**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 1

**August 2006**

**inc LATE GOVT comments at the end**

## 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**.

| Chapter-Comment | Batch | From Page | From Line | To Page | To line | Comments | Notes of the writing team |
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| G-1-1 | A | 0 | | | | In chapter I two components are missing: 1. The increase in potentially toxic cyanobacteria and 2. The climate related increase in dissolved organic carbon, which will cause severe drinking water problems in parts of the Northern countries. These two important climate related impacts should be mentioned in chapter 1. (Government of Sweden) | Cyanobacteria studies cited in Section 1.3.4.4.<br><br>Dissolved organic carbon evidence cited in Section 1.3.4.5. |
| G-1-2 | A | 0 | | | | When several factors are known to contribute to the change/decrease of biodiversity the report is correctly reluctant to quantify the role of climate change. However when there is an interaction between the impacts of climate change and the impact of other stress factors this is a topic that should be mentioned in this chapter.<br>One of the factors where a negative interaction exists is between range shifts caused by climate change and habitat fragmentation (Opdam & Wascher 2004). Empirical evidence exists that the natural reaction of species to climate change is hampered by human induced habitat fragmentation. Warren et al. (2001) showed that only species with a large dispersal capacity or species for which their suitable habitat is not fragmented (using habitat of the wider country side) are able to expand their ranges northwards. While species with small dispersal capacity or species with specific habitat requirements that are rare (habitat specialists) were not able to expand their range. Hill et al (1999) showed for the butterfly speckled wood (Pararge aegeria) that habitat availability is an important determinant for the rate of expansion when species are responding to climate change.<br>Another example is the interaction between climate change driven sea level rise and human land use change occurs in coastal areas. It should be stressed that sea level rise has a larger impact on wetland ecosystems when the human land use pressure in the coastal area is large, e.g. coasts defended by dikes and urbanization. Wetlands disappear or become smaller when human land use makes inward movement of the ecosystem impossible (Wolters et al 2005).<br>Hill, J.K., Thomas, C.D., Huntley B., 1999. Climate and habitat availability determine 20th century changes in butterfly's range margin. Proceedings of the Royal Society London B 266, 1197- 1206.<br>Opdam, P., Wascher, D., 2004. Climate change meets habitat fragmentation: linking landscape and biographical scale levels in research and conservation. Biological Conservation 117 (2004) 285-297.<br>Warren, M., S., Hill, J.K. et al 2001. Rapid responses of British butterflies to opposing forces of climate and habitat change. Nature 414, 65-69.<br>Wolters, M., Bakker, J.P et al 2005. Salt marsh erosion and restoration in south-east England: squeezing the evidence requires realignment. Journal of Applied Ecology 1365-2664. | References added to Sections 1.2.1.2, 1.3.5, and 1.3.3.2. |

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| | | | | | | (Government of Netherlands) | |
| G-1-3 | A | 0 | | | | There is a significant Northern Hemisphere (NH) bias in this chapter, with few references given for the Southern Hemisphere (SH), especially in tables 1.3 - 1.11. Authors should review literature from the SH to ensure that the review of observed changes is comprehensive.<br>(Government of Australia) | Accepted. Appropriate SH references have been included where available. Specific input has been provided from the chapters on Australia and NZ, Latin America and Africa. NH bias in the Tables has been reduced through editing the Tables. |
| G-1-4 | A | 0 | | | | It is a discrepancy that conservation measures that are carried out as adaptation to the impacts of climate change on biological systems are not taken into account. The term adaptation is only used for human systems and not for ecosystems (biological systems). This is probably the reason why the sector 'evidence of adaptation and vulnerability ' is missing in the sector 1.3.4 'Marine and freshwater biological systems' and sector 1.3.5.'Terrestrial biological systems'. However nature conservation management is a human activity and can therefore be adapted as a reaction to climate change.<br>Examples of spatial adaptation strategies for terrestrial nature management are:<br>Adaptation of the spatial cohesion of nature reserves by creating ecological networks of ecosystems and robust corridors to facilitate the climate change driven range shift of species with small dispersal capacity to follow the suitable climate conditions (Gastona et al 2006; Opdam & Wascher 2004; Hannah 2005; Lovejoy 2005).<br>Improve matrix permeability: regions are to become trans-national pathways for range shifts and potential future protected area (Gustavo et al 2005).<br>Find and protect the short-term refugia. Identify where species and ecosystems are most likely to persist for decades or centuries in an unstable and unpredictable environment (Saxton 2003).<br><br>Gustavo et al, 2005. Managing the matrix. In: L. Hannah and T. Lovejoy (eds.) Climate change and Biodiversity, Yale University Press.<br>Hannah, L., 2005. Designing landscapes and seascapes for change. In: L. Hannah and T. Lovejoy (eds.) Climate change and Biodiversity, Yale University Press.<br>Kevin J. Gastona, K.J., Charmanb, K. et al., 2006. The ecological effectiveness of protected areas. Biological Conservation 132: 76-87.<br>Lovejoy, T., 2005. Conservation with a changing climate. In: L. Hannah and T. Lovejoy (eds.) Climate change and Biodiversity, Yale University Press.<br>Opdam, P., Wascher, D., 2004. Climate change meets habitat fragmentation: linking landscape and biographical scale levels in research and conservation. | Added adaptation citations in Section 1.3.9.3 and 1.5. |

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| | | | | | | Biological Conservation 117 (2004) 285-297.<br>Saxton, 2003. Adapting eco-regional plans to anticipate the impact of climate change. In Drafting a conservation blue print, a practitioners guide to planning for biodiversity C.R. Groves (ed.)<br>(Government of Netherlands) | |
| G-1-5 | A | 0 | | | | Interesting discussions on ecosystem shifts. Suggestion for more litterature on the issue: Alternative states and positive feedbacks in restoration ecology Trends in Ecology & Evolution, Volume 19, Issue 1, January 2004, Pages 46-53 Katharine N. Suding, Katherine L. Gross and Gregory R. Houseman.<br>(Government of Sweden) | This reference is not in the main focus of the chapter. |
| G-1-6 | A | 0 | | | | citation style would benefit from checking: the author is mentioned twice (once outside the bracket and once within) should be changed to the "normal" style: Author (year)<br>(European Union) | Addressed |
| G-1-7 | A | 0 | | | | Chapter 1 is primarily a listing of numerous studies and reports in the scientific literature. Many of the observations documented by the citations appear to focus on specific research sites, and these are not differentiated clearly from more systematic measurements or observations from measurement networks. While the chapter presents an impressive survey of results, the text provides little insight about the character of the observations reported in numerous references and virtually no evaluation of the uncertainties involved. The geographic context of observations is unclear in many cases. Major observation capabilities such as satellite remote sensing or the global network of sites making eddy-covariance flux measurements are given little attention.<br>Logically, Chapter 1 should provide a basis for impact evaluations described in the remaining chapters. Instead, Chapter 1 attempts to briefly summarize broad classes of impacts — such summaries are too brief to be useful; in some instances appear to contradict other chapters in WG2 and WG1 draft findings; and seem out-of-place in the chapter on Observations chapter. In many cases, impact summaries in Chapter 1 are redundant with and in some instances contradict more detailed assessments of the same class of impacts in other chapters. Thus, space that might be used in Chapter 1 to describe observations of impacts more adequately is used instead to assess impacts as implied by observations, which are not explained well, making for a weak presentation overall.<br>A number of review comments about material in subsequent chapters question whether available observations are adequate to support assessment conclusions. Reviewers describe lengths of measurement records, spatial sampling, and | The role of networks is addressed in Section 1.2.2.1, and numerous network studies are cited in Section 1.3.5.<br><br>Insights into the character of the observations is given in the Executive Summary, the summaries for each of the systems assessed in Section 1.3, and Section 1.5<br><br>Evaluation of uncertainties is presented in the Executive Summary through confidence statements, in Section 1.2 Methods of Detection and Attribution of Observed Changes, and in Setion 1.4, Larger-scale aggregation and attribution to anthropogenic climate forcing.<br><br>Geographic context is provided in Figures 1.9 and 10. Remote sensing studies are assessed where relevant; eddy-covariance flux measurements are more germane for WGI.<br><br>Other WGII AR4 chapters are referenced for |

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| | | | | | | measurement uncertainties as inadequate to support numerous conclusions within the report. The Observations chapter should address these matters to provide the necessary data background and framework for the rest of the assessment. The record of climate change is particularly important. Additionally, a number of chapters discuss the impacts of extreme events such as hurricanes. The Observations chapter must make a case, as described in recent literature, that such extreme events are linked to climate change.<br>Chapter 1 should be rewritten, deleting material describing impact assessments, leaving that to the appropriate chapters to follow, and explaining available observations in more detail than simply citing numerous documents. An evaluation of relevant observations is needed, including identification of serious gaps. Chapter 1 should provide a synthesis with regard to confidence and uncertainty of available observations and evaluate the implications of uncertainty for impact assessments of subsequent chapters.<br>(Government of USA) | fuller discussion of the processes discussed here in a broad aggregation of observed changes across natural and managed systems. |
| G-1-8 | A | 1 | 0 | 71 | | This chapter on observed changes could be shortened by 20 pages or more if: 1) it simply dealt with observed changes rather than impacts and processes and 2) if it referred to other chapters that containing more detailed material about observed changes. For example, the polar chapter (Ch. 15) has an excellent discussion about changes in permafrost, ice caps and sea ice (with excellent graphics), the mechanism by which climate change alters these parts of the cyrosphere, and the anticipated the impacts of these changes. There is too much duplication and too little cross referencing among these and other chapters of AR4.<br>Chapter 1 was not intended to be a stand-alone assessment, but it presently addresses key climate drivers, processes and mechanics of change, primary and higher-order impacts, and societal adaptations.<br>(Government of USA) | Text shortened. Other WGII chapters cited.<br><br>Climate drivers, etc. Needed to address topic of observed changes. |
| G-1-9 | A | 1 | 4 | | 4 | Define Managed Systems somewhere in the text<br>(Government of USA) | Defined in Section 1.1. |
| | | | | | | | |
| G-1-10 | A | 1 | 33 | | 33 | Spell out TAR<br>(Government of USA) | Done. |
| G-1-11 | A | 1 | 1 | | | Instead of headings like “Effects of changes in sea ice”, “Effects of changes in lake ice and river ice”, “Evidence of adaptation in the cyrosphere”, “Coastal processes and zones”, “Effects of trends in heat and cold stress”, (which are covered in the polar, coastal and human health chapters), Chapter 1 should strictly focus on “Observed changes” in river ice, coastal erosion, heat stress, etc. | Section headings given in PAO. Focus tightened to WGII observed changes. |

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| | | | | | | (Government of USA) | |
| G-1-12 | A | 2 | 1 | | 1 | Define Aggregation in the text<br>(Government of USA) | Defined in Section 1.1. |
| G-1-13 | A | 3 | 1 | 5 | 36 | The Executive Summary would benefit from careful editing of the text. In general, many impacts on social systems and activities mentioned in the main text are neglected in the Executive Summary (e.g., some Arctic coastal communities relocating, impacts on tourism, impacts on fisheries, large human impact of lower crop yields in the Sahel, and increased economic losses due to extreme events even after normalization). In addition, Section 1.4 is completely neglected in the Executive Summary. The fact that the first joint attribution studies have been published should be mentioned prominently in the Executive Summary.<br>(European Union) | ES rewritten, with more on anthropogenic influence. |
| G-1-14 | A | 3 | 3 | 5 | 36 | The executive summary should be rewritten to improve clarity. Evaluation of observed climate change evidence is difficult because the observed responses of systems and sectors are influenced by many other factors. Non-climatic (list these) drivers can influence systems and sectors (what are these), directly and/or indirectly through their effects on climate variables such as reflected solar radiation and evaporation. Socio-economic processes, including land-use change e.g. transitional of agriculture to urban areas) land-cover modification (e.g. From forest to grasslands).<br>There is more and stronger evidence that climate change is affecting natural and managed (what is this?) systems in the cryosphere. There is emerging evidence from hydrological, oceanic and coastal zones of anthropogenically induced climate change.<br>Changes in the cryosphere are manifested in the following ways: Accelerating changes in sea level rise, disappearance of ice and emergence of the lithosphere, increased instability of mountain permafrost, thawing of buried ice and destabilization of glacial lake moraines and increased runoff from snow and glaciers. Make statements regarding sea level rise consistent with WG I. WG I concludes that sea level is rising but not that the rate of sea level rise is increasing.<br>Changes in the distribution and migration patterns of Arctic mammals and Antarctic Peninsula fauna; and greening of the Arctic and the Antarctic Peninsula.<br>Recent evidence suggests that climate changes have affected the hydrologic cycle by increasing runoff/stream flow, droughts and floods, and changes in the thermal structure of lakes.<br>There is increasing freshwater runoff from large basins in the Eurasian Arctic into the Arctic Ocean. | In sea level rise 'acceleration' has been substituted by 'increased sea level rise in recent decades', in agreement with Chapter 4, WG1.<br><br>ES rewritten. |

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| | | | | | | Areas most affected by increasing long-term droughts are characterized by decreasing runoff and lowering lake levels. Lakes and rivers around the world are warming effecting thermal structures and lake chemistry.<br>Coastal zones increasingly show evidence for: Sea-level rise, enhanced wave heights, increased intensity of storms and coastal erosion in the polar regions….<br>Ensure consistency of statements regarding sea level rise with WG I conclusions.<br>There is evidence from a wide range of species and communities in terrestrial ecosytems that recent warming is already strongly affecting natural biological systems. There is substantial new evidence in marine and freshwater systems that link ecosystem changes to warming (very high confidence).<br>In terrestrial ecosystems: There are significant poleward and elevational range extensions of flora and fauna, coincident with warming of these regions. Changes in abundance of certain species are attributed to climate change (e.g. the disappearance of key butterfly species).<br>In marine and freshwater ecosystems: Many observed changes in phenology and distribution have been associated with rising water temperatures, changes in salinity, oxygen levels, and circulation. There is well documented poleward movement of plankton and fish by 10 degrees of latitude over a period of 4 decades in the North Atlantic…..<br>The warming of lakes and rivers affects abundance and productivity, community composition, phenology, distribution and migration of species in these domains.<br>Human responses to recent climate changes are now detectable in a few agricultural practices and changing state of human health (medium confidence)….In arid regions….<br>Since 1970 extreme weather events have led to rising costs. (medium confidence).<br>In some regions, the frequency of extreme weather events/floods is increasing. The number and intensity of tropical cyclones , particularly in the Atlantic Ocean and Northwest Pacific has significantly increased since 1976.<br>(Government of USA) | |
| G-1-15 | A | 3 | 4 | 3 | 4 | Add the word "chemical" after the word physical, since chemcial proceses are discussed later in the chapter<br>(Government of Sweden) | Not focus of chapter; chemical changes are included as part of physical changes. |
| G-1-16 | A | 3 | 6 | 3 | 6 | Authors need to explain what the "stronger quantitative evidence" that has been found relates to.<br>(Government of Australia) | Phrase deleted. |
| G-1-17 | A | 3 | 7 | | 7 | The distinction between a sector and a region should be made clear;<br>(Government of USA) | The term ‘sector’ replaced with managed or human system, or deleted. |

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| G-1-18 | A | 3 | 8 | 3 | 9 | Delete "are like to" as this statement is tautologically true.<br>(European Union) | Text rewritten. |
| G-1-19 | A | 3 | 8 | | | "like" should be "likely"<br>(Government of Ireland) | Text rewritten. |
| G-1-20 | A | 3 | 9 | 3 | 9 | Add the word "chemical" after the word physical, since chemcial proceses are discussed later in the chapter<br>(Government of Sweden) | Not focus of chapter; chemical changes are included as part of physical changes. |
| G-1-21 | A | 3 | 11 | 3 | 11 | Replace start of sentence by "The attribution of observed changes to anthropogenic climate change is difficult..."<br>(European Union) | Text rewritten. |
| G-1-22 | A | 3 | 21 | 3 | 22 | The authors should include a reference to the findings on attribution in the WG1 report in this heading to ensure consistency across the reports.<br>(Government of Australia) | Accepted. A statement from the WGI chapter on attribution has been included and cross-referenced now. |
| G-1-23 | A | 3 | 21 | 3 | 21 | Add the word "chemical" after the word physical, since chemcial proceses are discussed later in the chapter<br>(Government of Sweden) | Not focus of chapter; chemical changes are included as part of physical changes. |
| G-1-24 | A | 3 | 24 | | 26 | Multiple use of attributed/attribution is confusing. Suggest changing “attributed” to “ascribed” or “a result of”<br>(Government of USA) | Rejected. Attribution is used as defined in the chapter and in the IPCC Glossary. |
| G-1-25 | A | 3 | 29 | 3 | 29 | The term "cryosphere" refers to the a natural system only. For that reason, the term "natural and managed systems in the cryosphere" should be replaced by "natural and social systems in polar and glacial regions/ice covered regions" or something similar. This recommendation also affects the title of Section 1.3.1.<br>(European Union) | Name is from Plenary-Approved Outline. |
| G-1-26 | A | 3 | 30 | 3 | 30 | "Hydrology" is a science not a system or a sector. For that reason, the term "hydrology and water resources" should be replaced by "Hydrological systems" or something similar. This recommendation also affects the title of Section 19.3.2.<br>(European Union) | Name is from Plenary-Approved Outline. |
| G-1-27 | A | 3 | 33 | | 42 | Changes in ocean circulation should be included as one of the manifestations of a changing Cryosphere; also in the third bullet changes in water supplies should be called out explicitly.<br>(Government of USA) | Ocean circulation changes have been reassessed and no significant changes have been found in the light of a more extensive literature search and the findings of Chapter 4 |
| G-1-28 | A | 3 | 34 | 3 | 34 | what is meant by 'land scape appearance' ?<br>(Government of Netherlands) | changed to ‘changes in landscape due to ice loss’ |
| G-1-29 | A | 3 | 34 | 3 | 34 | the term "landscape appearance" may need clarification<br>(European Union) | changed to ‘changes in landscape due to ice loss’ |
| G-1-30 | A | 3 | 34 | | 34 | Remove “changes in” since sea level rise implies a change | Removed |

