studied ticks and tick-borne infections has repeatedly challenged the authors of these articles. (Government of France)	I will check the reference
G-12-171	A	20	39	20	40	I would add a qualifier to this statement. "...no longer sufficient for livestock at current stocking rates without irrigation". In fact Holden and Breton suggest that grass production on the west, Atlantic, coast of Ireland might increase, they say grass production in the east and south east of Ireland might decrease. The situation in the East and SE of Ireland is not the majority climate response for Ireland. (Government of Ireland)	OK
G-12-172	A	21	3	21	3	Change "acerbate" to "exacerbate" (European Union)	OK
G-12-173	A	21	21	21	22	"new, exotic or invasive species" all are meaning the same. Maybe "invasive, non-native species" would be better (Government of Finland)	OK
G-12-174	A	21	33	21	47	Fronzek and Carter (2006) present a scenario-based analysis of energy demand for cooling in Europe. The authors should consider to report their findings: 1) strongest absolute increase between 1961-1990 and 2071-2100 in cooling degree days in central and southern Europe (e.g. 111-148% at Madrid); 2) future increase in inter-annual variability of cooling degree days. Fronzek, S. and T.R. Carter (2006). Assessing uncertainties in climate change impacts on resource potential for Europe based on projections from RCMs and GCMs. Climatic Change, in press. (Government of Finland)	New reference and findings from it added in text
G-12-	A	22	1	22	16	Another case is the sensitivity of energy production to heat waves and drought; in	Example of french rivers added in text

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175						the summer of 2003, the temperature of many French rivers raised in a way that the power generation potential of thermal units was lowered due to compliance with water heat release regulation and some power units (conventional and nuclear) came close to a shutdown consequently" (Government of France)	
G-12-176	A	22	5	22	6	The implications of the statement the "land area devoted to biofuels may increase by a factor of two to three" needs to be explained. (Government of Australia)	Text clarified
G-12-177	A	22	20			Section 12.4.8.2 - transport, also impact of subsidence (changing soil moisture) on roads and other transport networks - Highways Agency "Well Maintained Highways" July 2005 (TSO) (Government of UK)	Noted
G-12-178	A	22	20			Decreased ice extent facilitates navigation in the arctic (Arctic Climate Impact Assessment) (European Union)	Noted
G-12-179	A	22	29	22	29	Add new sentence: "The stability and safety of infrastructure must be made more robust in areas with a predicted increase in precipitation". (Government of Sweden)	Noted
G-12-180	A	22	31			The authors should also consult the recent report by Sievänen et al., 2005 on tourism and recreation in Finland: Sievänen, T., Tervo, K., Neuvonen, M., Pouta, E., Saarinen, J. and Peltonen, A. 2005. Nature-based tourism, outdoor recreation and adaptation to climate change. FINADAPT Working Paper 11, Finnish Environment Institute Mimeographs 341, Helsinki, 46 pp. Download at: http://www.environment.fi/default.asp?contentid=165486&lan=en (Government of Finland)	Report added in references
G-12-181	A	22	31			Section 12.4.8.3 tourism - could make reference to the Defra-funded project Climate Change and the Visitor Economy (2006) - also at impacts of changing nature of tourism, which is important for vulnerability (and for vulnerability of other sectors - biodiversity, transport, urban areas) (Government of UK)	Report added in reference list
G-12-182	A	22	41			Artificial snowmaking does not only counteract reduced snowfall, but even allows for expansion beyond traditional ski areas (and may have further impact on water resources) (European Union)	Suggestion followed
G-12-183	A	22				Section 12.4.8.1 - perjaps there should be mention of the impact of extreme events on electricity supply - ie impact on infrastructure and thus ability to supply power (Government of UK)	Suggestion followed

