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

Government and Expert Review of Second Order Draft

Specific Comments

GOVERNMENT REVIEW COMMENTS

TECHNICAL SUMMARY

Author responses - December 2006

(includes late Mexican Govt. comments at the end)

Codes used by Chapter 4 (Ecosystems):

A: Agreed
R: Rejected (add rationale)
L: Left it under advisement (should be avoided for FGD)
NA: Not applicable
TR: Text Removed

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
G-TS-1	A	0		0		It's important stating explicitly the level of confidence in conlusions. However, attaching confidence to statements that contain other qualitative descriptors such as 'seriously' (eg p35, line 37) and 'severely' (p35, line 48) leads to confusions. Does [seriously+ very high confidence] equate to [severely + high confidence]? (assuming that 'severely' is worse than 'seriously' and 'very high' is better than 'high') ! These other qualitative descriptors of the level of impact risk appear throughout the TS. They either to be standardised. (Government of UK)	We have tried to standardize the language following what is set out in Box TS-1.
G-TS-2	A	0				we propose to talk about climate impacts and vulnerabilities sectorally and not distribute the facts and projections over 3 different places, namely section B (which can be incorporated into section C), section C and Boxes TS-3,4 (which could be eliminated because information seems to be duplicated). This is really hard to read and to get an overview on (especially in a summary). Once it is matched there seems to be a high potential for shortening also. A new chapter is suggested in terms of "how to deal with it" (adaptation, sustainability, how to cope with vulnerable areas etc.). At present, all these aspects are rather mixed over the chapters (e.g. adaptation aspects already in section C). Alternatively, do everything by sectors. (Government of Germany)	We have followed the Plenary-agreed Outline for the WG2 AR4. When we didn't do this for the SPM, this brought complaints from governments.
G-TS-3	A	0				There is a lack of consistency among the executive summaries of the chapters and the TS. At a minimum, all statements in such summaries should refer to the sections or subsections in the underlying chapters. Moreover, in light of the fact that most of the chapters include significant uncertainties and related research priorities, such summaries should include a reference to them as well. Authors are inconsistent and do not follow language regarding uncertainty provided in the introduction (eg. Virtually Certain, Very Likely, etc.), and instead use "will" (or similar wording) that suggest a higher level of certainty than the information provided in the chapter. Therefore, the authors do not use the appropriate terminology when referring to the "degree of confidence" AND "likelihood of occurrence/outcome". General comment on Research Gaps: The TS (p. 3) states that the "[a]ssessment aims to describe major aspects of current knowledge of climate change impacts, adaptation and vulnerability in 2006. Specifically, it addresses seven questions," the last of which is: "What gaps exist in current knowledge and how best can these be filled?" We presume that the term "gaps" is intended to be synonymous with the words "uncertainties" and the related words "research priorities," and that these various chapter sections are apparently aimed at identifying these "gaps."	We have worked hard to ensure line-of-sight between the SPM, TS, chapter ESs and the main text of the chapters in the FGD. Full sourcing is provided. We have tried to accompany all substantive statements with a confidence estimate. Language has been edited to exclude as far as possible vague words such as 'could', 'would, 'may, 'might' and to include the formal uncertainty language in Box TS-1. This general coment seems to be addressed to the chapters as much as to the TS. However, with respect to the TS we can say the following. We made the decision to deal with knowledge gaps in their own section, rather than treating them within each section of the TS, believing that to take the latter path would