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| | | | | | | (Government of USA) | |
| G-1-31 | A | 3 | 47 | 3 | 48 | Delete the phrase "Recent evidence in hydrology and water resources shows that" because this is clear from the rest of the sentence.<br>(European Union) | Text rewritten. |
| G-1-32 | A | 3 | 47 | | 49 | The part of the statement that says that there is more evidence of an intensified hydrological cycle in regard to droughts and floods is not supported by the evidence presented in this chapter. There is mixed evidence of increasing floods or droughts as seen in Tables 1.3a and 1.3b and in section 1.3.8.1 on page 56. On page 25, lines 5 to 9, Huntington (2005) is quoted as supporting the concept that trends in floods and droughts support the concept of the intensification of the hydrological cycle. This is an inaccurate representation of Huntington (2005). In that paper (even in the abstract) Huntington states that the empirical evidence to date does not consistently support an increase in the frequency or intensity of floods. Rather, increased runoff and other factors in Huntington (2005) support the idea of an intensification of the hydrologic cycle.<br>A well documented hydrologic change in North America and Eurasia that is not mentioned on page 3, but should be, is the shift in peak streamflows by 1-2 weeks due to earlier snowmelt (see studies listed at the bottom of Table 1.2a and on page 19, lines 8 to 14).<br>(Government of USA) | We have changed the statement to read, 'some regions . . . ' We removed 'intensification of hydrological cycle.' We added shift in streamflow to ES. |
| G-1-33 | A | 4 | 1 | 4 | 3 | rephrase Messages unclear due to convoluted wording.<br>(European Union) | Text rewritten. |
| G-1-34 | A | 4 | 5 | 4 | 5 | Add "and biology" after the word chemistry<br>(Government of Sweden) | Biology is in TBS section of ES. |
| G-1-35 | A | 4 | 13 | 4 | 13 | "Coastal processes and zones" should be renamed to "Coastal zones" or "Coastal regions". This recommendations also affects the title of Section 1.3.3.<br>(European Union) | Name is from Plenary-Approved Outline. |
| G-1-36 | A | 4 | 20 | 4 | 23 | Unclear: to what extent climate change leads to local sea-level rise above the global mean. Revise with a clear and consistent message.<br>(European Union) | Text rewritten. |
| G-1-37 | A | 4 | 20 | 4 | 20 | It is noted that according to AR4 WGI report global average sea level rise was 1.7 mm/yr in the past but that this rate has increased to about 3 mm/yr in the last decade. It is suggested to make this text more coherent with the findings of WG I.<br>(Government of Austria) | Revised to clarify and ensure consistency with WGI.. |
| G-1-38 | A | 4 | 20 | 4 | 20 | Global trend of 1,7mm:yr is not consistent with SOD WG I, Ch 5, page 2, line 43-44 "Sea level rise measured by satellite altimetry since 1993 is estimated as 3.1 ± 0.8 mm yr–1" . See also same page lines 56 to line 2 page 3 | Revised to clarify and ensure consistency with WGI. |

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| | | | | | | (Government of France) | |
| G-1-39 | A | 4 | 20 | 4 | 23 | 'Many' suggests it could be the majority of places where global trend is exceeded. Drafting is confusing in attributing this variation by place to climate change. (Government of Australia) | Revised to clarify and ensure consistency with WGI. |
| G-1-40 | A | 4 | 20 | | 23 | The sea level rise trend rate cited is unclear whether it represents relative SLR or absolute SLR, and over what period. The best scientific source for global average absolute SLR is Leuliette, 2006. As I recall, the rate of SLR from these satellite data is roughly 2.9 + .4 mm/year since 1993. This is a better source because it eliminates the question of rates of land subsidence/uplift, and it also shows that the level of increase is not uniform (i.e. some regions will experience more absolute SLR than others, at least over years to decades. http://sealevel.colorado.edu/current/sl_ib_ns_global.jpg In considering this comment, ensure consistency of statements regarding sea level rise with WG I conclusions. Confirm that Leuliette (2006) exists and is in the literature cited – the citation may be to a 2004 rather than 2006 paper. (Government of USA) | Revised to clarify and ensure consistency with WGI. |
| G-1-41 | A | 4 | 20 | | 21 | Here and in several other places in the text of Chapter 1 the authors suggest that sea level rise during the 20th century average (at an average rate of ~1.7 mm/yr) is due to “climate change”. Sea level has been rising since the peak of the last interglacial about 20,000 years ago and the rise during the 20th century is not attributed to anthropogenic factors according to WGI. There is a lag in response (that is why sea level will continue to rise long after greenhouse gas emissions have been stabilized) and an acceleration due to human-induced increases in greenhouse gases has not been detected. WGI has concluded that the instrumental record from satellite altimetry is too short to determine that a persistent increase in the rate of sea level rise has indeed commenced. (Government of USA) | Revised to clarify and ensure consistency with WGI. |
| G-1-42 | A | 4 | 25 | 4 | 30 | These bolded sentences should be re-written to include standard IPCC likelihood and confidence terms and to more clearly define quantitative words such as "strongly" and "substantial". The final sentence also seems redundant when compared with the preceding two sentences. (Government of Australia) | Statement is substantiated in text immediately following. |
| G-1-43 | A | 4 | 28 | 4 | 29 | Replace the sentence by "The evidence shows that the biology of both terrestrial and aquatic systems are now being strongly influenced by observed warming (very high confidence)" (Government of Sweden) | Authors emphasize changes in systems, rather than changes in biology. |
| G-1-44 | A | 4 | 31 | 4 | 39 | The Executive Summary should also mention that some amphibian species are | Evidence regarding amphibians is still |

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| | | | | | | thought to have become extinct due to changes in regional climate that are consistent with anthropogenic climate change (in particular the Golden Toad in Costa Rica).<br>(European Union) | confounded. |
| G-1-45 | A | 4 | 32 | 4 | 32 | focus only on studies "exhibiting significant warming impacts" implies a circular argumentation, given that these warming impacts are to be shown. Rephrase<br>(European Union) | Text rewritten. |
| G-1-46 | A | 4 | 38 | 4 | 39 | An explanation is needed as to why disappearances in butterflies are key examples of changes in abundance of species.<br>(Government of Australia) | Butterflies removed from ES statement. |
| G-1-47 | A | 4 | 39 | | | consider rephrasing '...including disappearane of a few key butterfly species'<br>(Government of Ireland) | Butterflies removed from ES statement. |
| G-1-48 | A | 4 | 46 | 4 | 46 | Delete "already"<br>(European Union) | Done. Text rewritten. |
| G-1-49 | A | 5 | 9 | 5 | 10 | may be better as ' ...reductions in precipitation and increases in temperature on…'<br>(Government of Ireland) | Text rewritten. Not applicable. |
| G-1-50 | A | 5 | 16 | 5 | 23 | The confidence levels in the section "Regarding human health" does not fit with the overall medium confidence level, as the section states that "there is little evidence", this section should therefore be given its own bold heading and a new confidence level.<br>(Government of Australia) | OK. Perhaps wwe should reword to “Some evidence” to replace “little” |
| G-1-51 | A | 5 | 16 | 5 | 23 | Also extreme precipitation events with consequent floods will threaten human health. Why is that not mentioned?<br>(Government of Sweden) | But is this due to climate change or variation? |
| G-1-52 | A | 5 | 17 | 5 | 20 | This statement neglects important work on the relationship between past climate change and human health. According to the 2002 WHO Burden of Disease assessment (M. Ezzati, A. D. Lopez, A. Rodgers, S. Vander Hoorn, C. J. L. Murray, and Comparative Risk Assessment Collaborating Group, 2002: Selected major risk factors and global and regional burden of disease, Lancet, 360:1347-1360), anthropogenic climate change is estimated to have caused the loss of over 150.000 human lifes per year.<br>(European Union) | ?<br>I need to check this reference |
| G-1-53 | A | 5 | 25 | 5 | 25 | The authors should explain the term "global losses".<br>(Government of Australia) | Text rewritten. Addressed. |
| G-1-54 | A | 5 | 25 | 5 | 25 | Change the formulation "Global losses reveal rapidly rising costs..." into the clearer and correct "Global losses due to extreme weather events are rapidly rising since the 1970s" | Text rewritten. |

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| | | | | | | (European Union) | |
| G-1-55 | A | 5 | 34 | | 34 | There is no increase in Category 5 storms in either the Atlantic or Northwest Pacific.<br>(Government of USA) | Rejected. Published literature reports observed changes in intense TCs in these basins since 1970 (Webster et al, 2005; Emanuel, 2005). |
| G-1-56 | A | 6 | 5 | | 5 | Effects of human systems<br>(Government of USA) | Disagree. Poor idium use. |
| G-1-57 | A | 6 | 7 | 6 | 7 | Add the word "chemical" after the word physical, since chemcial proceses are discussed later in the chapter<br>(Government of Sweden) | Disagree. |
| G-1-58 | A | 6 | 8 | | 8 | Assessed with regard to<br>(Government of USA) | Changed. |
| G-1-59 | A | 6 | 12 | 6 | 13 | Delete "Absence of evidence, i.e." as the rest of the sentence is completely -or even better- understandable without this term.<br>(European Union) | Thank you. Done. |
| G-1-60 | A | 6 | 20 | | 20 | Spell out WG I on first use.<br>(Government of USA) | Done. |
| G-1-61 | A | 6 | 24 | 6 | 24 | Add the word "chemical" after the word physical, since chemcial proceses are discussed later in the chapter<br>(Government of Sweden) | Not focus of chapter; chemical changes are included as part of physical changes. |
| G-1-62 | A | 6 | 34 | 6 | 35 | The present bullet reads: “Snowmelt and runoff: Snow and runoff had occurred increasingly earlier in California since the late 1940s”. This phrase should be changed (or deleted) of several reasons: a). The summary in this section (§1.1.1) mostly deals with large regions (Arctic, Antarctic, Northern Hemisphere). It thus seems peculiar to just refer to California, and particularly conc. snowmelt and runoff. b). What is meant by “….snow (…) had occurred increasingly earlier….”. Probably it is meant “snowmelt” and not “snow”? c). What is meant by “….(…) runoff had occurred increasingly earlier….”. Doesn’t runoff occur all year round, maybe except in the deserts in California? Probably the intention was to deal with “runoff from snowmelt”. Suggestion of new text for this bullet: (quoted from WGII-TAR, ch.4.3.6.1, p.200): “Snowmelt and runoff: In large parts of eastern Europe, European Russia, central Canada and California, there has been a major – and unprecedented - shift in stream flow from spring to winter”.<br>(Government of Norway) | OK, change accepted |
| G-1-63 | A | 6 | 38 | 6 | 38 | Add "Changes in chemical systems" according to what has been written on in e.g. Chapter 1, page 27 lines 6 to 27 or Chapter 1, page 21 lines 18 to 27<br>(Government of Sweden) | Not focus of chapter; chemical changes are included as part of physical changes. |

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| G-1-64 | A | 6 | 48 | 6 | 50 | I don't know why the long drought in Spain is not mentioned here? (Government of Belgium) | Added in 1.3.2, 1.3.6. |
| G-1-65 | A | 6 | 49 | 6 | 50 | Note that TAR WG2 Chapter 8 concluded that most of the increase in damages is due to increased wealth and exposure. However, part of the increase in losses was attributed to climate change, in particular to more frequent and intense extreme weather events. Please add these two points. (Government of Netherlands) | Added. |
| G-1-66 | A | 7 | 4 | | 9 | Although the focus on temperature is appropriate, important variables other than temperature should at least be mentioned here (e.g. precipitation); Also, the implications of only going back to 1970 should be discussed and a justification given. In light of the cold temperatures of the 1970s, the examination may be somewhat skewed; Abalati, NASA/GSFC. Revise the chapter to explain the rationale for considering the period since 1970 and for considering only temperature. Explain the implications of these assumptions for chapter conclusions. (Government of USA) | Other variables mentioned and selection of temperature justified. Focus on 'recent decades' rather than specific period. |
| G-1-67 | A | 7 | 7 | | 7 | It has an important influence (Government of USA) | Phrase added. |
| G-1-68 | A | 7 | 8 | 7 | 8 | Add the word "chemical" after the word physical, since chemcial proceses are discussed later in the chapter (Government of Sweden) | Not focus of chapter; chemical changes are included as part of physical changes. |
| G-1-69 | A | 7 | 22 | 7 | 23 | "Hydrology" is a science not a system or a sector. (European Union) | Names of sections are from Plenary-Approved Outline. |
| G-1-70 | A | 7 | 29 | | 29 | Explain larger-scale aggregation (Government of USA) | Explained Section 1.1. |
| G-1-71 | A | 7 | 38 | 7 | 42 | Perhaps an example could be given to make these terms clear, especially the difference between response and sensitivity (Government of Netherlands) | Text reworked, with 'response' explained. |
| G-1-72 | A | 7 | 41 | 7 | 42 | The definition of 'Adaptation' in the TAR (see TAR Glossary) referred to 'Adjustment in natural or human systems…'. If AR4 is going to change the scope of meaning for Adaptation, this will need to be explained. (Government of Australia) | Test rewritten. |
| G-1-73 | A | 7 | 45 | | | The reference to ACIA should be (ACIA 2005) (not 2004). This should also be updated in the reference list. (Government of Norway) | OK, changed. |
| G-1-74 | A | 7 | 48 | 8 | 5 | Delete the phrase in brackets as it -wrongly- suggests that in developing countries there is a predominance of systems that may be less sensitive to temperature. (European Union) | Deleted. |

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| G-1-75 | A | 8 | 3 | | 4 | An urgent need to improve the observation networks and to enhance data sets of physical and biological systems and in the….<br>(Government of USA) | Observed networks will enhance datasets. Research capabilities need to be enhanced overall. |
| G-1-76 | A | 8 | 16 | 8 | 16 | Delete "than"<br>(European Union) | Agree. Done |
| G-1-77 | A | 9 | 9 | | 9 | Explain sectors and systems<br>(Government of USA) | Sectors removed; chapter now uses natural, managed, and human systems. |
| G-1-78 | A | 9 | 12 | | 12 | Non-climate drivers (such as….)<br>(Government of USA) | Changed. |
| G-1-79 | A | 9 | 34 | | 34 | "rainfall" should be changed to "precipitation" in order to include snowfall<br>(Government of USA) | Agree and changed. |
| G-1-80 | A | 9 | 45 | | 45 | The parentheses seem to be in the wrong place (should close after "PDO")<br>(Government of USA) | Agree and changed. |
| G-1-81 | A | 9 | 46 | | 46 | and the Arctic Oscillation (AO)<br>(Government of USA) | Agree and changed. |
| G-1-82 | A | 10 | 1 | | 1 | Ensure consistent use of climate and climatic throughout.<br>(Government of USA) | Agree. |
| G-1-83 | A | 10 | 15 | 10 | 16 | Table 1.1 is useful, however, in the row concerning "Invasive species" the bracketing of countries under the invasive species needs to be explained (i.e is Australia the country which being invaded or the source country?).<br>(Government of Australia) | Agree. |
| G-1-84 | A | 10 | 15 | 10 | 51 | Table 1.1 : Row 'Land-cover modification' Column 'Direct effects on systems' add: 'biodiversity loss'<br>(Government of Netherlands) | Agree and changed |
| .G-1-85 | A | 10 | 15 | | 15 | Under geological processes need to add plate tectonics, leads to continental drift over space and time, effects sea level rise and fall, global albedo changes. Consider this comment in context of recommendation to delete Table 1.1.<br>(Government of USA) | Uniform effects due to 'Plate tectonics' such as continental drift, are outside the time range of this chapter. 'Catastrophic" effects due to plate tectonics are already listed (volcanism, earthquakes, tsunamis) |
| G-1-86 | A | 10 | 15 | | | The Socio-economic processes that drive land-use change (as mentioned in lines 17 and 18 on page 10) may also be included in Table 1.1 like other non-climate drivers.<br>(Government of Pakistan) | Interesting point. |
| G-1-87 | A | 10 | 15 | | 15 | In Table 1, last column, last row, it is worth specifically singling out snow cover, since pollution has the most dramatic effect on snow covered surfaces. Consider this comment in context of recommendation to delete Table 1.1. | Agree and done. |