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G-12-184	A	23	11	23	13	As climate projections as well as impact assessments are and always will be uncertain responding to new threats is difficult for all stakeholders in all climate sensitive sectors. It is not a specific challenge for insurers. Therefore delete the sentence. (Government of Germany)	Noted
G-12-185	A	23	27	24	6	The first two (out of three) paragraphs on Human Health are insufficiently documented by references, and as such require complete revision. (Government of France)	Ok. Text being revised
G-12-186	A	23	27	24	6	Section 12.4.11 should consider and cite the following book, which follows specifically on Europe: B. Menne, K.L. Ebi (editors): Climate Change and Adaptation Strategies for Human Health, Steinkopff, Darmstadt, 2006 (European Union)	OK. Will be considered
G-12-187	A	23	27	24	6	Section 12.4.11 general comment: A very short aggregation of research results! As health is one of the most highly prized assets in life this seems indeed unbalanced. As well as in other sections IPCC has to assess these changes and draw a conclusion. Can climate change threaten human health? Where are hot spots / key vulnerabilities? Is it possible to convey the message with a figure (distribution change of vectors or something like that)? (Government of Germany)	Text is being revised but there is no space to include new materials, as page length is strict
G-12-188	A	23	27			The FINADAPT report by Hassi and Rytönen (2005) may be useful for this section: Hassi, J. and Rytönen, M. 2005. Climate warming and health adaptation in Finland. FINADAPT Working Paper 7, Finnish Environment Institute Mimeographs 337, Helsinki, 22 pp. Download at: http://www.environment.fi/default.asp?contentid=165486&lan=en (Government of Finland)	Reference will be added, and to section 12.5.11.
G-12-189	A	23	31	23	32	Can't a European example be used here (e.g. Schär et al., 2004)? (Government of Finland)	Ref added.
G-12-190	A	23	36	23	36	A reference to add here is the PRUDENCE paper by Beniston et al. (submitted). This is already cited elsewhere in this chapter. (Government of Finland)	Ref added.
G-12-191	A	23	38	23	45	Also rodent borne diseases could be mentioned here. Rodent dynamics depend on the snow cover in the north and temperature induced mast (seed) years in central Europe (Vapalahti et al 2003, Lancet Inf Dis 3:) The impact of climate change on these underlying factors will change the regional patterns of rodent dynamics and hence dynamics of rodent borne diseases. (Government of Finland)	Comment added, but no literature specifically on climate change and rodent related diseases in Europe.ep.
G-12-	A	23	39	23	39	The viewpoint attributed to Kovats et al is highly mis-leading. The abstract of	Text has been revised to take account of this

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192						<p>their article makes this perfectly clear: "Results from biological and statistical models suggests that these (climate) changes could indeed increase the risk, particularly of malaria, TBE and Lyme disease. However, most predictions are based on model simulations which contain only a subset of the links between climate and vector-borne diseases and generally do not consider the effects of non-environmental variables such as socio-economy and agriculture. Analyses have shown that the historical distribution of European malaria – and its later disappearance - were more strongly related to vector competence, land cover and socio-economic factors than to climate. Although climate changes may improve conditions for transmission, the current state of these other determinants mean re-emergence of endemic transmission is extremely unlikely. It is therefore unlikely that climate changes alone can lead to the reemergence of this disease. Similar analyses of the past or present distribution of other vector-borne diseases of interest for Europe can allow us to quantify the exact role of climate and make more valid predictions of the effect of future climatic changes". The other article quoted, by Hunter, is mainly focussed on microbiology (it was published in J App Microbiol), only deals with the UK, and dismisses the likelihood of increase in vector-borne diseases because of "infrastructure". There appears to be an error in the reference details. (Government of France)</p>	<p>comment. The Kovats et al 2001 papers is a review that discusses the attribution of changes in vbd incidence to observed climate change. Statements regarding the early effects of climate change on health are consistent with chapter 1.</p> <p>Hunter reference is also a appropriate overview paper.</p>
G-12-193	A	23	43	23	45	<p>Judging from their references, the authors are referring to Leishmaniasis; in common usage, the word "sandflies" refers to both phlebotomines and to Culicoides spp., vectors of bluetongue virus, an important viral disease of sheep and goats. Apart from this, they refer to Bröker and Gniel, though the article is on Tick-borne Encephalitis (TBE); Molyneux, who makes no mention of northward extension of any vectors or vector-borne disease, Korenberg, an article in Russian ; Kuhn, who actually states "It has been speculated that a combination of increased importation of canine leishmaniasis into currently non-endemic areas (22) and climate changes may cause the disease to be introduced at higher latitudes, resulting in endemic transmission ... but studies on tropical species also suggest a significant, if more important, relationship with land cover and soil types". (The speculative article that the authors of the chapter refer to is by authors who have no other publications); Lindgren and Naucke, also on tick diseases (but hotly disputed) and two of Sarah Ranolph's papers, both in popular magazines (i.e. none of the ca. of her publications in Nature, Science, etc). In short, "tick-related" (i.e. tick-borne diseases) are supported by reference to publications by relatively unknown authors, and "sandfly vectors" are supported by reference to articles on tick-borne and other diseases,</p>	<p>Text revised. VL discussed in relation to future projections. References have been corrected.</p> <p>There is some literature showing northward movement but no formal analysis of the cause of the change in distribution.</p>