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						Presumably, they should be a significant part of the draft. However, not identifying those "gaps" in a uniform and consistent manner from chapter to chapter tends to denigrate them in importance and significance. Even more important is the nearly total absence of any recognition or discussion of the substance of these many identified uncertainty-related research "gaps" in the SPM. As to the specific issue of "research gaps/priorities," in several chapters such research needs are extensively listed, generally as "priorities" for a particular chapter, but there is no definition or explanation of what the term means, and, even more importantly, there is no apparent attempt to prioritize these extensive chapter-specific lists for the assessment as a whole. In addition, there is no explanation in the draft as a whole to indicate, from the standpoint of WGII at least, a time frame for the conduct of such research. Moreover, the draft lacks any indication on the part of the WGII as to what entity or entities should have the lead responsibilities to initiate and carry out such research. Presumably, it is not the IPCC, which has no research mandate. Just as important is a view on the time frame for such research and, in that context, the intended meaning of the term "priorities." Given the number of research items in each of the chapters, such priorities cannot be temporally based. They must be based in terms of rank of importance or significance. However, as among chapters, there is no such apparent ranking. All items are treated as equally important and significant, which has the tendency to make the overall list overwhelming and not helpful to governments, stakeholders or the private sector. In short, the numerous lists of chapter research needs – assuming that each such list adequately explains the relevant need – are presented in a vacuum that lacks essential details and gives the appearance of an extensive "shopping list" that does not indicate what the real priorities are for the draft as a whole. While such lists help to amplify uncertainties in the chapters, their significance and importance are not similarly highlighted in the SPM or the TS. In fact, they are hardly mentioned. Part "G" of the TS (p. 55) includes a subpart G.2 titled "Future Research Needs." However, this less than two-page summary only refers to some of the research needs included in the chapters. It is unclear from this subpart what is intended by this brief discussion of "research needs" compared to all of the "research" priorities or gaps identified in the chapters.Technical Summary must reflect changes made to the supporting chapters. Water markets, which are critical adaptations for drought management and agricultural production should be mentioned in the Technical Summary since other water management strategies are specifically mentioned. Water markets are	in fact reduce their prominence in the TS. To follow this approach would tend towards being 'policy prescriptive'.. In writing the section on knowledge gaps, we have been aware of this risk, and have perhaps erred on the side of caution, but we don't think so. These items have emerged out of extensive discussion within the group of authors. This remark seems to imply that they are a random collection, but this is far from the case. Judgements differ, which makes it hard to rank the suggestions. Chapter 17 does not consider water markets sufficiently important to make reference to them in the Technical Summary. Chapter 3

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						discussed indepth in the main report. (Government of USA)	has only 2 paragraphs on these.
G-TS-4	A	0				There are numerous examples in the TS of the bolded "headline statement" not being reflected in the following text. The authors should review the use of bolding and the formatting of the TS to ensure consistency in the message presented. (Government of Australia)	We have tried to do this – authors have been encouraged to draw on their chapter Executive Summaries for these statements.
G-TS-5	A	0				The TS currently collates the summaries of the chapters with limited synthesis or consistency in depth and language. In particular, the summary of regional papers is repetitive. It may be appropriate for this section to summarise the findings that are common to all regions and then focus on specific impacts in different regions. (Government of Australia)	We have tried to avoid repition in this Final Government Draft.
G-TS-6	A	0				The purpose of the TS is to inform an informed readership of the specific findings of the WG2 report with greater specificity than allowed in the SPM. In particular the TS provides the opportunity for stakeholder interests (in specific sectors or regions) to be linked into the broader messages contained in the SPM. At present there is a disconnect between the TS and some of the key findings in the WG2 report. The TS should basically serve as a collation of the Executive Summaries of the Chapters, however, the authors of the TS have a role to ensure consistency in the messages presented and to ensure that the main messages concerning possible impacts are highlighted. Identification of its possible audience would be useful. (Government of Australia)	We have worked hard to ensure line-of-sight between the SPM, TS, chapter ESs and the main text of the chapters.
G-TS-7	A	0				It is stongly suggested at impacts are always linked to global climate change in terms of temperature change in order to put impacts into context. Information without such context is of very little. Such information would greatly improve the user-friendlyness of the report because otherwise the reader would have to consult the main document or even the original literature. (Government of Austria)	We have tried to do this, and have provided Tables SPM-3 and SPM-4 which are based entirely on temperaure changes.
G-TS-8	A	0				It is proposed to follow more strict the general structure as indicated by the description of the chapters A, B to G. In particular it would be helpful to address vulnerabilities and likely future impacts in chapter C under the assumption of no adaptation at all and to include already occurring or potential adaptation in chapter D. This clarity could help to better inform about the potential impacts of climate change but also bring better the benefits and the effects to the attention of the reader. (Government of Austria)	This was always the plan – the chapter CLAs didn't always follow this scheme in the SOD, but we have tried harder to get them to conform in the FGD.
G-TS-9	A	0				Early on in the TS there is a need for an explanation of how reader should interpret statements of impact that are connected to (°C) temperature rises. What is the	We have taken more care in the FGD – see the beginnign paragraph of Section D, and also