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| | | | | | | (Government of USA) | |
| G-1-88 | A | 10 | 15 | | | Consider deleting Table 1.1 and replacing with brief text to clarify the non-climatic changes that will be considered within the chapter. This table takes up too much space and contributes little to this chapter that is supposed to address "observed changes".<br>(Government of USA) | This was done in the FOD. Do not agree. The Chapter addresses observed impacts. |
| G-1-89 | A | 11 | 7 | | | Pielke 2002 or Pielke et al 2002?<br>(Government of Ireland) | Changed. |
| G-1-90 | A | 11 | 11 | 11 | 14 | Fragmentation of natural habitats caused by land-use change and land-cover modification will hamper the range shifts of species as a response to climate change, leading to an extra loss of biodiversity (Opdam & Wascher 2004).<br>Opdam, P., Wascher, D., 2004. Climate change meets habitat fragmentation: linking landscape and biographical scale levels in research and conservation. Biological Conservation 117 (2004) 285-297.<br>(Government of Netherlands) | These points are true but they are dealt with elsewhere. |
| G-1-91 | A | 11 | 23 | 11 | 25 | The influence of poverty on health impacts due to climate change could be better explained by giving examples like increased vulnerability to extreme events, malnutrition and poor living conditions as we see in the slum settlements, rather than linking it with air conditioning which seems a luxury for the persons living in extreme poverty.<br>(Government of Pakistan) | Agreed. Text rewritten. |
| G-1-92 | A | 11 | 48 | 11 | 49 | The term "Examining one-to-several-species or indicators" is not clear. Rephrase sentence.<br>(European Union) | Text rephrased. |
| G-1-93 | A | 12 | 4 | | 4 | There are more than visible imaging sensors used on aircraft to remotely sense the Earth. These include laser altimetry, SAR, scatterometry, passive microwave instruments, etc. The authors should not limit their reference to airborne photography.<br>(Government of USA) | Section on data removed to shorten text. |
| G-1-94 | A | 12 | 10 | | 10 | The proper capitalization of ICESat is "ICESat".<br>(Government of USA) | Text removed to shorten chapter. |
| G-1-95 | A | 12 | 33 | | 33 | CZCS was launched in 1978 on the Nimbus 7 satellite, not 1972.<br>(Government of USA) | Text removed to shorten chapter. |
| G-1-96 | A | 13 | 14 | | | Section 1.2.3.1: This section has not addressed the very common problem of inadequately specified analysis, including when there is correlation among independent variables -- and especially where not all (potentially) important explanatory independent variables have been included. Clearly, there are significant | Text removed to shorten chapter. |

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| | | | | | | problems of insufficient data for doing robust analysis of trends, especially in biological systems. But the discussion of statistical methods needs to acknowledge this weakness and the risks of inappropriately attributing causality where not all independent drivers have been included.<br>(Government of USA) | |
| G-1-97 | A | 15 | 8 | | | Section 1.3 should explicitly relate its conclusions on observed changes back to the WG1 report, to ensure consistency throughout the whole AR4. This could be done through referencing the specific chapters of the WG1 report consistently through section 1.3.<br>(Government of Australia) | Consistency with WGI checked. |
| G-1-98 | A | 15 | 11 | | 11 | In the cryosphere, terrestrial hydrosphere, ocean and coastal zones…<br>(Government of USA) | Names of systems given in Plenary-Approved Outline. |
| G-1-99 | A | 15 | 21 | 22 | 16 | The following reference should be cited and included: "Community of Arctic Bay, Nickels, S., Furgal, C., Akumilik, J., Barnes, BJ. 2005. Unikkaaqatigiit – Putting the Human Face on Climate Change – Perspectives from Arctic Bay, Nunavut. Ottawa: Joint publication of Inuit Tapiriit Kanatimi, Nasivvik Centre for Inuit Health and Changing<br>Environments at Université Laval and the Ajunnginiq Centre at the National Aboriginal Health Organization. Available at http://www.itk.ca/environment/climate-book/community/ArcticBay.pdf<br>(European Union) | OK, added. |
| G-1-100 | A | 15 | 39 | | 40 | Cite Hodgkins et al for earlier stream flows in North America<br>Hodgkins, G A, R. W. Dudley, and T. G. Huntington. 2003. Changes in the timing of high river flows in New England over the 20th century. Journal of Hydrology, 278:244 - 252.<br>(Government of USA) | OK, added. |
| G-1-101 | A | 15 | 45 | 15 | 48 | The present text reads: “A few maritime glacier areas are advancing due to increased local and regional precipitation in Norway and New Zealand (Chinn et al 2005), although in the last few years the mass balance of small Norwegian glaciers started diminishing, while that of larger glaciers still increases, suggesting a reversal". This sentence is not only difficult to understand, - but more important is that the statement conc. Norwegian glaciers is erroneous! a). Even if the mass balance of a glacier “has started diminishing”, the glacier may still increase. The important issue for increasing / decreasing glaciers is whether the mass balance is positive or negative. The statement probably refers to cumulative net balance during a longer time period. b). What is meant by: “…while that of larger glaciers still increases, suggesting a reversal”? c). The statement about Norwegian glaciers | OK, text changed and reference added. |

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| | | | | | | in this sentence is not updated, and unfortunately not correct. Since 2000, all Norwegian glaciers (incl. the larger ones) have been retreating. In the draft text for IPCC-WGII 4AR the following is stated in ch.4 conc. glaciers in Scandinavia: "Norwegian coastal glaciers, which advanced in the 1990s due to increased accumulation in response to a positive swing in the North Atlantic Oscillation (NAO), started to retreat around 2000 as an almost simultaneous result of reduced winter accumulation and greater summer melting (Kjøllmoen, 2005). Norwegian glaciers further inland have retreated continuously at a more moderate rate." The reference used in WGI is: Kjøllmoen, B.E., 2005. Glaciological investigations in Norway in 2004. Norwegian Water Resources and Energy Directorate, Oslo, http://www.nve.no/FileArchive/176/Glac_invest2004.pdf. An updated reference including year 2005 may be found in: Kjøllmoen, B.E. (ed), L.M.Andreassen, R.V.Engeset, H.Elvehøy, M.Jackson and R.H.Giesen, 2005. Glaciological investigations in Norway in 2005. Norwegian Water Resources and Energy Directorate, Oslo, http://www.nve.no/admin/FileArchive/79/report2mf.pdf. A journal reference (in press, will probably be published in august 2006): Andreassen, L.M., H.Elvehøy, B.Kjøllmoen, R.V.Engeset and N.Haakensen, 2006. Glacier mass balance and length variations in Norway. Annals of Glaciology 42. In press. (Government of Norway) | |
| G-1-102 | A | 16 | 10 | | 10 | Confused by the reference to year-round exposure to ablation. Even below the equilibrium line there are seasons in which there is no ablation. Presumably the authors meant net ablation through the year? Additionally, delete “exposure to” on Page 16, Line 10 of the chapter. (Government of USA) | OK, text changed. |
| G-1-103 | A | 17 | 5 | 17 | 5 | Add "et al." after one of the name Hock (Government of Sweden) | OK, added. |
| G-1-104 | A | 17 | 9 | | 12 | The Rignot reference is not correct. Should be Rignot, E., Rivera, A. and Casassa, G. (2003) Contribution of the Patagonia Icefields of South America to sea-level rise.Science, 302, (5644) pp. 434–437. (Government of USA) | OK, modified. |
| G-1-105 | A | 17 | 27 | | 27 | Sea level rise. Global glacier volume losses have accelerated …. (Government of USA) | OK, modified. |
| G-1-106 | A | 17 | 28 | | 28 | in Alaska (Government of USA) | OK, modified. |
| G-1-107 | A | 17 | 30 | | 30 | The impression given is that the Abdalati et al., 2004 reference states that glaciers in the Arctic are undergoing accelerating loss. The reference is applicable to some | ‘Canadian’ now added before Arctic. |

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| | | | | | | of the Canadian ice caps only, not the Arctic as a whole. Dowdeswell and Hagen (2004) [Arctic ice caps and glaciers. In: Bamber, J. L. and Payne, A. J. (Eds.) Mass Balance of the Cryosphere, Cambridge University Press] suggest there for a number of places in the Arctic, there is no evidence to support an arctic-wide accelerating trend.<br>(Government of USA) | |
| G-1-108 | A | 17 | 36 | | 38 | The Rignot and Kanagaratnam reference is notable for identifying the acceleration of outlet glacier, but these magnitudes are very debatable as there are a number of other mass balance estimates that don't find the same magnitude of negative mass balance for Greenland. Most notable are those of Krabill et al, 2000 (Science), Thomas et al., 2004, GRL, Thomas et al., 2006, GRL, and Zwally et al., 2005 (J. Glaciol). All of these provide significantly lower estimates than those of Rignot et al, and by only presenting the most extreme number, there is no acknowledgement or indication of how debatable these numbers are. The Thomas et al., 2004 and 2006 references do further support the notion of accelerating loss, so including them would strengthen that point.<br>(Government of USA) | Reference to Rignot and Kanagaratnam is now deleted, and all sea level rise values refer directly to Chapter 4, WG1. |
| G-1-109 | A | 17 | 37 | | 37 | sheets show an increased contribution from Greenland…<br>(Government of USA) | OK, changed. |
| G-1-110 | A | 17 | 39 | | 39 | The Velicogna and Wahr numbers are also the subject of much debate, and there are two other altimetry studies that provide significantly different numbers for a different period (Zwally et al., J. Glaciology, 2005, and Wingham et al. Proceedings of the Royal Society, 2006). These should be included for completeness. Ensure that estimates of sea level rise and trends presented here are consistent with conclusions of Working Group I, particularly by acknowledging the Working Group I conclusion that the record is too short to conclude that sea level rise is accelerating.<br>(Government of USA) | Reference to Velicogna and Wahr, 2006 is now deleted, and all sea level rise values refer directly to Chapter 4, WG1. |
| G-1-111 | A | 17 | 40 | | 41 | thermal expansion and other causes was… while in 1993-2003 it was…<br>(Government of USA) | OK, changed. |
| G-1-112 | A | 17 | 45 | 17 | 51 | This section on impacts on the Earth's gravitational field needs to express more clearly that this work is very tentative and that the acceleration in J2 may be due to numerous non-climate related factors.<br>(Government of Australia) | Reference to the Earth's gravitation field (J2) has now been eliminated. |
| G-1-113 | A | 18 | 15 | 18 | 19 | This statement should be mentioned in the Executive Summary.<br>(European Union) | OK, now mentioned in the Executive Summary. |
| G-1- | A | 18 | 21 | | 28 | It would make more sense to me to present the ice shelves after the ice sheets, since | OK, section moved and modified. |

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| 114 | | | | | | much of their significance comes from their interactions with the ice sheets.; also their contribution to sea level, when they melt is not exactly zero because of the difference in density between fresh water and sea water. It is probably more appropriate to say in line 26 "… contribution of melting ice shelves to sea level rise is essentially zero. However…"<br>(Government of USA) | |
| G-1-115 | A | 18 | 34 | | 39 | Greenland losses are also a result of increased melt rates (Abdalati and Steffen, 2001 JGR, Box et al, 2006, J of Climate); The reference to large losses in the Amundsen Sea Sector of Antarctica should also be Shepherd et al., (GRL, 2004). There should be a reference for the coastal thinning of Antarctica. This would probably be Zwally et al, 2005 (J. Glaciology). The Zwally et al, 2005 reference or the Wingham et al reference should also be used in addition to the Velicogna and Wahr reference for the losses in west Antarctica.<br>(Government of USA) | OK, modified accordingly. |
| G-1-116 | A | 18 | 48 | | 49 | In recent decades there has been general worldwide decrease of snow cover extent in spring in the Northern Hemisphere…<br>(Government of USA) | OK, changed. |
| G-1-117 | A | 19 | 9 | | 11 | The Hodgkins et al., 2003 reference should be to New England, not Alaska. Alternatively, the Hodgkins et al., 2003 reference could be dropped and a newer study added that includes a much large part of eastern North America: Hodgkins, G. A., and R. W. Dudley, 2006, Changes in the timing of winter–spring streamflows in eastern North America, 1913–2002: Geophysical Research Letters, vol. 33, L06402, doi:10.1029/2005GL025593. The Cayan 2001 reference should be Cayan et. al 2001.<br>(Government of USA) | OK, New Hodgkins reference included. |
| G-1-118 | A | 19 | 9 | | 9 | Are occurring earlier in the Western…<br>(Government of USA) | OK, changed. |
| G-1-119 | A | 19 | 21 | | 38 | All of this material is covered in the polar chapter (Ch. 15). Note here that the Chapter 1 text focuses on potential impacts like increased slope instability, increased navigation in the Arctic, and enhanced coastal erosion (anticipated impacts), with very little observational evidence presented.<br>(Government of USA) | References to Chapter 4, WG1 and Chapter 15, WG2 have now been added. |
| G-1-120 | A | 19 | 31 | | 31 | Need to discuss changes in northeastern Siberia the Yetema complex.. thought to be 500 GT of carbon sequestered in the permafrost.<br>(Government of USA) | Could not find it in the literature. Zimov reference now added. Note that no observed changes in carbon release are reported for permafrost areas. |
| G-1- | A | 19 | 44 | 19 | 45 | First quantitative estimation on C-content in permafrost soils and on amounts of | Reference added. |

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| 121 | | | | | | potentially released GHGs from thawing soils was published in SCIENCE (Vol. 312, no. 5780, pp.1612-1613) by ZIMOV et al. In 'Permafrost and the Global Carbon Budget' at 16.June 2006<br>(Government of Germany) | |
| G-1-122 | A | 19 | 48 | 20 | 6 | While there may be evidence of thawing of permafrost, the evidence of impacts on infrastructure is not as clear. A number of the references cite the difficulty of determining whether damage to infrastructure has been due to climatic influences or human influence yet the broad statement here does not reflect that. The references (and the Polar regions chapter) should be reviewed and the statement revised.<br>(Government of Canada) | OK, statement changed according to conclusions of Chapter 15, WG2 and Chapter 4, WG1. |
| G-1-123 | A | 20 | 15 | | 15 | Slope instability on thawing Arctic continental shelves may also contribute to large mass wasting –ocean-wide events possible triggering tsunamis<br>(Government of USA) | OK, added, but no evidence for this could be found. |
| G-1-124 | A | 20 | 18 | | 22 | More significant (or as significant) as the 3% per decade ice loss is the loss of perennial ice at a rate of nearly 10% per decade (Comiso et al., Weather, 2006 or Comiso et al., GRL, 2004) and the significant reduction of thickness of more than 40 percent in the last several decades reported by Rothrock et al., 1999 (GRL).;<br>(Government of USA) | According to Chapter 4, WG1, the evidence of very strong reduction of sea ice thickness in the Arctic is still debatable based on other studies that show large interannual variability and even some studies that show no change (e.g. McLaren et al., 1994; Shy and Walsh, 1996), see Chapter 4, WG1 for complete references). We now quote a 'thinning of ~1 m from 1987 to 1997 (Chapter 4, WG1)'. |
| G-1-125 | A | 20 | 20 | | 22 | Is this comment on Antarctic corrected?<br>(Government of Ireland) | Yes, it has been corrected based on the latest findings presented in Chapter 4, WG1. |
| G-1-126 | A | 20 | 29 | 20 | 29 | Change to 'uncharted'.<br>(Government of Australia) | Done. |
| G-1-127 | A | 20 | 29 | | 29 | unchartered islands and seamounts have been discovered…<br>(Government of USA) | Changed. |
| G-1-128 | A | 21 | 3 | | 3 | The reference to ice skating should come after the transportation and the bridge and pipeline crossings as it is of less importance;<br>(Government of USA) | Changed. |
| G-1-129 | A | 21 | 17 | 21 | 17 | Add after the sentence in line 16: "The response of spring lake ice breakup dates is, however, nonlinear to air temperature increases implying that an annual mean air temperature increase of 1°C leads to faster ice breakup changes in warmer geographical regions than in colder regions (Weyhenmeyer et al. 2004). Full reference: Weyhenmeyer, G. A., M. Meili and D. M. Livingstone. 2004. Nonlinear | OK, added. |

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| | | | | | | temperature response of lake ice breakup. Geophysical Research Letters 31: L07203, doi: 10.1029/2004GL019530.<br>(Government of Sweden) | |
| G-1-130 | A | 21 | 18 | 21 | 18 | The heading in this line is essentially the same as that in line No. 51 on page 20. Appropriate change may be made.<br>(Government of Pakistan) | OK, changed. |
| G-1-131 | A | 21 | 19 | | | ..under ice habitation 'in' lakes...<br>(Government of Ireland) | Changed. |
| G-1-132 | A | 21 | 21 | 21 | 21 | delete the word "summer" in the sentence "such as summer oxygen depletion rate, since it is not correct that the timing of lake ice breakup has an impact on summer conditions. However, the timing of lake ice breakup has indeed strong influences on spring conditions.<br>(Government of Sweden) | 'Summer' deleted. |
| G-1-133 | A | 21 | 24 | | 24 | Are the break-ups due to jamming or is the jamming due to break-ups? As written, it seems backwards.<br>(Government of USA) | Order has now been reversed. |
| G-1-134 | A | 21 | 43 | | | International Polar Year - 2007-2008<br>(Government of Ireland) | Reference to IPY has been deleted following an expert review comment. |
| G-1-135 | A | 22 | 5 | | 5 | The phrase "both shrinkage and" seems redundant given that shrinkage is discussed in the preceding line;.<br>(Government of USA) | Sentence has been changed. |
| G-1-136 | A | 22 | 11 | | 11 | "ice mass reduction" should be "glacier and ice sheet shrinkage" since this is only referring to land ice. the phrase "ice mass reduction" does not distinguish land ice.<br>(Government of USA) | OK, changed. |
| G-1-137 | A | 22 | 14 | 22 | 14 | Add "and skating" after the word skiing since skating is similarly important for several Nordic contries<br>(Government of Sweden) | Skating is only discussed in the text in relation to possible impact of cryospheric changes. No evidence in decrease of skating activity has been found reported in the literature. |
| G-1-138 | A | 23 | 2 | | 10 | There is an inconsistency in this passage. On the one hand you say that "in most but not all regions the net result has been an increase in ET", but at the end of the paragraph you conclude that "no significant trends in ET can be detected globally". The last statement is overly broad when it is clear that ET has increased in North America (-cf. Walter et al., 2004) and Russia (Golubev, 2001). There is a lot of circumstantial evidence in that the growing season has lengthened over the northern hemisphere – see Schwartz et al., 2006 Global Change Biology. In addition to other evidence reported in Huntington, T. G. 2006, Evidence for intensification of the global water cycle: review and synthesis, Journal of Hydrology, 319:83-95. Define | (For Hydrology, the following codes were used)<br>A = Addressed<br>NA = Not applicable<br>TR = Text removed<br><br>TR |