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						several of which are blatantly misquoted. (Government of France)	
G-12-194	A	24	13			Water stress is NOT just in south eastern Europe.South east UK is predicted (in fact already is) to suffer from water stress, and no doubt some other parts of nw europe as well (Government of UK)	In the subchapter 12.4.1 was mentioned that water stress might increase in Great Britain, Italy Greece, the Balkan region and large areas Central and Eastern Europe. The highest increase in water stress is expected in southeastern Europe., see also E-12-359
G-12-195	A	24	30	24	33	...Changing land use patterns so that they are more suitable..." Can you please shortly give the background? What do you mean? Please explain in more detail. (Government of Germany)	The reference on Rounswell 's article is excluded from the text
G-12-196	A	24	48			"...provide some quantitative estimates...". How do they look like? How do the IPCC assess these estimates? Is there any risk? Please specify! (Government of Germany)	Originally was included previously. Will be reinserted
G-12-197	A	25	10			"...or by irrigating current dryland pastures..." Do this recommendation settle the claim of an integrated assessment by IPCC? In the light of increasing water stress where an irrigation of current (!) dryland pastures will be possible? And how will this assessment change under the precondition of further future drying? (Government of Germany)	No relevant comment to this section
G-12-198	A	25	12			Coastal pollution is another issue to consider in conjunction with climate change. Should this be treated somewhere here? (Government of Finland)	Relevant in other sections
G-12-199	A	25	33			There is no reference to the recent work of this chapter's Review Editor, for example: Kellomäki, S. and Leinonen, S. (eds.) 2005. Management of European forests under changing climatic conditions. Final report of the project "Silvicultural response strategies to climatic change in managed European forests" funded by the European Union under the contract EVK2-2000-00723 (SilviStrat). University of Joensuu, Faculty of Forestry. Research Notes 163. and Kellomäki, S., Strandman, H., Nuutinen, T., Peltola, H., Korhonen, K.T. and Väisänen, H. 2005. Adaptation of forest ecosystems, forests and forestry to climate change. FINADAPT Working Paper 4, Finnish Environment Institute Mimeographs 334, Helsinki, 44 pp, downloadable at: http://www.environment.fi/default.asp?contentid=165486&lan=en (Government of Finland)	Two Kellomäki's articles are included in 12.4.4
G-12-200	A	26	4			reference GMES FTS for high resolution, high frequency forest product. (Government of Ireland)	References will be included
G-12-	A	26	15			There are no references at all in this section! Clearly, a wetlands expert needs to be	References will be included

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201						consulted urgently. (Government of Finland)	
G-12-202	A	26	32			National plans are not covered in this section, but are becoming increasingly important (e.g. Finnish examples: Ministry of Agriculture and Forestry, 2005. Finland's National Strategy for Adaptation to Climate Change [Marttila, V., Granholm, H., Laanikari, J., Yrjölä, T., Aalto, A., Heikinheimo, P., Honkatuki, J., Järvinen, H., Liski, J., Merivirta, R. and Paunio, M. (eds)], Helsinki (available in Finnish, 276 pp., Swedish 212 pp. and English, 280 pp.) http://www.mmm.fi/sopeutumisstrategia/ and Pöyry, J. and Toivonen, H. 2005. Climate change adaptation and biological diversity. FINADAPT Working Paper 3, Finnish Environment Institute Mimeographs 333, Helsinki, 46 pp. Download at: http://www.environment.fi/default.asp?contentid=165486&lan=en (Government of Finland)	There are several plans in different countries. If we mention the Finnish example we should also mention examples from the other European countries. Would there be a value in producing a table summarising all of these plans? Does anyone have privileged access to them
G-12-203	A	27	17	27	19	This is repetition of earlier information (Government of Finland)	OK, I can remove the sentence
G-12-204	A	27	50	28	1	Please insert after "climate by": "mitigation of greenhouse gas emissions for example".... (Government of Germany)	Text modified according to suggestion
G-12-205	A	28	8	28	8	Change "in integrated in" to "and integrated in" (European Union)	Typo corrected
G-12-206	A	28	13			Again, see Sievänen et al., 2005 (FINADAPT study) (Government of Finland)	Reference added
G-12-207	A	28	21			See above: also mention the large energy use of this process and potential impact on water resources. (European Union)	Suggestion followed
G-12-208	A	28	27	28	28	The authors should consider whether the promotion of cultural tourism in Europe can really be characterised as an adaptation action related to possible climate change. (Government of Australia)	It is seen as an adaptation option in literature
G-12-209	A	29	4			12.5.11 human health - no mention of adaptation in relation to increased/changing disease prevalence - need better monitoring and surveillance, emergency action plans etc. (Government of UK)	Addressed as: As adaptation in relation to increased/changing disease prevalence, there are proposed the long-term stationary monitoring of natural habitats of vectors, carriers and reservoirs hosts, as well as careful pre-planning and strengthening of effective anti-epidemic