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| | | | | | | pan ET and recognize that the discussion refers to evapotranspiration not evaporation. Is the discussion still valid with these considerations? The entire paragraph needs revision for accuracy and clear definition of the terms involved and their role in the water balance affecting run-off.<br>(Government of USA) | |
| G-1-139 | A | 23 | 23 | | 25 | If permafrost is going to be included in section 1.3.1.5, then it should be listed here as one of the main elements of the Cryosphere<br>(Government of USA) | A |
| G-1-140 | A | 23 | 32 | | 32 | Add Arctic Oscillation to the NAO mentioned in the first Observed Change section.<br>(Government of USA) | A |
| G-1-141 | A | 23 | 33 | | 33 | Table entry for USA should include the following references that clearly demonstrate increases in discharge that are more current and extensive than Lins and Slack 1999.<br>McCabe & Wolock 2002. Geophys. Res. Lett. 2002 29(24), 2185, doi:10.1029/2002GL015999<br>Mauget 2004 Climatic Change 63:121-144.<br>You should have a table entry for Finland showing increases in discharge based on Hyvarinen, V. 2003. Nordic Hydrology 34:71-90.<br>You should have a table entry for South America showing increases in discharge based on:<br>Garcia & Mechoso. 2006. Hydrol. Sci. J. 50:459-478<br>You could mention Labat et al 2004 for a global analysis showing increases in discharge<br>Labat et al. 2004 Adv. In Water Resour. 27: 631-642<br>You could mention Tao for increases in discharge for parts of China<br>Tao et al. 2003 Agricultural For. Met. 118:251-261<br>You could mention Kulkarnki et al 2003 for the Baspa River<br>Kulkarni et al. (2003) Intl. Arch. Photogramm. Remote Sensing Spatial Infor. Sci. 34:1265-1269<br>You should note () for decreases in streamflow in parts of Canada<br>Schindler and Donahue. 2006. Proc. Natl Acad. Sci. 103:7210-7216.<br>Dery et al. 2005 J. Climate 18: 1540-1557<br>(Government of USA) | Some refernces listed in text and others in SM |
| G-1-142 | A | 24 | | | | S.W Western-Australia - Check figure (5%). Fig SPM-2(d) states 50%.<br>(Government of Australia) | A |
| G-1-143 | A | 24 | | | | Misprint in Table 1.2.(a) The 5% drop for inflow should be 50% to be consistent with source data in F11.4 | A |

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| | | | | | | (Government of Ireland) | |
| G-1-144 | A | 24 | | | | First reference is incomplete<br>(Government of USA) | Reference completed. |
| G-1-145 | A | 24 | | | | At the bottom of table 1.2a: In the first column should read: "Western North America, New England, Canada, northern Eurasia". In the last column, Cayan 2001 should be Cayan et al. 2001, Regonda 2005 should be Regonda et al. 2005, Hodgkins et al, 2003 is listed twice. If desired, the Hodgkins et al., 2003 reference could be dropped and a newer study added that includes a much larger part of eastern North America: Hodgkins, G. A., and R. W. Dudley, 2006, Changes in the timing of winter–spring streamflows in eastern North America, 1913–2002: Geophysical Research Letters, vol. 33, L06402, doi:10.1029/2005GL025593.<br>(Government of USA) | A |
| G-1-146 | A | 25 | 0 | 25 | 0 | Add in the table Lake Võrtsjärv, Estonia/1884-2000/Strong water level fluctuations are related to the North Atlantic oscillation/ (Noges et al. 2003) Full reference: Noges T, Noges P, Laugaste R. 2003. Water level as the mediator between climate change and phytoplankton composition in a large shallow temperate lake. Hydrobiologia 506: 257-263<br>(Government of Sweden) | Addressed and listed in SM |
| G-1-147 | A | 25 | 5 | 25 | 8 | The statement that dry areas are tending to become drier, needs to be more clearly highlighted and should be clearly explained in the SPM and Executive Summary for Chapter 1.<br>(Government of Australia) | A |
| G-1-148 | A | 25 | 5 | | 20 | Section 1.3.2.2 pg 25 line 5 to 20 Please note that Huntington (2006) is partially misrepresented. This section begins by stating "Documented trends in floods ….and droughts shows that dry areas tending to become drier . . . . . ".Huntington (2006) stated that the evidence does NOT consistently support trends towards increasing frequency of floods (Lins and Slack, 1999; Douglas et al., 2000; McCabe and Wolock, 2002; Vogel et al., 2002; Zhang et al., 2001b; Lindstrom and Bergstrom, 2004; Hyvarinen, 2003; Mudelsee et al., 2003). There is strong evidence for an increase in stream/river discharge in higher flow quantiles but NOT in the highest flow quantiles (i.e. floods). This may seem a fine point but it is important because of all the concern over "extreme events". The evidence simply does not support an increase in flooding. This may come as a surprise to those that have seen positive evidence for increases in rainfall and rainfall intensity (e.g. Frei and Schär. 2001 Journal of Climate 14:1568–1584; Karl and Trenberth, 2003; Groisman et al., 2005) and increases in higher flow quantiles but in this case the evidence is too inconsistent with regard to flooding per se. The weight evidence for | Some references cited in text and others in SM. |

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| | | | | | | an increase in the intensity of the hydrologic cycle is compelling considering documented increases in rainfall, runoff, atmospheric water vapor, evaportranspiration, changes in ocean salinity, increases in snowfall resulting in increases in wintertime accretion of mountain glaciers, and lengthening of the growing season all reviewed in Huntington (2006). Analysis of satellite observations show that the Sahel is moister with increasing rainfall.<br>References:<br>Groisman, P.Y., R.W. Knight, D.R. Easterling, T.R. Karl, H.G. C, and V.N. Razuvae. 2005. Trends in intense precipitation in the climate record. J. Climate 18:1326–1350.<br>Hyvarinen, V. 2003. Trends and characteristics of hydrological time series in Finland. Nordic Hydrology 34:71-90.<br>Lins, H.F., and J.R. Slack. 1999. Streamflow trends in the United States. Geophys. Res. Letters 26:227-230.<br>McCabe, G.J., and D.M. Wolock. 2002. A step increase in streamflow in the conterminous United States. Geophys. Res. Lett. 29(24), 2185, doi:10.1029/2002GL015999,2002. 29:38-1 to 38-4.<br>Douglas, E.M., R.M. Vogel, and C.N. Kroll. 2000. Trends in floods and low flows in the United States: Impact of spatial correlation. Journal of Hydrology 240:90-105.<br>Lindstrom, G., Bergstrom, S., 2004. Runoff trends in Sweden 1807– 2002. Hydrol. Sci. J. 49, 69–83.<br>Mudelsee, M., Bo¨rngen, M., Tetzlaff1, G., Gru¨newald, U., 2003. No upward trends in the occurrence of extreme floods in central Europe. Nature 425, 166–169.<br>Vogel, R., Zafirakou-Koulouris, A., Matalas, N.C., 2002. Frequency of record-breaking floods in the United States. Water Resour. Res. 37, 1723–1731.<br>Zhang, X., K.D. Harvey, W.D. Hogg, and T.R. Yuzyk. 2001. Trends in Canadian stream flow. Wat. Resour. Res. 37:987-998.<br>Frei and Schär. 2001 Journal of Climate 14:1568–1584.<br>Karl, T.R., Trenberth, K.E., 2003. Modern global climate change. Science 302, 1719–1723.<br>(Government of USA) | |
| G-1-149 | A | 25 | 13 | | 14 | We disagree with the statements about the Sahelian Zone and the impressions that serious drought continues there without qualification. The statement below, supported and drawn from the papers below, have found recent precipitation and primary production trends to the contrary. We feel it is dangerous to state unequivocal statements about on-going drought in the Sahel when there are recently | A |

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| | | | | | | published papers to the contrary.<br>The statements about rain use efficiency attributed to Hein and Ridder (2006—not 2007) are only based upon 1 site in the Sahel Zone and are contradicted by the Prince et al. (1998) paper below.<br>Examination of Sahelian rainfall and primary production time series from 1981 to 2005 reveals two periods; (a) 1981–1993 marked by below average NDVI and persistence of drought with a signature large-scale drought during the 1982–1985 period; and (b) 1994–2005, marked by a trend towards 'wetter' conditions with region-wide above normal NDVI conditions with maxima in 1994 and 1999. These patterns agree with recent region-wide trends in Sahel rainfall. However taken in the context of long-term Sahelian climate history, these conditions are still far below the wetter conditions that prevailed in the region from 1930 to 1965. These recent patterns can be considered as a gradual recovery from extreme drought conditions that peaked during the 1983–1984 period (Anyamba et al. 2005, Hermann et al. 2005, Nicholson 2005, and Olsson et al. 2004).<br><br>References:<br>Anyamba, A. and Tucker, C.J., 2005. Analysis of Sahelian vegetation dynamics using<br>NOAA-AVHRR NDVI data from 1981–2003. J. Arid Environment 63:596-614.<br>Herrmann, S. M., Anyamba, A., and Tucker, C.J., 2005. Recent Trends in Vegetation Dynamics in the African Sahel and their Relationship to Climate. Global Environmental Change 15:394-404.<br>Nicholson, S. 2005. On the question of the ''recovery'' of the rains in the West African Sahel. J. Arid Environments 63:615–641.<br>Olsson, L., Eklundh, L. and Ardoe, J. (2005) A recent greening of the Sahel – trends,<br>patterns and potential causes. Journal of Arid Environments 63:556-566.<br>Prince, S. D., Brown de Colstoun, E. and Kravitz, L.L. (1998) Evidence from rain-use efficiencies does not indicate extensive Sahelian desertification. Global Change Biology 4, 359-374.<br>(Government of USA) | |
| G-1-150 | A | 25 | 19 | | 19 | Least should be "last"<br>(Government of USA) | A |
| G-1-151 | A | 25 | 23 | | 23 | In this table for the observed change in the Elbe and Dresden rivers you neglected to say whether the trend was increasing or decreasing.<br>(Government of USA) | A |

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| G-1-152 | A | 25 | | | | What about the changes in the Great Lakes and Lake Baikal? (Government of USA) | No references |
| G-1-153 | A | 26 | 2 | 26 | 3 | Authors should review Table 1.3b to determine whether Australian droughts of 1990's 2000's should be included, this would provide greater SH - NH balance. (Government of Australia) | Listed in SM |
| G-1-154 | A | 26 | 2 | | | Table 1.3b: Why is the Sahel mentioned in the text but not in the table? (European Union) | Listed in SM |
| G-1-155 | A | 26 | 2 | | | In table 1.3b, 2nd to last row, the reference to Hodgkins et al. 2005 is incorrect for two reasons. First, it should be a different Hodgkins et al. 2005 than is listed in the reference list on p. 84, lines 13-15 (that reference is for river ice which is correct for a different section of chapter 1). The correct reference for this section is Hodgkins, G. A., Dudley, R. W., and Huntington, T. G., 2005, Summer low flows in New England during the 20th century: Journal of the American Water Resources Association, vol. 41, p. 403-412. The second issue is the geographic area covered by the study; it is not “Much of Europe and UK”, it is New England in the northeastern USA. The “Summer low flows in New England...” article does show “No evidence of significant increase in droughts (defined as streamflow below a certain threshold)” (Government of USA) | A |
| G-1-156 | A | 26 | 5 | 26 | 5 | Water quality is strongly influenced by biological processes which are described in a separate section. To avoid having repetition the section could be renamed as: "Changes in physical and chemical water properties" (Government of Sweden) | A Text was altered to ‘changes in chemical and physical aspects of lakes and rivers’ |
| G-1-157 | A | 26 | 7 | 26 | 7 | Replace the word "thermal" by the word "physical" since it is not only the thermal structure that changes but also other physical processes (Government of Sweden) | A These sentances appeared redundant and were deleted to save space. |
| G-1-158 | A | 27 | 30 | 27 | 30 | Replace the title of the table by "Examples of changes in physical and chemical water properties" (Government of Sweden) | A Text was altered to ‘Examples of changes in chemical and physical apsects of lakes and rivers’ |
| G-1-159 | A | 27 | 30 | | 30 | In this table you could add the following citations that contain reported trends for increases in stream water temperature. Bartholow 2005 N. Amer. J Fish. Manag. 25:152-162 ; Klamath River Oregon Morrison, 2002 J. Hydrol. 263:230-244. Fraser River, BC Canada Juanes, et al. 2004. Can. J. Fish. Aquat. Sci. 61:2392-2400. – Three major rivers Northeast USA Daufresne et al. 2004 Global Change Biol. 10:124-140 - Upper Rhône River | NA due to incomplete references. Comment was addressed by a better table, which I have provided. |

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| | | | | | | Mouthon & Daufresne 2006 Global Change Biol. 12:441-449 Upper Saône RiverWebb, B.W. 1996. Hydrol. Proc. 10:205-226. United Kingdom, Austria Huntington, T. G., G. A. Hodgkins, R. W. Dudley, 2003, Historical trend in river ice thickness and coherence in hydroclimatological trends in Maine. Climatic Change 61: 217-236. – Wild River, Maine<br>(Government of USA) | |
| G-1-160 | A | 27 | 31 | 27 | 31 | Table: Delete the word "altered phytoplankton dynamics and primary production" because this is tackled later in the chapter. Write instead "with impacts on water quality"<br>(Government of Sweden) | A<br>Comment was addressed by a better table, which I have provided. |
| G-1-161 | A | 28 | 5 | 28 | 6 | It is not clear to a policy reader that the first sentence of this summary is supported fully by the body of Section 1.3.2. The sentence as cast suggests a general, well supported conclusion on intensification globally of the hydrological system. The content of the Section suggests there is only partial evidence for this.<br>(Government of Australia) | The first sentence has been removed. |
| G-1-162 | A | 28 | 14 | 28 | 15 | This sentence referring generally to intensified droughts, and particularly so in the Sahel, contrasts with p.25, lines 13-14 which quotes only the single case of the Sahel.<br>(Government of Australia) | The sentence has been removed. |
| G-1-163 | A | 28 | 25 | | 26 | Here the authors specifically refer to “climate induced sea level rise”, which is inappropriate because WGI does not attribute sea level rise to climate change in the IPCC sense (as defined in the Technical Summary). In the very next paragraph they say that there is a “possible acceleration” during the last decade, which is more accurate.<br>(Government of USA) | Disagree. We include other non-climate driving forces in the statement. |
| G-1-164 | A | 28 | 32 | | 32 | shoreline change is difficult to determine.<br>(Government of USA) | Addressed. |
| G-1-165 | A | 29 | 10 | | 10 | Table 1.4, 4th column, 2nd and 4th rows. There is a more recent estimate of the TOPEX-derived sea level of 3 mm/yr from Leuliette, E. W., Nerem, R. S. and Mitchum, G. T. (2004) Results of TOPEX/Poseidon and Jason calibration to Construct a Continuous Record of Mean Sea-Level. Marine Geodesy, 27, No. 1–2, pp. 79–94.<br>(Government of USA) | Not relevant anymore. Sea level removed from table. |
| G-1-166 | A | 30 | 43 | 31 | 7 | The loss of wetlands caused by sea level rise has higher impacts on coastal areas where human land use pressure is high. Urbanization and fixed coastal defending systems block the wetland system to develop land inwards, where abiotic conditions might still be favourable, so called coastal squeeze (Wolters et al 2005; | Addressed. Wolters cited. |

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| | | | | | | Tol 2004).<br>Tol, R.S.J., 2004. The double trade-off between adaptation and mitigation for sea level rise: an application of fund.<br>Wolters, M., Bakker, J.P et al 2005. Salt marsh erosion and restoration in south-east England: squeezing the evidence requires realignment. Journal of Applied Ecology 1365-2664.<br>(Government of Netherlands) | |
| G-1-167 | A | 31 | 9 | 31 | 10 | not all coastal wetlands retreating in N-France… what does this mean… most are but some are stable, most are stable, some are exapnding, most are expanding… This senentce should be more specific.<br>(Government of Netherlands) | Addressed. Normandy, France. |
| G-1-168 | A | 31 | 12 | | | …trapping sediments and also in reducing…'<br>(Government of Ireland) | Text rewritten. |
| G-1-169 | A | 32 | 10 | 32 | 36 | These two sub-sections use Tuvalu as an example of possible relocation due to climate change, however, no reference is cited for these examples. Stating that a reference is needed seems to imply that the authors have decided to include this example without a basis in literature, this is not appropriate and the use of the Tuvalu example should be reviewed. It is difficult to show scientifically, what is meant by 'considering' abandoning a homeland.<br>(Government of Australia) | Text removed. No longer relevant. |
| G-1-170 | A | 32 | 10 | 32 | 22 | It is a discrepancy that conservation measures that are taken as an adaptation to the impacts of climate change on biological systems are not taken into account. The term adaptation is only used for human systems and not for ecosystems (biological systems). However nature conservation management is a human activity and can therefore be adapted as a reaction to climate change.<br>Vulnerability and adaptation of conservation management for wetlands suffering from erosion are discussed in Wolters et al. (2005) and Tol (2004).<br>Tol, R.S.J., 2004. The double trade-off between adaptation and mitigation for sea level rise: an application of fund.<br>Wolters, M., Bakker, J.P et al 2005. Salt marsh erosion and restoration in south-east England: squeezing the evidence requires realignment. Journal of Applied Ecology 1365-2664.<br>(Government of Netherlands) | Discussion of conservation measures added in 1.5.<br><br>Wolters also cited in 1.3.3. |
| G-1-171 | A | 32 | 22 | 32 | 27 | The first sentence is hard to understand with the one sentence having two oblique references to situations exceeding global trends. The sentence seems to contradict the conclusion at page 28, lines 31-32.<br>(Government of Australia) | Text rewritten to clarify. |

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| G-1-172 | A | 32 | 22 | | | Proposal: add "During the period 1984 to 1994, the total volume of aggregates supplied for beach renourishment in the Spanish coast, mostly in response of coastal erosion was 53,243.984 m3. That amounted to a total investiment of 1,440 millions of euro"<br>(Government of Spain) | |
| G-1-173 | A | 33 | 7 | 33 | 7 | Add "atmospheric deposition" after "urban development)"<br>(Government of Sweden) | Added. |
| G-1-174 | A | 33 | 23 | 33 | 24 | SCUBA diving is NOT a major source of stress for the vast majority of coral reefs (in comparison to climate change, pollution, overfishing and destructive fishing, etc), except perhaps in highly localised settings where tourism use is very intense. This reference to non-climate stresses should be consistent with more informed treatments of stresses such as Figure 16.1.<br>(Government of Australia) | Text on coral reefs rewritten. |
| G-1-175 | A | 33 | 39 | | | Section 1.3.4.1 is not a very comprehensive or well-structured review/overview of the topic. It omits key issues relating to non-climate stresses (such as the many important stresses listed in Figure 16.1). It should make clear that coral bleaching is triggered by unusually high water temperatures early on, to provide context and relevance of the issue. It should also cite primary data papers in preference to overview/policy comment papers to support specific claims.<br>(Government of Australia) | Text on coral reefs rewritten. |
| G-1-176 | A | 33 | 41 | 33 | 43 | This reference to non-climate stresses should be consistent with more informed treatments of stresses such as Figure 16.1.<br>(Government of Australia) | Text on coral reefs rewritten. |
| G-1-177 | A | 33 | 47 | 33 | 51 | The statistic from Wilkinson 2004 is NOT that 16% of the world's corals were killed; rather, it is that 16% of the world's coral reefs were "seriously damaged". This is an important distinction and this statement needs to be corrected.<br>(Government of Australia) | Text on coral reefs rewritten. |
| G-1-178 | A | 34 | 14 | 34 | 14 | Hughes et al 2003 is not a primary source of knowledge on this issue. Suggest Coles and Brown 2003, as cited in previous paragraph.<br>(Government of Australia) | Text on coral reefs rewritten. |
| G-1-179 | A | 34 | 17 | 34 | 19 | The inferential logic in this sentence is not well warranted by the literature cited, and its relevance to the topic is unclear.<br>(Government of Australia) | Text on coral reefs rewritten. |
| G-1-180 | A | 34 | 29 | 34 | 29 | Correct reference - Royal Society.<br>(Government of Australia) | Yes. Changed to read 'Royal Society' |
| G-1-181 | A | 34 | 43 | | | redundancy : accompanying El Nino events<br>(Republic of Korea) | NO CHANGES. Text OK as is. |

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| G-1-182 | A | 35 | 0 | | | Need to include a discussion of changes in the Bering Sea, www.arctic.noaa.gov (Government of USA) | Text added. CHANGED |
| G-1-183 | A | 35 | 20 | | | forward in there seasonal cycles -> forward to places where their seasonal cycles can be fit(?) (Republic of Korea) | In this case moving forward in their seasonal cycles means they are getting earlier. NO CHANGES |
| G-1-184 | A | 35 | 22 | | | functional groups -> define (maybe mentioned in previous sections?) (Republic of Korea) | Functional groups should not have to be defined here as it is a well-known term in ecology. NO CHANGES |
| G-1-185 | A | 35 | 46 | 35 | 46 | "cod are highly dependent", should be IS…… (Government of Netherlands) | I think this should be 'are'. NO CHANGES |
| G-1-186 | A | 36 | 36 | 37 | 1 | Table 1.6 is very helpful but has a clear NH bias, authors need to review literature to ensure there is no further SH data, including a review of Australian sources. (Government of Australia) | There is unfortunately a bias towards the NH but this is because all the long-term studies and associated evidence are based here. I have sent out of few emails to my colleagues in Australia to see if they know of any important studies that should be included. NO CHANGES |
| G-1-187 | A | 37 | 0 | | | in table add bering and Chukchi Sea discussions. (Government of USA) | Text added. CHANGED |
| G-1-188 | A | 37 | 3 | 37 | 20 | the aspect of increasing cyanobacterial biomass in connection to climate change is missing (some cyanobacteria can be toxic). Suitable references could be: Charmichael, W. W. 2001. Health effects of toxin-producing cyanobacteria: "The CyanoHABs". Human and Ecological Risk Assessment 7: 1393-1407 and Huisman, J., J. Sharples, J. M. Stroom, P. M. Visser, W. E. A. Kadinaal, J. M. H. Verspagen, and B. Sommeijer. 2004. Changes in turbulent mixing shift competition for light between phytoplankton species. Ecology 85: 2960-2970 (Government of Sweden) | Addressed<br>The text was modified to note the increase in cyanobacteria, the potential concern for human health, and to provide references. Carmichael was used as a reference, but Huisman et al. was not, because Huisman et al. deals with experimental laboratory manipulations rather than observations of changes in a natural system. |
| G-1-189 | A | 37 | 11 | 37 | 11 | change the word "increased" to "changes" since it is very dependent what kind of time window you consider. Mostly you do not get an overall increase but you can get an increase during certain periods. As it stands now it means that a longer growing season leads to an icnrease which is not true. | Not applicable<br>The word 'increased' here is appropriate for the context, which is an attempt to illustrate how climate change has increased |

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| | | | | | | (Government of Sweden) | productivity/abundance in some lakes. Futher down in the paragraph, cases where there has been a decrease are mentioned. The word 'increased' refers to the studies that are cited, which show and discuss increases in productivity over the past century. |
| G-1-190 | A | 37 | 14 | 37 | 14 | change the word "increased" to "changes"<br>(Government of Sweden) | Not applicable<br>See previous comment. |
| G-1-191 | A | 37 | 15 | 37 | 15 | move the reference Weyhenmeyer et al. 1999 to line 13 since it considers phytoplankton and not zooplankton<br>(Government of Sweden) | Addressed.<br>Weyhenmeyer et al 1999 was deleted since the paper actually refers to the timing of the spring bloom not abundance or productivity |
| G-1-192 | A | 38 | 0 | | | what about the Great Lakes?<br>(Government of USA) | Not applicable.<br>It has been difficult to detect changes in the Great Lakes that are due to climate change because of other influences on the Great Lakes. For some details on these confounding factors see Mills et al 2003 Lake Ontario: food web dynamics in a changing ecosystem (1970-2000) Canadian Journal of Fisheries and Aquatic Sciences. |
| G-1-193 | A | 38 | 1 | 38 | 1 | Remove the reference Adrian et al. 1995 since this is not an example of a deep tropical lake (the study refers to Heiligensee with a mean depth of 5.9 m, located in Germany)<br>(Government of Sweden) | Addressed.<br>Text was deleted as suggested. |
| G-1-194 | A | 38 | 25 | 38 | 25 | Replace the reference "Weyhenmeyer et al. 1999" by "Weyhenmeyer 2001" since this reference is dealing with large lakes. Full reference: Weyhenmeyer, G. A. 2001. Warmer winters - are planktonic algal populations in Swedens largest lakes affected? Ambio 30: 565-571.<br>(Government of Sweden) | Addressed.<br>Text was changed as suggested. |
| G-1-195 | A | 39 | 6 | | | please add at the end of the paragraph: "For brown trout populations, the warming in Alpine rivers resulted not only in an upward shift in thermal habitat, but this was additionally accelerated by an increase in the incidence of temperature dependent proliferative kidney disease at the habitat's lower boundary (Hari et al. 2006). "<br>(Government of Switzerland) | Addressed.<br>Text was modified to include the suggested .information. |
| G-1- | A | 39 | 7 | 39 | 7 | The section 'Evidence of adaptation and vulnerability' is missing. | Not applicable. |

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| 196 | | | | | | (Government of Netherlands) | This section was not written, primarily to save space, as most of the information is already presented within the text. |
| G-1-197 | A | 39 | 12 | 39 | 13 | The phrase 'substantial change' suggests irretrievable loss of large areas with little prospect of recovery. The summary should bring out more clearly the relative significance of climate change, climate variability and human impacts and which affects so far are irretrievable/reversible.<br>(Government of Australia) | Text on coral reefs in summary rewritten. |
| G-1-198 | A | 39 | 18 | 39 | 18 | Table, titles of the columns: Write "Observed changes", "Longest time period considered" since you give several references and not all refer to such a long time period mentioned, "Total number of lakes/rivers studied"<br>(Government of Sweden) | Addressed.<br>Modifications to the text were made as suggested. |
| G-1-199 | A | 39 | 18 | 39 | 18 | Table first raw: Specify: "Increases, especially during winter, due to longer growing season"<br>(Government of Sweden) | Addressed.<br>Changed text to read 'Increases associated with longer growing season' |
| G-1-200 | A | 39 | 18 | 39 | 18 | Add examples of the increase of potentially toxic cyanobacteria<br>(Government of Sweden) | Addressed.<br>Text and references regarding toxic cyanobacteria have been included in the main text of the document rather than as an additional row in the table. |
| G-1-201 | A | 40 | 8 | | | …responses are possible..<br>(Government of Ireland) | Wrong English. "None" is singular. |
| G-1-202 | A | 40 | 17 | 40 | 18 | Rephrase the beginning of the sentence as follows: "The detection of the influence of non-climate driving forces..."<br>(European Union) | Rephrased. |
| G-1-203 | A | 40 | 23 | 40 | 23 | correction: )( should be ; in the double citation<br>(Government of Netherlands) | Thank you—has been corrected. |
| G-1-204 | A | 41 | 28 | | 28 | Clarify whether the birch item is with regard to birch leaf fall or leaf out. Revise the entire sentence to clarify the distinction between the two items indicated by station data.<br>(Government of USA) | Sentence is revised now. |
| G-1-205 | A | 41 | | | | In Section 1.3.5.2, 'Changes in phenology', it was surprising to see very limited reference to increasing temperature being, at least in part, a driver of advancing spring. In this section there are numerous references for numerous species (Tables 1.8, page 41 and 1.9, page 42) reporting advancement and delay of spring phenological events in days per decade. However, the crucial question for a report | Thank you for this valuable comment. Numbers on changes per °C are inserted in the respective paragraphs on plants and animals. |

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| | | | | | | on climate change is the link to temperature (and other climate variable). Therefore, we strongly recommend the inclusion of some type of prediction of the advancement or delay in spring events in relation to increasing spring temperature. Some of the important references pertaining to increasing temperature and spring phenological phases include, a 2-3day earlier arrival of the swallow (Hirundo rustica) in the UK (Sparks and Loxton, 1999) and Ireland (Donnelly et al., 2004) with a 1°C increase in March temperature although (as already stated in the IPCC report) temperature in the breeding grounds is also important (Tryjanowski 2002; Butler 2003; Cotton, 2003; Huppop and Huppop, 2003 (all these references are already in the IPCC report). In relation to plant species, Donnelly et al., (2006) reported an advancement of leaf unfolding for a suite of 9 tree varieties from the International Phenological Gardens of between 4 and 12 days (an average of 7 days earlier) for every 1°C increase in spring temperature (February-April inclusive). This is in agreement with Sparks et al. (2000) and Chmielewski and Rötzer (2001) (reference already in IPCC report), who also reported that leafing of trees across Europe advanced by approximately one week as a result of a 1°C increase in spring air temperature. In addition, Menzel et al., (2006) (Box 1.3 of the IPCC report) reported a spring/summer advancement across Europe of 2.5 days for every 1°C increase in temperature. Therefore, for the purpose of the IPCC report we recommend a stronger emphasis be placed on the fact that earlier spring phenology is, at least in part, a response to increasing temperature and suggest a paragraph be included at the beginning of section 1.3.5.2 page 41 pertaining to this. References: Donnelly, A., Jones, M.B., Sweeney, J. (2004) A review of indicators of climate change for use in Ireland. International Journal of Biometeorology 49:1-12. Sparks T.H., Loxton, R.G. (1999) Arrival date of the swallow. In: Cannell MGR, Palutikof JP, Sparks TH (eds) Indicators of climate change in the UK. Centre for Ecology and Hydrology, Huntingdon, UK, pp 62–63. Sparks, T.H., Jeffree, E.P. and Jeffree, C.E. 2000 An examination of the relationship between flowering times and temperature at the national scale using long-term phenological records from the UK. International Journal of Biometeorology 44, 82-7.<br>(Government of Ireland) | |
| G-1-206 | A | 42 | 0 | | | What about changes in Russia?<br>(Government of USA) | Some NDVI studies include changes in Russia. |
| G-1-207 | A | 42 | 0 | | | Table 1.9: Should state 1 of 2 spring arriving species arrived earlier. Currently is misleading as study included 5 migratory birds but this table only considers spring events - i.e. only 2 species in this study, the others arriving in other seasons.<br>(Government of Australia) | Information updated accodingly. |

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| G-1-208 | A | 43 | 0 | | | include a mention of changes in birds in the Arctic see www.arctic.noaa.gov (Government of USA) | Unclear which reference to include. Is it: http://cooperisland.org/importantfindings.htm #2? |
| G-1-209 | A | 43 | 17 | 43 | 17 | (Post, reindeer) insert correct citation (Government of Netherlands) | Thank you—Done. |
| G-1-210 | A | 43 | 17 | | | Post, 2002. (Government of Ireland) | Thank you—Done. |
| G-1-211 | A | 44 | 47 | | | pollen season (see 1.3.7.5) and NOT 1.3.5.5 (Government of Switzerland) | Thank you—corrected. |
| G-1-212 | A | 45 | 26 | 45 | 41 | While the more recent publications by Pauli et al. are included, they are not in widely available journals. I would therefore suggets to also include the Grabherr et al. 1994 Nature reference for the Alipine monitoring in the GLORIA project. (Government of Netherlands) | Included in Working Group Report for the TAR. No space available to review it again. |
| G-1-213 | A | 45 | 37 | 45 | 38 | vare et al. : strange place in sentence for reference… what is it refering to? (Government of Netherlands) | Refering to the diversity of plants, thus placed directly behind the term. |
| G-1-214 | A | 46 | 0 | | | Table 1.10: Comment: Czech Republic/ ticks/ uplift from 700m to 1100m in the period 1982-2002 (Daniel and Kriz; 3002); Tickborne encephalitis in the Czech Republic; project report; 2002 (Government of Germany) | Included as new line in table 1.10. |
| G-1-215 | A | 46 | 0 | | | Include a reference to Russia. (Government of USA) | Russia and Bulgaria included with examples of treeline shifts. |
| G-1-216 | A | 46 | 3 | 46 | 15 | The abstract of Pounds (2006) reports: "An estimated 67% of the 110 or so species of Atelopus, which are endemic to the American tropics, have met the same fate [of extinction], and a pathogenic chytrid fungus (Batrachochytrium dendrobatidis) is implicated. Analysing the timing of losses in relation to changes in sea surface and air temperatures, we conclude with 'very high confidence' (> 99%, following the Intergovernmental Panel on Climate Change, IPCC) that large-scale warming is a key factor in the disappearances." The chapter authors did not state why they largely neglected the findings of this study (as well of the earlier study by Punds et al. from 1999 also published in Nature). If the chapter authors disagree, they should give an explanation; otherwise, the fact that dozens of amphibian species have become extinct, and that this decline has been attributed to anthropogenic climate change, deserves to be clearly mentioned in the main text as well as in the Executive Summary. (European Union) | We agree and have made Pounds et al 2006 a focus of the paragraph. |
| G-1-217 | A | 47 | 20 | 47 | 24 | However an interaction exists between habitat fragmentation and range shifts caused by climate change (Opdam & Wascher 2004). Empirical evidence exists | Literature is included in the section about range shifts. |