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							initiatives for conditions of drinking water rationing (Ekdahl, 2004; Izmerov <i>et al.</i> , 2004. Awareness building based on the scientific facts of the climate-health relationship is probably the best alternative to tackle climate induced health risks (Hassi and Rytkönen, 2005).
G-12-210	A	29	30	29	31	A complete meteorological analysis of the situation and its relation to previous heatwaves (1947, 1976, 1983) has been done by Bessemoulin et al. (2004) which could be quoted. Bessemoulin P., N. Bourdette , Ph. Courtier, et J. Manach, 2004 : La canicule d'août 2003 en France et en Europe. La Météorologie, 46, 25-33. (Government of France)	Not applicable, belongs within WG-I
G-12-211	A	29	33	29	34	It can also be mentioned that this heat wave was difficult to forecast at long range (André et al., 2004) as well as at short range (Juvanon du Vachat et al., 2004). Juvanon du Vachat R., S. Planton, and M. Gillet, 2004 : Adaptation to heat waves occurrence in France, paper presented at the OECD Global Forum on Sustainable Development : Development and Climate Change, Paris, 2004. (Government of France)	Not applicable, belongs within WG-I
G-12-212	A	29	44			Insert after "disruption of": "inland navigation" (Zebisch, M., T. Grothmann, D. Schröter, C. Haße, U. Fritsch, W. Cramer (2005): Climate Change in Germany – Vulnerability and Adaptation of climate sensitive Sectors. Umweltbundesamt Climate Change 10/05 (UFOPLAN 201 41 253). ISSN 1611-8855. Dessau 2005. pp 205. (http://www.umweltdaten.de/publikationen/fpdf-1/2974.pdf) (Government of Germany)	Addressed
G-12-213	A	29	46			50,000 deaths for the heatwave may be inaccurate - standard figure is 27,000-30,000 (Government of UK)	Will be addressed in the health chapter and reference to this will be made
G-12-214	A	29	47	29	48	A sentence can be written to describe the precise reason why people die in these warm conditions : a persistent high level of night time temperature as explained in Besancenot (2002) and for that case (Cohen et al., 2005). Rousseau (2005) also has made a complete analysis of such a critical episode for the night from 11th to 12th of August, when the rate of mortality has increased by a very large amount. Besancenot JP, 2002 : Vagues de chaleur et mortalité dans les grandes agglomérations urbaines. Environnement, Risques et Santé, 1, (4), 229-240. Cohen J.C., J.-M. Veysseire, P. Bessemoulin, 2005 : Bio-climatological aspects of	To be covered in the healt chapter, and therefore not included in this chapter

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						summer 2003 over France. In “ Extreme weather events and public health response” (Kirch W. Ed. Springer). Rousseau D., 2005 : Analyse fine des surmortalités pendant la canicule 2003. L'évènement météorologique de la nuit du 11 au 12 août 2003 en Ile-de-France. La Météorologie, 51, 16-22. (Government of France)	
G-12-215	A	29	48	29	49	The reference to Ménard (2004) can be added, as this paper has made the analysis of the different aspects of the crisis implied by the very great number of fatalities : funerary, mediatic, political. Ménard J., 2004 : Analyse critique de la crise sanitaire survenue en France lors de la vague de chaleur d'août 2003. in « L'homme face au climat (E. Bard, O. Jacob, 2006) ». (Government of France)	To be covered in the health chapter, and therefore not included in this chapter
G-12-216	A	29	50	29	51	It has been stated by Valleron et al.(2004) that people who die during the summer 2003 heat wave were already fragile and doomed to die. Valleron A.J. et A. Boumendil, 2004 : Epidémiologie et canicules : analyse de la vague de chaleur 2003 en France. Comptes Rendus de l'Académie des Sciences, Biologies, 327, 1125-1141. (Government of France)	To be covered in the health chapter, and therefore not included in this chapter
G-12-217	A	30	38	30	50	Tol (e.g. http://www.uni-hamburg.de/Wiss/FB/15/Sustainability/pejthc.pdf) suggests that slowing of the THC would reduce impacts in Europe (less warming) (European Union)	Consistency of wording to check
G-12-218	A	30	62			The text indicates a survey has been carried out. Details on this should be provided or the text revised to reflect the nature of the published results. (Government of Ireland)	Consistency of wording to check
G-12-219	A	31	8	31	10	This measure may not be familiar to all readers - please offer a brief explanation. (Government of Finland)	OK. Text has been changed and definition given
G-12-220	A	31	16	31	19	The causal relationship that is implied by this sentence is not obvious and should be clearly stated. Would Europe be forced to reduce food imports, thus reducing transport with high ecological costs? (Government of Finland)	Text has been changed to include the exact sentence used by the author quoted. Indeed, no causal relationship was implied., However, the original text was changed during the editing process.
G-12-221	A	31	24	31	28	It is said, that human appropriation, footprint and pressures on ecosystem services are high and will increase further. What does this mean with regard to sustainable development? What have to be done to ensure SD? Draw a conclusion!	Text has been changed The conclusion is implied when saying that some consider that we are beyond acceptable pressures. Not being there literature to support a stronger