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| | | | | | | that the natural reaction of species to climate change is hampered by habitat fragmentation. Warren et al. (2001) showed that only species with a large dispersal capacity or species for which their suitable habitat is not fragmented (habitat of the wider country side) are able to expand their ranges northwards. In contrast species with small dispersal capacity or species with rare habitat requirements (habitat specialists) were not able to expand their range. Hill et al (1999) showed for the butterfly speckled wood (Pararge aegeria) that habitat availability is an important determinant for the rate of expansion when species are responding to climate change.<br>Hill, J.K., Thomas, C.D., Huntley B., 1999. Climate and habitat availability determine 20th century changes in butterfly's range margin. Proceedings of the Royal Society London B 266, 1197- 1206.<br>Opdam, P., Wascher, D., 2004. Climate change meets habitat fragmentation: linking landscape and biographical scale levels in research and conservation. Biological Conservation 117 (2004) 285-297.<br>Warren, M., S., Hill, J.K. et al 2001. Rapid responses of British butterflies to opposing forces of climate and habitat change. Nature 414, 65-69.<br>(Government of Netherlands) | |
| G-1-218 | A | 47 | 37 | 47 | 40 | The selective advantage of species that are 'good colonists' is not used in a correct sense. The advantage of species with a good dispersal capacity is a direct result of the interaction of climate change driven range shift with another dominant stress factor: habitat fragmentation caused by land use change (Opdam & Wascher 2004). Empirical evidence exists that range expansion of species to climate change is hampered by habitat fragmentation. Warren et al. (2001) showed that only species with a large dispersal capacity or species for which their suitable habitat is not fragmented (habitat of the wider country side) are able to expand their ranges northwards. In contrast species with small dispersal capacity or species with rare habitat requirements (habitat specialists) were not able to expand their range. Hill et al (1999) showed for the butterfly speckled wood (Pararge aegeria) that habitat availability is an important determinant for the rate of expansion when species are responding to climate change.<br>Hill, J.K., Thomas, C.D., Huntley B., 1999. Climate and habitat availability determine 20th century changes in butterfly's range margin. Proceedings of the Royal Society London B 266, 1197- 1206.<br>Opdam, P., Wascher, D., 2004. Climate change meets habitat fragmentation: linking landscape and biographical scale levels in research and conservation. Biological Conservation 117 (2004) 285-297. | The habitat fragmentation is addressed in the range shifts section and the suggested references are included there.<br>As wording is used in orginally publications, the 'good colonists' sections seems ok. |

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| | | | | | | Warren, M., S., Hill, J.K. et al 2001. Rapid responses of British butterflies to opposing forces of climate and habitat change. Nature 414, 65-69.<br><br>(Government of Netherlands) | |
| G-1-219 | A | 47 | 46 | 47 | 48 | The section Evidence of adaptation and vulnerability is missing.<br>It is a discrepancy that conservation measures that are carried out as adaptation to the impacts of climate change on biological systems are not taken into account. The term adaptation is only used for human systems and not for ecosystems (biological systems). This is probably the reason why the sector 'evidence of adaptation and vulnerability ' is missing in the sector 1.3.5.'Terrestrial biological systems'.<br>However nature conservation management is a human activity and can therefore be adapted as a reaction to climate change.<br>Examples of spatial adaptation strategies for terrestrial nature management are:<br>Current landscapes are highly fragmented, meaning that natural responses such as range shifts now need additional spatial planning to succeed (Hannah 2005; Lovejoy 2005). Examples of spatial adaptation strategies for terrestrial nature management are:<br>Adaptation of the spatial cohesion of nature reserves by creating ecological networks of ecosystems and robust corridors to facilitate the climate change driven range shift of species with small dispersal capacity to follow the suitable climate conditions (Gastona et al 2006; Opdam & Wascher 2004; Hannah 2005; Lovejoy 2005).<br>Improve matrix permeability: regions are to become trans-national pathways for range shifts and potential future protected area (Gustavo et al 2005).<br>Find and protect the short-term refugia. Identify where species and ecosystems are most likely to persist for decades or centuries in an unstable and unpredictable environment (Saxton 2003).<br><br>Gustavo et al, 2005. Managing the matrix. In: L. Hannah and T. Lovejoy (eds.) Climate change and Biodiversity, Yale University Press.<br>Hannah, L., 2005. Designing landscapes and seascapes for change. In: L. Hannah and T. Lovejoy (eds.) Climate change and Biodiversity, Yale University Press.<br>Kevin J. Gastona, K.J., Charmanb, K. et al., 2006. The ecological effectiveness of protected areas. Biological Conservation 132: 76-87.<br>Lovejoy, T., 2005. Conservation with a changing climate. In: L. Hannah and T. Lovejoy (eds.) Climate change and Biodiversity, Yale University Press.<br>Opdam, P., Wascher, D., 2004. Climate change meets habitat fragmentation: | New section about adaptation included based on your suggestions. |

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| | | | | | | linking landscape and biographical scale levels in research and conservation. Biological Conservation 117 (2004) 285-297.<br>Saxton, 2003. Adapting eco-regional plans to anticipate the impact of climate change. In Drafting a conservation blue print, a practitioners guide to planning for biodiversity C.R. Groves (ed.)<br>(Government of Netherlands) | |
| G-1-220 | A | 48 | 2 | 48 | 2 | vulnerability of species' … to be consistent with the IPCC definitions it should be sensitivity and not vulnerability<br>(Government of Netherlands) | According to the glossary, vulnerability is the susceptibility to be harmed, what is meant here. |
| G-1-221 | A | 48 | 27 | 48 | 27 | Table 1.10a should be replaced by Table 1.11a.<br>(Government of Pakistan) | Figures do have legends now; open and closed cirlces are explained. |
| G-1-222 | A | 49 | 0 | | | Include a reference to Russia.<br>(Government of USA) | Russia inserted in 1.3.5. |
| G-1-223 | A | 49 | 1 | 49 | 1 | The citation in the row "Finland" is wrong, should be: (Hilden et al. 2005)<br>(Government of Finland) | Reference corrected. |
| G-1-224 | A | 49 | 2 | 49 | 2 | In Table 1.1c, Row 2, Column 3, Line 2, the end bracket after the word "season" may be deleted.<br>(Government of Pakistan) | Fixed. |
| G-1-225 | A | 50 | 19 | 50 | 33 | In section 1.3.6.1, 'Crops and livestock' 3rd last paragraph, reference is made to indicators of climate change in the UK (Cannell et al., 1999). In a review of climate change indicators for Ireland Donnelly et al., (2004) suggested similar indicators of the impact of climate change on agriculture to those proposed by Cannell et al., (1999) for the UK. These include the area sown and the yield of forage maize, the percentage of main crop potato that is irrigated and the amount of water used in irrigation of the potato crop as indicators of the impact of climate change on Irish agriculture. In addition, Donnelly et al., (2004) point out the difficulty in isolating a climate signal in increasing crop yields due to the introduction of new varieties and improved crop management which clearly help to increase yields and counteract the limitations imposed by lack of rainfall. We recommend that this study (Donnelly et al., 1999) be incorporated into the text. [Alternatively into Chapter 12 "Europe" section 12.4.7.1]<br>(Government of Ireland) | Cited in Section 1.3.5.1. |
| G-1-226 | A | 50 | 26 | | 26 | What is IRRI?<br>(Government of USA) | Defined. |
| G-1-227 | A | 51 | 0 | | | include a reference to forest fires in Alaska, BLM work..<br>(Government of USA) | Please provide full reference. |
| G-1- | A | 51 | 1 | 51 | 4 | There seems to be a contradiction between the first sentence suggesting largest | OK, adressed |

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| 228 | | | | | | changes in tropical ecosystems and the second sentence suggesting above-average changes in Northern forests.<br>(European Union) | |
| G-1-229 | A | 51 | 12 | 51 | 14 | The construction of this sentence may be checked again.<br>(Government of Pakistan) | OK, adressed |
| G-1-230 | A | 51 | 13 | | | detected in relation to the ….or…detected due to the…<br>(Government of Ireland) | OK, adressed |
| G-1-231 | A | 51 | 19 | 51 | 20 | Please provide the reference (? Battisti et al. 2004 again)<br>(Government of Netherlands) | I do not understand: the reference is provided |
| G-1-232 | A | 51 | 22 | 51 | 26 | The start of the sentence "While the increase..." is misleading as both examples provide evidence of the link between climatic conditions and forest fires.<br>(European Union) | OK, adressed. |
| G-1-233 | A | 51 | 33 | 51 | 33 | GCM model… not correct as GCM stands for General Circulation MODEL … so just use GCM<br>(Government of Netherlands) | OK, adressed.. |
| G-1-234 | A | 51 | 50 | 1 | 51 | Delete the text in brackets as it is is not relevant here and potentially misleading.<br>(European Union) | OK, adressed. |
| G-1-235 | A | 52 | 9 | 52 | 9 | The word "yields" may be added after "corn and soybean".<br>(Government of Pakistan) | OK, adressed. |
| G-1-236 | A | 52 | 10 | | 10 | what about human induced desertification because of soaring birthrates?<br>(Government of USA) | A big question, not relevant here. |
| G-1-237 | A | 52 | 17 | 52 | 25 | The benefits of warming in North America, Europe and temperate regions have been mentioned but an important harmful effect of warming, namely loss in yield in tropical / subtropical countries has not been mentioned. This may now be included.<br>(Government of Pakistan) | OK, adressed. |
| G-1-238 | A | 52 | 32 | 52 | 33 | Replace the term "noncommunicable diseases associated with heat and cold stress" by "direct health effects of heat or cold stress".<br>(European Union) | OK; Done |
| G-1-239 | A | 52 | 35 | 52 | 36 | Sentence not clear.<br>(European Union) | OK, modified |
| G-1-240 | A | 52 | 45 | | 45 | what about the ticks from Siberia?<br>(Government of USA) | Please provide reference. |
| G-1-241 | A | 52 | 48 | | 48 | how about other factors such as birthrates, age distributions? Gender vulnerability?<br>(Government of USA) | OK; modified. |
| G-1-242 | A | 52 | 50 | 53 | 3 | The long listing of nonclimatic factors, including references, appears excessive.<br>(European Union) | Some of these are necessaary. |
| G-1- | A | 53 | 6 | 53 | 8 | The sentence starting "Patz (Patz)" should be integrated with the previous | OK – modified. |

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| 243 | | | | | | paragraph as it refers to nonclimatic factors.<br>(European Union) | |
| G-1-244 | A | 53 | 40 | 53 | 48 | Comment: Please add to the described tick-borne diseases (TBE and Lyme) a short hint regarding the Czech republic as mentioned above (Daniel and Kriz, 2002).<br>(Government of Germany) | Added. |
| G-1-245 | A | 54 | 23 | 54 | 33 | The coverage of the 2003 European summer heatwaves is inadequate. The recent best estimate of excess deaths in Western Europe of the two heat waves is at least 50.000 (Tom Kosatsky, The 2003 European heat waves, Euro Surveill 2005;10(7):148-149, available at http://www.eurosurveillance.org/eq/2005/03-05/pdf/eq_7_2005_148-149.pdf ), of which about 20.000 occurred in Italy (Conti S, Meli P, Minelli G, Solimini R, Toccaceli V, Vichi M, Beltrano C, Perini L., Epidemiologic study of mortality during the Summer 2003 heat wave in Italy. Environ Res. 2005 Jul;98(3):390-399, available at http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WDS-4F05G1H1&_coverDate=07%2F31%2F2005&_alid=422216974&_rdoc=1&_fmt=&_orig=search&_qd=1&_cdi=6774&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=40e8b92778eaafc835aee1ff9cdaaa2a ). While a single climatic event cannot be attributed to a single cause, Stott et al. (Peter A. Stott, D. A. Stone, and M. R. Allen, Human contribution to the European heatwave of 2003, Nature 432, 610-614 (2 December 2004) \| doi: 10.1038/nature03089, available at http://climateprediction.net/science/pubs/nature03089.pdf ) claim that "we estimate it is very likely (confidence level >90%) that human influence has at least doubled the risk of a heatwave exceeding this threshold magnitude". In combination, these studies suggest that the majority of the 50.000 or so excess deaths experienced are statistically attributable to anthropogenic climate change. The chapter authors should review these studies, and in the absence of a good reason to disagree with their findings, report this statistical joint attribution in Sectoin 1.3.7, 1.4.2, 1.4.3, and the Executive Summary. A good treatment of this heatwave is provided in Section12.6.2, and a cross-reference should be added.<br>(European Union) | This topic is dealt with at length in 8.2.1 |
| G-1-246 | A | 54 | 29 | 54 | 33 | It would be helpful to indicate which parts of the population were most subject to excess deaths (eg frail elderly).<br>(Government of Australia) | OK; Done |
| G-1-247 | A | 54 | 35 | 54 | 35 | The word "are" may be replaced by "have".<br>(Government of Pakistan) | OK; done |
| G-1- | A | 54 | 35 | | 35 | In general, high-income populations have… | OK; done |

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| 248 | | | | | | (Government of USA) | |
| G-1-249 | A | 54 | 39 | 54 | 41 | this statement should be substantiated by precise numbers and a reference. The reason given is also not clear: what is the meaning of "decreased response to cold"? Does this mean decreased vulnerability to cold?Is this type of vulnerability correctly measured?<br>(Government of France) | OK ; modified |
| G-1-250 | A | 54 | 39 | 54 | 39 | Davis et al. 2003A and Davis et al. 2003B<br>(Government of Netherlands) | OK |
| G-1-251 | A | 55 | 10 | 55 | 11 | source/ reference for these species?<br>(Government of Ireland) | OK |
| G-1-252 | A | 55 | 17 | | | Some affirmations are made without corresponding references (in particular "Pollen abundance, however, is more strongly ..."). I would suggest the following shorter version of the first part of this section: "There is evidence that observed climate change is affecting the timing of the onset of pollen production. Studies, mostly from Europe, indicate the pollen season have started earlier (but later at high latitudes) in recent decades, and such shifts are consistent with observed changes in climate. The results concerning pollen abundance are more variable, as pollen abundance can be more strongly influenced by land use changes and farming practices". References are mentionned above and listed below. The second part concerning dust can remain as is.<br>Clot B (2003) Trends in airborne pollen: an overview of 21 years of data in Neuchâtel (Switzerland). Aerobiologia 19: 227-234.<br>D'orico P, Yoo J, Jaeger S (2002) Changing seasons: an effect of the North Atlantic Oscillation? Journal of Climate 15: 435-445.<br>Emberlin J, Detandt M, Gehrig R, Jaeger S, Nolard N, Rantio-Lehtimäki A (2002) Responses in the start of Betula (birch) pollen seasons to recent changes in spring temperatures across Europe. Int J Biometeorol 46: 159–170.<br>Emberlin J, Jaeger S, Dominguez-Vilches E, Galan C, Hodal L, Mandioli P, Lehtimaki A, Spieksma F, Bartlett C (2000) Temporal and geographical variations in grass pollen seasons in areas of western Europe: an analysis of season dates at sites of the European pollen information system. Aerobiologia 16: 373-379.<br>Frei T, Leuschner RM (2000) A change from grass pollen induced allergy to tree pollen induced allergy: 30 years of pollen observation in Switzerland. Aerobiologia 16: 407-416.<br>Galán C, García-Mozo H, Vázquez L, Ruiz L, Díaz de la Guardia C, Trigo MM (2005) Heat requirement for the onset of the Olea europaea L. pollen season in several sites in Andalusia and the effect of the expected future climate change. Int J | OK – inserted and modified |

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| | | | | | | Biometeorol 49: 184-188.<br>Inoue S, Kawashima S, Takahashi Y (2002) Estimating the beginning day of Japanese cedar pollen release under global climate change. Global Change biology 8: 1165 - 1168.<br>Jäger S (2002) Long term trends of pollen seasons in Europe: Changes in start, duration and intensity. Abstracts of the 7th International Congress on Aerobiology, Montebello, Canada, August 2002.<br>Leuschner RM, Christen H, Jordan P, Vonthein R (2000) 30 years of studies of grass pollen in Basel (Switzerland). Aerobiologia 16:381-391.<br>Ranta H , Oksanen A, Hokkanen T, Bondestam K, Heino S (2005) Masting by Betula-species; applying the resource budget model to north European data sets. Int J Biometeorol 49: 146-151.<br>Rasmussen A (2002) The effects of climate change on the birch pollen season in Denmark. Aerobiologia 18: 253-265.<br>Singh A B, Pandit T, Dahiya P (2003) Changes in airborne pollen concentrations in Delhi, India. Grana 42: 168-177.<br>Spieksma FThM, Corden JM, Detandt M, Millington WM, Nikkels H, Nolard N, Schoenmakers CHH, Wachter R, de Wager LA, Willems R, Emberlin J (2003) Quantitative trends in annual totals of five common airborne pollen types (Betula, Quercus, Poaceae, Urtica, and Artemisia), at five pollen-monitoring stations in western Europe. Aerobiologia 19: 171-184.<br>Teranishi H, Kenda Y, Katoh T, Kasuya M, Oura E, Taira H (2000) Possible role of climate change in the pollen scatter of Japanese cedar Cryptomeria Japonica in Japan. Climate Research 14:65-70.<br>Thibaudon M, Outteryck R, Lachasse C (2005) Bioclimatologie et allergie. Revue française d'allergologie et d'immunologie clinique: 45:447-455.<br>Van Vliet AJH, Overeem A, De Groot RS, Jacobs AFG, Spieksma FM (2002) The influence of temperature and climate change on the timing of pollen release in the Netherlands. International Journal of Climatology 22:1757-1767.<br>Zwander H (2002) Der Pollenflug im Klagenfurter Becken (Kärnten) 1980-2000. Carinthia II 192: 197-214.<br>(Government of Switzerland) | |
| G-1-253 | A | 55 | 17 | | | Section 1.3.7.5: many important references are lacking, concerning different pollens and causes of the changes: here the most representative : Emberlin et al., 2000; Frei and Leuschner, 2000; Leuschner et al., 2000; Teranishi et al., 2000; D'Odorico et al., 2002; Emberlin et al., 2002; Inoue et al., 2002; Jäger, 2002; Rasmussen, 2002; Van Vliet et al., 2002; Zwander, 2002; Clot, 2003; Singh et al., | OK; Modified.<br>Topic dealt with in detail in Chap. 8 |