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						Furthermore: Adaptation helps societies to cope with pressures. This does not imply automatically a sustainable development. Therefore delete "Furthermore, impacts may be....different socioeconomic levels." (Government of Germany)	conclusion, no further one can be drawn. Text has been changed regarding adaptation to clarify some of the issues raised in this comments
G-12-222	A	31	31			substitute "Europe has shown" by "Europe has to show". "Europe has shown" is in contradiction to p. 31, l. 8 to 24. Please assess what have to be done further to reconcile industrial with sustainable development, what challenges are at stake? (Government of Germany)	This text has now been deleted to to space limitations
G-12-223	A	31	38	32	36	Limited information on cost estimates of climate change impacts and adaptation measures (Government of Czech Republic)	OK. Will be added
G-12-224	A	31	40	32	8	One uncertainty comes through the relationship of change due to climate change and changes following European policies such as the Common Agricultural Policy (CAP) and European Directives such as the Water Framework Directive (WFD) and the new European Materine Strategy Directive (EMS, e.g. Borja 2006). Which will have the stronger effect on e.g. land-use and chemical transport following that? (Government of Finland)	Agreed. Text to be added
G-12-225	A	32	0			More research into the implications of low probability-high impact events (e.g., abrupt climatic change) for Europe would also be useful (European Union)	OK
G-12-226	A	32	5	32	6	Either provide supporting citations of omit this statement (Government of Finland)	OK. Reference to be added
G-12-227	A	32	13	32	14	Systematic testing and validation of hydrological and chemical models against data from years/seasons with different climatic conditions in order to prove coherent reaction of the modelled system to what has been observed in field trials or catchment monitoring programmes with regard to effects of changed environmental conditions (Hildén et al 2005) is needed. (Government of Finland)	OK
G-12-228	A	32	18	32	18	Araujo et al. Apply statistical not deterministic models. An alternative reference might be Wilby et al., for Thames floods (Wilby, R.L. and I. Harris, 2006: A framework for assessing uncertainties in climate change impacts: Low-flow scenarios for the River Thames, UK. Water Resources Research, 42, W02419, doi:02410.01029/02005WR004065. (Government of Finland)	OK. Will be checked and changed