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| | | | | | | 2003; Spieksma et al., 2003; Galan et al., 2005; Ranta et al., 2005; Thibaudon et al., 2005. PLEASE, FIND BELOW starting from row 20 the corresponding complete references.<br>(Government of Switzerland) | |
| G-1-254 | A | 55 | 17 | | | I would suggest adding a link to section 8.2.7, which is very complementary; such as "(see also 8.2.7)".<br>(Government of Switzerland) | OK; Done |
| G-1-255 | A | 55 | 32 | | 32 | what about just too many people depleting resources?<br>(Government of USA) | OK |
| G-1-256 | A | 55 | 38 | 57 | 39 | Arw these numbers corrected for inflation? I\|f so please make this clear, if not please provide more meaningful figures.<br>(Government of Netherlands) | Unclear. No figures at this page and line no. |
| G-1-257 | A | 55 | 47 | 57 | 34 | This section presents a selective overview of the literature on extreme weather events. It is not consistent with WG1 conclusions. Please bring this section in line with Section 3.8 of WG1 on extremes, and make cross-references. And please focus on impacts rather than the events themselves.<br>(Government of Netherlands) | This section is now consistent with WG1 material although is inevitably looking at more extreme events than may be the subject of WG1 – as for example 100 year RP floods v 2-5 year RP extreme flows. |
| G-1-258 | A | 55 | 49 | 55 | 49 | The word "of" may be added after "The rapid onset".<br>(Government of Pakistan) | OK |
| G-1-259 | A | 56 | 16 | 56 | 36 | I don't have the articles where is referred to in this paragraph, but we have to be careful when lumping together the increase in flooding with climate changes. Flooding is probably more related to changes in capacity of retention or (temporary) absorption of water in the soil. A faster reaction of the river on a rainstorm can not be caused by climate changes but has more to see with straitening of rivers, intensive land use, disappearance of flooding zones, construction of concrete sewerage systems with overflow,...<br>No doubt extra flooding can be caused by changes in rainfall too. But I guess this cause is only minor compared with other related changes.<br>(Government of Belgium) | Have clarified discussion around evidence for the most extreme floods and been careful to reference that for higher frequency flooding episodes the evidence is mixed. . |
| G-1-260 | A | 57 | 8 | 57 | 11 | The sentence does not clarify as to whether the overall number of tropical cyclones per year in the Atlantic basin are increasing or decreasing in trend. The sentence needs to be restructured accordingly.<br>(Government of Pakistan) | Section rewritten. |
| G-1-261 | A | 57 | 36 | 60 | 31 | This entire section on economic impacts, insurance losses, energy consumption, and societal adaptation should be deleted. Chapter 1 is not a stand alone assessment. These higher order effects of the changes in the Earth's systems are covered in the other chapters. | This section covers material around extremes and their catastrophic consequences not addressed in other chapters. |

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| | | | | | | (Government of USA) | |
| G-1-262 | A | 57 | 43 | 57 | 46 | The Pielke et al. 2002 reference is not correct. This paper (Climatic Change 52(1-2), 1-11) does not present normalised flood losses. It probably should be Pielke, Jr., R.A., M.W. Downton, and J.Z. Barnard Miller, 2002: Flood Damage in the United States, 1926–2000: A Reanalysis of National Weather Service Estimates. Boulder, CO: UCAR.<br>(Government of Netherlands) | Reference corrected |
| G-1-263 | A | 57 | 46 | 57 | 48 | Note that Pielke and Downton 2000 (Journal of Climate 13(20), 3625-3637) did find an increase in flood losses in the US. Also, Pielke et al. 2002 (see my previous comment) did find an upward trend in per capita flood damage.<br>(Government of Netherlands) | But not an upward trend in losses fully normalized to take accountof changes in GDP. |
| G-1-264 | A | 57 | | | | please add discussion about relationship of Atlantic hurricane frequency and magnitude<br>(Government of USA) | Rewritten. |
| G-1-265 | A | 58 | 5 | | | these included the main/ key (?) developed countries<br>(Government of Ireland) | corrected |
| G-1-266 | A | 58 | 10 | 58 | 11 | Authors should explain the statement that only " a small trend was found for an increase in annual catastrophe losses since 1970" and how this accords with the later statement at line 47, that "global losses reveal rapidly rising costs….since the 1970's". These statements seem contradictory.<br>(Government of Australia) | Small trend in normalized losses, significant trend in unnormalized losses. |
| G-1-267 | A | 58 | 15 | 58 | 17 | How significant is this correlation? Please add the r2 and p values.<br>(Government of Netherlands) | These measures of significance are provided in the paper referenced. |
| G-1-268 | A | 58 | 45 | 58 | 45 | 1.3.8.5. becomes into 1.3.8.6. and insert 1.3.8.5. named 'social impacts of natural disasters' including: loss of employment, massive population movements, unestructructed social situations, aid management.<br>(Government of Spain) | Not relevant to this specific discussion. |
| G-1-269 | A | 58 | 48 | 58 | 49 | Please make sure that this statement is accurately reflected also in the SPM (page 5, lines 46-48). Currently, the SPM denies that climate change may play a role.<br>(Government of Netherlands) | SPM has been modified. |
| G-1-270 | A | 58 | 49 | 58 | 49 | Please add that there is some evidence that increases in disaster losses may be related to climate change. These references support this: Mills 2005 in Science 309, 1040-1044, Schiermeier 2006 in Nature 441, 674-675 and the workshop report at http://sciencepolicy.colorado.edu/sparc/research/projects/extreme_events/munich_workshop/workshop_report.pdf.<br>(Government of Netherlands) | Schiermeier employed the work undertaken in the Miller study, and the reference to this work is now provided here. Mills is not global nor employs normalized losses. |
| G-1- | A | 58 | 49 | 59 | 4 | Again, please bring in line with and cross ref. to Section 3.8 of WG1. | Linked and cross referenced. |

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| 271 | | | | | | (Government of Netherlands) | |
| G-1-272 | A | 59 | 0 | | | add discussion from Judith Curry. She has a more extensive and longer time series of hurricane-climate data.<br>(Government of USA) | Rewritten to be consistent with material from WG1. |
| G-1-273 | A | 59 | 7 | | | Including the following indicators : Vulnerability y Human security<br>Poverty, Social differences and environmental justice<br>Demographic and Social population structure and migrations<br>Food secures<br>Culture and social values<br>Social organization and Political institutions and management<br>(Government of Spain) | This section covers systems with direct links to climate. |
| G-1-274 | A | 60 | 2 | | | The use of tourism its more related with a consumist society<br>(Government of Spain) | Not applicable. |
| G-1-275 | A | 60 | 17 | 60 | 19 | southern Africa repeated, only need one<br>(Government of Ireland) | Fixed. |
| G-1-276 | A | 60 | 33 | | | Insert new section 1.3.9.4: Population Movements Population movements are indicative about adaptative strategies to Global Environmental Change, due they also respond to social causes. Beside great migration moves South – North, You should underline inner demographic flow at all countries where you might observe Global Environmental Change Example ( Lack of water).<br>(Government of Spain) | There is a lack of studies on this with direct links to climate. |
| G-1-277 | A | 60 | 34 | 60 | 41 | The current title of Section 1.4 is misleading (neglecting 1.4.3), and the first paragraph is not clear. The current Section 1.4.3. should rather be a separate Section 1.5 "Summary", while 1.4 should be renamed "Attribution of observed changes to anthropogenic climate change" ; reformulate the first paragraph.<br>(European Union) | Accepted. This section has been revised substantiallly in response to Govt and Expert comments. |
| G-1-278 | A | 61 | 19 | 61 | 19 | Authors should review the use of the confidence range given by Parmesan of "very high confidence" this could confuse readers due to the use of the same phrase for IPCC confidence assessments. To prevent this confusion, authors should consider not using confidence ranges from external literature.<br>(Government of Australia) | The Parmesan assessment of confidence uses the same ranges as the IPCC confidence language. Hence, it is retained as it is appropriate for this study. |
| G-1-279 | A | 61 | | 61 | | In Box 1.3 (page 61-62) 'Phenological responses to climate in Europe: The COST 725 Project' there is no reference to the figures in the text and an explanation is required to distinguish between 'open' and 'closed' circles in the second figure on page 62. In addition, Box 1.3, page 62 second paragraph, the meaning of the sentence beginning 'The pattern of observed change in spring was spatially consistent and efficiently matched measured national warming……' is unclear. | Revised. Figure captions have been inserted and text modified. |

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| | | | | | | (Government of Ireland) | |
| G-1-280 | A | 62 | 0 | | | Add a discussion of the Arctic Oscillation (AO)<br>(Government of USA) | This section on the NAO has been removed so the comment is no longer relevant. |
| G-1-281 | A | 64 | 47 | | | What is SAR?<br>(Government of USA) | Revised |
| G-1-282 | A | 65 | 49 | 65 | 49 | Only 1 GCM mentioned… include also GFDLR30 and PCM (mentioned under Fig. 1.8)<br>(Government of Netherlands) | Figure and text revised. |
| G-1-283 | A | 66 | 34 | | | what is the value of r2?<br>(Government of Ireland) | Figure redone. |
| G-1-284 | A | 68 | 31 | 68 | 31 | What is "5o"?<br>(European Union) | Corrected. |
| G-1-285 | A | 70 | 21 | 70 | 21 | Turn the current Section 1.4.3. into a separate Section 1.5 "Summary" as it is not related to the the other sections of 19.4. (and not covered by the current title of 19.4).<br>(European Union) | Accepted and revised accordingly. |
| G-1-286 | A | 71 | 0 | | | Add a discussion of where we should go from here to improve needed observations.<br>(Government of USA) | Agreed. Included in new section 1.5. |
| G-1-287 | A | 71 | 24 | 71 | 24 | Delete the words "there are" at the end of this line.<br>(Government of Pakistan) | Text changed. |
| G-1-288 | A | 71 | 26 | 71 | 27 | See previous comment pointing out that Tuvalu example in Section 11.3.3 is not grounded in a literature reference.<br>(Government of Australia) | Tuvalu removed. |
| G-1-289 | A | 72 | 9 | | | The correct reference to ACIA should be: ACIA 2005: Arctic Climate Impact Assessment. Cambridge University Press, 1042p.<br>(Government of Norway) | Reference corrected. |
| G-1-290 | A | 83 | 1 | 83 | 3 | repeated reference<br>(Government of Ireland) | Reference corrected. |
| G-1-291 | A | 83 | 13 | | | Hari, R. E., D.M. Livingstone, R. Siber, P. Burkardt-Holm, H. Güttinger 2006: Consequences of climatic change for water temperature and brown trout populations in Alpine rivers and streams. Global Change Biology 12: 12-26<br>(Government of Switzerland) | Corrected. |
| G-1-292 | A | 83 | 37 | 83 | 39 | The citation is wrong, should be: Hilden, M., Lehtonen, H., Bärlund, I., Hakala, K., Kaukoranta, T. & Tattari, S. 2005. The practice and process of adaptation in Finnish agriculture. Finnish Environment Institute Mimeographs 335: 28 p. (FINADAPT Working Paper 5). http://www.ymparisto.fi/syke/finadapt<br>(Government of Finland) | Corrected. |

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| G-1-293 | A | 84 | 47 | | 49 | The journal in this reference should be “Climatic Change”, not “Climate Change” (Government of USA) | Corrected. |

# This part contains LATE GOVT comments for chapter 1

## CHAPTER 1

| Chapter-Comment | Batch | From Page | From Line | To Page | To line | Comments | Notes of the writing team |
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| 1-1 | LATE | 0 | 0 | 0 | 0 | References format needs to be unified. In some cases it is indicated "Parmesan and Yohe (Parmesan and Yohe 2003) found that…" In other cases it is indicated "Parmesan (Parmesan and Yohe 2003) found that ...".<br>I suggest choosing a more economic format, in terms of spaces, and always cite Parmesan and Yohe (2003). It is not necessary to indicate the author/authors twice.<br>(Government of Argentina) | Reference style corrected. |
| 1-2 | LATE | 0 | 0 | 0 | 0 | In general, and considering that tables imply a lot of space, I suggest the authors may significantly reduce the number of tables in this chapter, without risking the strength of evidences.<br>(Government of Argentina) | Number of tables reduced. Some moved to SM. |
| 1-3 | LATE | 0 | 0 | 0 | 0 | Check use of parenthesis. In many places, principally related to references and information together, parenthesis are opened and never closed.<br>(Government of Argentina) | Parentheses checked. |
| 1-4 | LATE | 0 | 0 | 0 | 0 | Check references to El Niño Southern Oscillation, sometimes it is referred as ENSO, and sometimes as El Niño, please unify.<br>(Government of Argentina) | Checked. ENSO and El Nino each used where appropriate. |
| 1-5 | LATE | 0 | | | | This information is given in Scientific American of January 2004, commenting on the studies made by W. Fraser, ecologist of the Montana State University. Due account taken of the reduced number of bird species living in the Antarctic this case would deserve consideration.<br>(Government of Argentina) | Included in general reference to Antarctic flora and fauna in ES. |
| 1-6 | LATE | 0 | | | | The two introductory chapters (Chapter 1: Assessment of Observed Changes and Responses to Natural and Managed Systems, and Chapter 2 New Assessment Methods and the Characterization of Future Conditions), have been generally improved, with respect to FOD.<br>(Government of Argentina) | Thank you. |
| 1-7 | LATE | 0 | | | | The chapter is well written in general, and it provides some interesting introductions to the chapters that follow. The major flaw, recognized by the authors, is the bias towards a developed world picture of the current state of the | Knowledge gap has been pointed out in chapter. All regional chapters were checked for additional references and are cross- |

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| | | | | | | systems and sectors. Admittedly there is a well established lack of information and research in most parts of the rest of the world. The authors accept that they may have not had access to all the available information and research. The problem partially lies in the composition of the authors team, which is heavily biased towards USA and European authors. Please note that this is not a remark on the professional qualities of the authors but rather points to a practical fact, i.e., that the chapter does not include regional specialists who may know where the information needed can be found and what is really available. In the case of Latin American local/regional journals do contain part of the information needed. Although those journals are rarely read outside the region, and it is difficult to publish the information in mainstream journals, for a variety of reasons, most of which are unrelated with scientific quality. Probably a good segment of the missing information that needs to be included in this chapter can be found in the text and/or references of the regional chapters. The authors should access the regional chapters to get the missing information if they cannot find it themselves.<br>Clearly this chapter reads as a developed world report and in many aspects, by omission, does not reflect the true state of the problem.<br>His chapter needs to be cross-referenced with the rest of the chapters in this assessment. Thus It needs a profound revision and addition of at least part of the missing information.<br>(Government of Argentina) | referenced where relevant. |
| 1-8 | LATE | 0 | | | | Finally, Chapter 1 does not include a section on Key uncertainties and research needs, in which the lack of research and very basically, of data (geophysical, biological, social, economic, behavioral, etc) shall be remarked<br>(Government of Argentina) | See Section 1.5. |
| 1-9 | LATE | 0 | | | | Chapter 1 presents some shortcomings regarding observed changes in the developing regions. Further, it is opportune to notice that cross-referencing and coordination with regional chapters is not yet complete. The case of the loss of about 70 % of the Addelie penguin population, in the last three decades, which should be pertinent in Chapter 1, because it is attributable to climate change, is not mention. The problem is that, in spite of its importance, it is not even included in Chapter 15.- Polar Regions.<br>(Government of Argentina) | Changes in Adelie penguins were covered in TAR. Now included in general statement in ES. |
| 1-10 | LATE | 3 | 1 | 5 | 36 | The Executive Summary does not have an homogenous coverage of all regions considered in the assessment. If this is due to a lack of information and research results in many parts of the world, as noted further along in the chapter, this must be clearly stated here. If information and research is needed this too must be stated | Section added to ES at end bringing forward differences in geographical locations of observations. |