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G-12-229	A	32	29	32	32	This may be the case, but studies in Europe are probably more advanced than anywhere else! Examples include the ESPACE project (Nadarajah, C. and J.D. Rankin, 2005: European spatial planning: adapting to climate events. Weather, 60, 190-194.) or various national-scale, stakeholder led programmes such as UKCIP. Contributions would be very valuable from representatives of agencies that are actually implementing climate change adaptation measures. See a good discussion from the planning perspective in Peltonen, L., Haanpää, S. and Lehtonen, S. 2005. The challenge of climate change adaptation in urban planning. FINADAPT Working Paper 13, Finnish Environment Institute Mimeographs 343, Helsinki, 44 pp. http://www.environment.fi/default.asp?contentid=165486&lan=en (Government of Finland)	OK. Text to be changed
G-12-230	A	32	30	32	31	Water management should be added in brackets (Government of Czech Republic)	Misplaced comment
G-12-231	A	32	40			Table 12.6, "Water resources". Add new sentence: "Spreading of pollutants from contaminated areas and waste dumps". (Government of Sweden)	Will check
G-12-232	A	32	40			Table 12.6 comment: We agree all research needs reflected in p.32 l. 10-36 (first para rather touches tasks of WG I). But it is absolutely unclear, why research needs are listed by sectors in the table. This type of compilation supports continued studies for separate sectors. From our point of view this contradicts the point, that research should focus more on integrated assessments of vulnerability. Please substitute this table by a new one, that reflects the text given in line 10 to 36 adequately. (Government of Germany)	The table refers to selected research needs. It does not imply that any of the other topics are not necessary. One needs, somehow, to organize topics.
G-12-233	A	33	1	33	4	Table 12.6 Under Health it should be included text about effects on pollution and air quality of climate change e.g. effects on ozone, changes in long range transport of air pollution etc. So far only the interaction is covered (Government of Norway)	Text changed
G-12-234	A	33	3			Table 12.7: The meaning of the entry "*" and "*" is not explained, and the meaning of "*" to "*" is not clear. (European Union)	Ok. Will be clarified
G-12-235	A	33	3			Table 12.7: Nice table, but this covers expected impacts, and should logically be moved up to precede discussion of adaptation. (Government of Finland)	OK. Will be done
G-12-236	A	33	3			Table 12.7 is a very nice table that is currently not used in the text. It could be moved to the summary. The same problems identified above apply to the table: the table (a) assesses expected impacts if there would be no adaptation, and (b) does	OK. Will be clarified.

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						not indicate if climate change is a minor or dominant pressure compared to others. If this information could be added to the table, it would even be better. Again, it would still be better if it would have the 7 regions in Figure 12.1 rather than 5. (European Union)	Unfortunately, information is not equally available for everywhere
G-12-237	A	33	3			Table 12.7 comment: In general we consider a table like this as to be highly important. A prerequisite for a complete understanding of such a table is to make the most important criteria for the assessment transparent. Therefore we recommend to compile the criteria for the assessment of each impact in an annex of the table. If it is unclear what criteria are used for assessing for example the northward shift of tree species it will be impossible to communicate and discuss the fact with policy makers or other stakeholders. We urge you to put some further effort into a transparent summarizing table. (Government of Germany)	OK. Will specify criteria used
G-12-238	A	33	40			Table 12.6, "Energy and transport" . Add new sentence: "Possible impact of climate change on roads and infrastructure". (Government of Sweden)	Noted
G-12-239	A	33		34		Table 12.7 First comment: Sector and systems: "Mountains, cryosphere", impact "Glaciers retreat" one question: In what Area are the Pyrenees included (Central or Mediterranean)?. If they are included in the Mediterranean there should be 3 red * in "Glaciers retreat" (Glacier region of Maladeta (Spain)) in the table. Second comment: Sector and systems: "Mountains, cryosphere", impact "Tree line upward shift" . In Spain many tree species are affected to climate change (specially to the tree line upward shift) like the Abies pinsapo, Pinus sylvestris in Sierra de Baza, Pinus nigra in Sierras Béticas and Pinus uncinata in Sierra de Gúdar for example. Change to 3 red * instead of 1 red *. Third comment: Sector and systems:"Tourism", impact "Winter (incl. ski) tourism". There are 27 skiing resorts in Spain that they will be affected due to the temperature increase and due to the snow cover reduction as the Central European skiing resorts will be. Change to 2 red * or 3 red * (it depends on the criteria used to put 3 blue * as it is now). (Government of Spain)	OK
G-12-240	A	34	4			Table 12.7, "Energy and transport" . Add new sentence: "Slope stability", with magnitude of impact * - ** (Government of Sweden)	It was not elaborated due to space limitations
G-12-241	A	41	39	41	44	Is there a difference between both publications? (Government of Germany)	No. One will be removed
G-12-242	A	50	1	50	4	Correct reference: Lindgren E., and T.G.T. Jaenson, 2006: Lyme borreliosis in Europe: Influences of climate and climate change, epidemiology, ecology and	Thanks

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						adaptation measures. WHO Regional Office of Europe, Copenhagen. pp 33. [Europe,Human health]; [Europe; Infectious diseases] (Government of Sweden)	
G-12-243	A	50	5	50	7	Correct reference: Lindgren, E., and T. Naucke, 2006: Visceral leishmaniasis in Europe: Influences of climate and climate change, epidemiology, ecology and adaptation measures. WHO Regional Office of Europe, Copenhagen. pp 35. [Europe,Human health]; [Europe; Infectious diseases] (Government of Sweden)	Thanks
G-12-244	A	53	18	53	21	What is the underlying literature? (Government of Germany)	Will be clarified