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| | | | | | | here. Please deepen the search for scientific results and information. Remember that many of the policy makers will concentrate more on this section than on the rest of the chapter.<br>(Government of Argentina) | |
| 1-11 | LATE | 5 | 12 | 5 | 12 | The topic of viticulture is complex, some areas farther away from the Equator may benefit from climate change. Closer to the Equator the warming can impact quality and introduce changes in the zonalization. Quality changes can be of either sign (G.B. Jones, Climate Change and global wine quality, Climatic Change, 2005, in press) , and hence the phrase cannot be so conclusive.<br>(Government of Argentina) | Viticulture statement removed from ES. |
| 1-12 | LATE | 5 | 16 | 5 | 20 | The examples are again too specific and refer to only one region. Since information is most certainly available in the relevant regional chapters, please either show a more global picture of the issue or avoid all together such a remark in a bullet of the Executive Summary. If necessary check the information contained in other chapters. This is a usual practice in the writing of IPCC documents.<br>In the same page, lines 16 to 20, the examples refer only to one region. Since information is most certainly available in the regional chapters, please either show a more global picture of the issue or avoid all together such a remark in a bullet of the Executive Summary.<br>Again in the same page, but in lines 21 to 23, reference to extreme temperatures points only to heat waves, mainly in resonance with the critical European case, in 2003. However, though with a different human dimension (number of deaths), heat waves attributable to climate change has been and are currently detected in the majority of the PCC regions. Chapter 1 should emphasize that the lack of statistical information is also a critical shortcoming.<br>(Government of Argentina) | Regions included are where evidence is documented. See Box on EU heatwave in Chapter 8. |
| 1-13 | LATE | 5 | 23 | 5 | 23 | At least change demonstrated by further studied. Heat waves are not new to the world, maybe to Europe. The consequences of heat waves upon health, for example cardiac problems, dehydration, children/ senior citizen s problems have been known and studied for decades, and advisory messages in the heat wave forecasts given in many countries at least for the last 20 years. While the 2003 european heat wave is an alert that should be noted please remove the bias to the bullet.<br>(Government of Argentina) | See Box on EU heatwave in Chapter 8. |
| 1-14 | LATE | 7 | 44 | 7 | 46 | This paragraph currently sounds as if the Artic indigenous people were the only ones that have detected the impacts of climate change. This is probably not so, and the main issue here is the lack of research in this aspect in many parts of the world. Please revise text. | Text rewritten. |

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| | | | | | | (Government of Argentina) | |
| 1-15 | LATE | 7 | 48 | 8 | 5 | This section needs to expand and enforce the need for local research and capacity building in developing countries in order to meet these significant goals. Unless regional/local policy makers get the message loud and clear that this is a major issue that needs financing and support the developing countries will not develop their capabilities and research in order for them to be able to determine their own future and path for development, hopefully sustainable development, something which is a region/country s decision and cannot be imposed from abroad. (Government of Argentina) | Data gaps now addressed in Sectio 1.5. |
| 1-16 | LATE | 9 | 7 | 11 | 25 | Section 1.2.1 Climate and non-climate drivers of change. This is an important and complex section. In its present form the message that the authors want to give is not coming out clearly. There are some topics missing in the analysis. No mention is made, for example, of extreme events, which can impact on ecosystems and thus have a feedback on the climate system. No mention is made of the relationships with stratospheric ozone change. In this case the authors are encouraged to refer to Chapter I: Ozone ad Climate: A review of Interconnections, IPCC/TEAP, Safeguarding the ozone Layer and the Global Climate System: Issues related to hydrofluorocarbons ad perfluorocarbons , Cambridge University Press, 2005. Some re-writing is encouraged to contemplate these missing topics and to clarify the text. (Government of Argentina) | Text rewritten in response to reviewers' comments. |
| 1-17 | LATE | 10 | 15 | 10 | 15 | Table 1.1, afforestation is not restoration of vegetative cover. It implies a change in the vegetative cover, e.g. planting trees in the Pampas, where trees were not part of the original ecosystem. Carbon sequetration is not implicit if the wood is used for example in the pulp mill industry. (Government of Argentina) | Changes made in table. |
| 1-18 | LATE | 11 | 24 | 11 | 25 | This is a distinctly biased statement. Lack of air conditioning may be a problem in parts of the US and Europe, as well as a cultural problem. However there are more severe deficiencies in the rest of the world which are by far more relevant here: lack of drinking water, lack of sanitation, lack of refrigeration for food preservation, etc. This statement must be changed. (Government of Argentina) | Air-conditioning removed. |
| 1-19 | LATE | 11 | 28 | 12 | 39 | There are some missing issues in this section. 1.as the section clearly states there is a lack of balance in data availability. Thus the section must also stress the need for sustained monitoring networks where data is not available. 2.Satellites are useful tools indeed, which must be complemented by the ´ground | Satellite data section removed due need to shorten chapter. Data gaps and need for networks now in Section 1.5. |

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| | | | | | | truth´ as provided by the monitoring and observation networks. This point should be made. Furthermore the budget cuts in NASA are placing in jeopardy a large portion of the current satellite system monitoring the state of the planet. Thus excessive reliance on satellite systems can be a problem in the near future. Thus the need for sustained ground measurements.<br>(Government of Argentina) | |
| 1-20 | LATE | 11 | 28 | 11 | 39 | In page 11, lines 28 to 39, dealing with data, there are some missing issues: first, as the section clearly states, there is a lack of balance in data availability. Thus, for the sake of decision making, the section must also stress the need for sustained monitoring networks, where data is not available. Second, it is clear that satellites are useful tools indeed, which must be complemented by the "ground truth" as provided by the observation and monitoring networks. This should be made. Furthermore, the budget cuts in NASA are placing in jeopardy a large portion of the current satellites monitoring the state of the planet (Nature 441, 15 June 2006). Thus excessive reliance on satellite systems could be a problem in the near future. Thus the need for sustained ground observation and monitoring shall be clearly stated.<br>(Government of Argentina) | Addressed in Section 1.5. |
| 1-21 | LATE | 16 | 19 | 16 | 30 | Box 1.1: This is a very interesting example, but the third and the fouth paragraphs could be reduced. Additionally, in the map (Fig. 1.2) scale is not indicated, and it is important.<br>(Government of Argentina) | Because of skepticism expressed by one expert reviewer, paragraphs 2 and 3 have been strengthened and it is preferred to keep them in order to present a more robust case |
| 1-22 | LATE | 22 | 3 | 22 | 5 | I suggest inverting the order of this sentence to give more emphasis to the generalized shrinkage, something like "Although there are a few cases of both shrinkage and growth related mainly to changes in precipitation, there is abundant evidence that most of the cryospheric components in polar regions and in mountains are undergoing generalized shrinkage in response to warming".<br>(Government of Argentina) | OK, done |
| 1-23 | LATE | 22 | 41 | 22 | 42 | This sentence seems to be not neccesary "However, other evidence for such a CO2-runoff relationship is difficult to find".<br>(Government of Argentina) | Needed for clarity. |
| 1-24 | LATE | 23 | 0 | 23 | 0 | I think a table showing no consistent trends is not indispensable, particularly considering the need of reducing the chapter in length.<br>(Government of Argentina) | Shortened table. |
| 1-25 | LATE | 34 | 45 | 34 | 48 | The effects of enhanced UV resulting from Antarctic ozone hole effects should be included<br>(Government of Argentina) | Not sure if this should be mentioned in our section.<br>NO CHANGES |

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| | | | | | | | |
| 1-26 | LATE | 34 | 45 | 34 | 48 | Regarding page 34, lines 45 to 48, here are few important things missing. For instance, there is no reference about the increased UVB radiation and its effects on ecosystems, as well as on the specialists living in the observation and research installations and the tourists who visit the Antarctica. Moreover, there is no information on the loss of about 70 % of the Adélie penguin population, in the last three decades. This is pertinent to Chapter 1, because it is attributable to climate change; however, it is not mentioned. The problem is that, in spite of its importance, it is not even included in Chapter 15.- Polar Regions. This information is given in Scientific American of January 2004, commenting on the studies made by W. Fraser, ecologist of the Montana State University. Due account taken of the reduced number of bird species living in the Antarctic this case would deserve consideration.<br>The inclusion of Central America in the issue of the UVB radiation sounds a bit odd. Statistical studies found, for example, in the UNEP Quadriennial Ozone Assessments show that statistically significant changes occur poleward of approximately 30 degrees of latitude, in both hemispheres.<br>(Government of Argentina) | Not sure if this should be mentioned in our section, however i have added some text and references about penguins. See my new version<br>CHANGED |
| 1-27 | LATE | 40 | 19 | 40 | 19 | The work carried out by Carlos Ballar and his team on the UV effects on plants in Tierra del Fuego, Argentina should be included.<br>(Government of Argentina) | Not possible due to space restrictions, we added e.g. to indicate that there are more studies. |
| 1-28 | LATE | 40 | 36 | 40 | 39 | Sentence " There have been reported instances of … period have been reported (Tryjanwski et al. 2004)" is not absolutely clear. Try rephrasing.<br>(Government of Argentina) | Done—reworded |
| 1-29 | LATE | 42 | 2 | 42 | | We do not believe that Australia is the only Southern Hemisphere country with information on this matter.<br>(Government of Argentina) | Unfortunately no other studies are known to the writing team or have been suggested by reviewers. |
| 1-30 | LATE | 45 | 43 | 45 | | Table 1.10. We believe that there are references on the southward expansion of insects in South America, e.g. the Annopheles Aegpytii, and yet no mention is made here.<br>(Government of Argentina) | There is little evidence that the reinfestation is triggered – at least partly – by changing climate (e.g. temperature). |
| 1-31 | LATE | 46 | 11 | 46 | 11 | The inclusion of Central America in the issue of UVB sounds a bit odd. Statistical studies found for example in the UNEP Quadrennial Ozone assessments show that statistically signifcant changes occur poleward of approx. 30 deg. In both hemispheres.<br>(Government of Argentina) | UVB has been deleted in this section. |
| 1-32 | LATE | 47 | 10 | 47 | 10 | What is so special about Europe in this context? Either justify or remove. | We removed it. Thanks |

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| | | | | | | (Government of Argentina) | |
| 1-33 | LATE | 48 | 14 | 52 | 25 | This chapter does not make reference to the impacts of extreme events, both in agriculture and forestry.<br>(Government of Argentina) | Extreme events are considered in agriculture and forestry section. |
| 1-34 | LATE | 48 | 16 | 48 | 23 | The difficulties in assessing climate impacts in agricutlture are correctly stated. However it shoudl be convenient to note that using the proper statistical tools with the relevant infomration it is possible to isolate the impacts of climate change in the gross production. Specific experiments can be carried out and effectively are to determine such impacts.<br>(Government of Argentina) | This chapter is focused on observed changes, not on experimental data. |
| 1-35 | LATE | 48 | 25 | 50 | 43 | Should this section not make reference as well to the experiments with crops analysis enhanced CO2 and O3 effects on crop yields?<br>(Government of Argentina) | This chapter is focused on observed changes, not on experimental data. Focus in on temperature change, not on CO2 and O3 effects. See Chapter 5. |
| 1-36 | LATE | 48 | | | | Section 1.3.6. Agriculture and forestry does not mention the observations made with enhanced concentrations of CO2 and O3, in crop productivity. The problem is that the O3 question is not clearly expressed in Chapter 5.<br>Finally, Chapter 1 does not include a section on Key uncertainties and research needs, in which the lack of research and very basically, of data (geophysical, biological, social, economic, behavioral, etc) shall be remarked<br>(Government of Argentina) | This chapter is focused on observed changes, not on experimental data. Focus in on temperature change, not on CO2 and O3 effects. See Chapter 5. Key uncertainties covered in 1.5. |
| 1-37 | LATE | 49 | 16 | 50 | 17 | The topic of viticulture is indeed complex, some areas farther away from the Equator may benefit from climate change. Closer to the Equator the warming can impact quality and introduce changes in the zonalization. Quality changes can be of either sign (G.B. Jones, Climate Change and global wine quality, Climatic Change, 2005, in press).<br>(Government of Argentina) | NA: in agreement with the text and box on wine, already mentioning the work by G.Jones |
| 1-38 | LATE | 50 | 45 | 51 | 37 | a.Do these results both apply to natural forests and plantations? Please specify.<br>b.Only Northern Hemisphere wildfires are mentioned. Fires in tropical regions, primarily induced by humans, are an important source of CO2, being one of the main CO2 contributions from Latin America (see chapter 13). Deforestation and fires impact upon the health of natural forests along the edge of the clearings, reducing their resilience to changes, including climate change, and they become more prone to fire risks. This section does not provide information on deforestation rates and land use changes.<br>The chapter should take into account the consequences of such changes in the overall balance of CO2 sequestration, otherwise it provides an overlyoptimistic | a. adressed<br>b. agree, but chapter1 is focused on changes, and references to be cited would be needed |

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| | | | | | | view of the problem. A thourough revision of this section is required.<br>(Government of Argentina) | |
| 1-39 | LATE | 51 | 22 | 51 | 26 | Sentence "While the increase of … affecting large wildfires" is not absolutely clear. Try rephrasing. The information about "in spite of management acting to reduce fuel load in forests" may not be neccesary.<br>(Government of Argentina) | OK, adressed |
| 1-40 | LATE | 52 | 17 | 52 | 25 | This reads as a summary for Europe and North America. If there is no information about the rest of the world please say so. Even that is relevant. If you are not sure, deepen your research.<br>(Government of Argentina) | NA: it is already said. We have discussed with Graziella Magrin (ch13): no observation of change, more variability |
| 1-41 | LATE | 52 | 28 | 55 | 44 | This section does not read as an assessment. There is neither a formal nor an exhaustive review and analysis of the literature. The section reads like a list of selected papers. Nevertheless, it is clear that a temperature change, as well humidity change, will have a direct impact upon the insects lifecycle. These are vectors of several non completed infections and diseases (for instance tropical disease like dengue, chagas, leshmaniasis). Developing country populations is more at risk of increased morbility because of their living conditions, deficient health services, housing, sanitation, malnutrition, etc. Thus changes in temperature and climate will have a greater impact upon health in these regions. Morbility changes can be expected.<br>Note too that impacts on food productions and food quality (e.g. lack of refrigeration) due to climate change and extreme events can enhance morbility.<br>There is a need to promote preventive actions by the national/regional health authorities to reduce such consequences of climate change.<br>There are no clear cut conclusions in the presentation. Some conclusions are introduced without adequate infomration in the text. A more throurugh review of the literature and available sanitary information is required.<br>(Government of Argentina) | There are very few studies on obsrved changes in health, and the evidence is confounded due to the highly managed nature of the health system. This section was written in close collaboration with the authors of Chapter 8. |
| 1-42 | LATE | 52 | 48 | 52 | 13 | Some of the conclusions regarding crop yields are not consistent with the text in page 50, lines 19-21. Please review and clarify both segments of text. Be specific.<br>(Government of Argentina) | Text rewritten. |
| 1-43 | LATE | 55 | 11 | 55 | 15 | Sentence "The variability an near-concurrence… stimulating blooms." is very long and not absolutely clear. Try cutting it in two, and rephrasing.<br>(Government of Argentina) | Text rewritten. |
| 1-44 | LATE | 55 | 47 | 59 | 4 | This section is interesting but gain it suffers from a US/Europe bias. It is hard to believe that there is no scientific information and statistical data on extreme events outside that region, particularly in recent years. Granted that it is not possible to | We searched for literature from Latin America. Please provide specific references and we will be happy to include them. |

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| | | | | | | carry a profound statistical analysis due to the shortness of the time series. However there is plenty of basic meteorological information, for example in Latin America, as well as a body of research in the region to deal with this topic. No mention is made for the first South Atlantic cyclone Caterina in Brazil, march 2004. There is literature about this. What about the state of severe cyclones in the Pacific and Indicn Oceans (Bay of Bengal)? This needs to be developed further.<br>Regarding flooding in different parts of the world only rather vague comments are made. For example what about the flooding in the Parana River Basin related to El Niño and the possible relationship between El Niño and climate change. What about the social consequences of extreme events?<br>What about other extreme events such as mud slides in Central America and the andean countries due to extreme rainfall?<br>Cleary this section needs much development and must be thouroughly revised.<br>(Government of Argentina) | |
| 1-45 | LATE | 57 | 14 | 57 | 27 | Try shrinking this paragraph. Again, considering the need of reduction, information about Emanuel methods may not be indispensable the authors could just informed about his/her findings, the same with Webster (Munich Re Group 2005).<br>(Government of Argentina) | Text rewritten. |
| 1-46 | LATE | 57 | 38 | 57 | 48 | The first two sentences of this paragraphs report an increase in economic losses that is then put down in the following paragraphs. I suggest the authors should only inform about the normalized losses, which are the only really meaningful.<br>(Government of Argentina) | Losses are relevant both normalized and not normalized. |
| 1-47 | LATE | 59 | 7 | | | This section reads primarily like a North Hemisphere assessment, with some few interpersed comments about some other parts of the world. A through revision and much research is required to make it acceptable for a global analysis.<br>(Government of Argentina) | There is very little data on socio-economic indicators changing with climate from the SH. What we have found has been added to the section. |
| 1-48 | LATE | 59 | 41 | 59 | 49 | We doubt that air-conditioning is the only concern. Please refer to previous comment on this same matter.<br>(Government of Argentina) | Qualifiers added. |
| 1-49 | LATE | 62 | 1 | 62 | 30 | Figures are not indicated and do not have legends as in other boxes<br>(Government of Argentina) | Figures do have legends now. |