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						reference point for those temperature rises - e.g. does temperature rise relate to 1900 (as shown in Fig TS-5); or is it with reference to temperature today/or 1990? Is a standard reference date applied consistently throughout the WG2 report; or if not, is it made clear what the relevant reference date is when a temperature rise - impact statement is made. Is the temperature reference date approach in WG2 report, the same as followed in WGI report? This seems a significant issue to make clear for the reader when many impacts are portrayed as serious at the 2-3°C temperature rise level; and there has been an observed global temperature rise of .....°C in past century. A standardised approach to reporting temperature rise throughout the WG2 report and indeed the whole AR4 would be helpful to a policy audience. (Government of Australia)	Tables TS-3 and 4.
G-TS-10	A	0				Comment on organization? (Some may say that TS more effective SPM than the actual SPM) (Government of Japan)	No action (but SPM follows more carefully the Plenary-agreed Outline for WG2 AR4).
G-TS-11	A	0				A lot of specific knowledge (for example IPCC jargon) is needed to understand large passages in the Technical Summary. Care should be taken for the Technical Summary being a kind of stand-alone which can be understood without references to all kinds of parts somewhere in the IPCC-report (which does not mean not refering to other parts for more details). (Government of Germany)	We have tried to improve the TS in this respect.
G-TS-12	A	1	1	57	38	It is desirable that throughout the SPM and the TS that temperatures be expressed in terms of temperature rise based on the pre-industrial base line rather than the 1990 baseline. (Government of Japan)	We have done this.
G-TS-13	A	2				It is suggested to include all subsections (e.g. A.1, A.2) in the table of contents to improve the readability. (Government of Austria)	Done.
G-TS-14	A	3	14	5	1	A condensed version of Section A.2 “Underpinning scenarios for the Working Group II Fourth Assessment” would benefit the SPM. Realize the space/length constraints of the SPM limit what can and/or can not be included, however for policymakers section A.2 is a critical section. Suggest that if all the text can not be condensed and inserted into the SPM, that at least writers consider condensing A.2.1 “Characterising the future in this assessment” and adding Figure TS-1 as is to the SPM. (Government of Japan)	Comment for SPM (note we have added something on SRES in the SPM, a nd also a table of temperatures and SLR under different scenarios to the SPM).
G-TS-	A	3	17	3	17	Reference is made to the TAR and AR4 WG I report. This reference to external	The TAR full citation is given, but we have

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
15						reports not included in this report and thus full citation should be included in references and author/year be used to cite in the text. (Government of Canada)	made a decsion to refer to the TAR as such, and not as McCarthy et al, 2001. Note that the TS has no references in that form, and we have worked to make it so.
G-TS-16	A	3	20	3	35	This is a sound and logical structure for the TS. (And it is a significant advance on the TAR TS structure). In several dot points the phrase current knowledge is used - this can be confused with observable now - a better expression. (Government of Australia)	Don't agree that 'observable now' is a better phrase.
G-TS-17	A	3	20		25	Why change the general categories from the base document which is grouped according to assessment of: A) observed changes, B) future impacts and adaptation of systems and sectors, C) future impacts and adaptation of regions, and D) responses to impacts? We do not agree that the TS should single out key vulnerabilities and implications for sustainability as separate questions to address, especially since both chapters are weak. (Government of USA)	We have followed the Plenary-agreed Outline in the structure of the TS. The length of the sections is designed to be *pro rata* to the length of the contribution in the main report.
G-TS-18	A	3	21	3	21	It is proposed to delete "in 2006" because "current" in line 20 describes the valid point in time better given that not all the literature published in 2006 might have been addressed and that also some literature only officially published in 2007 might have been already been addressed. (Government of Austria)	Done.
G-TS-19	A	3	38	3	38	The following language is proposed: .. Were appointed by the IPCC bureau on .. (Government of Austria)	Done.
G-TS-20	A	3	47	3	48	It is proposed to delete: "if he or she wishes" in order to be as concise as possible. (Government of Austria)	Done.
G-TS-21	A	3	48	3	49	It would be helpful if, in addition to Box TS-1 that explains uncertainty terms with set confidence or probability thresholds, terms used in the report such as "could", "should" and "expected" were also explained. (Government of Canada)	These have no systematic meaning, and so far as is possible we have worked to remove these terms.
G-TS-22	A	3				footnote 3: Delete "Where" at the beginning. (Government of Austria)	Done.
G-TS-23	A	4	46	4	46	Is this definition of "vulnerability" still up to date? In particular, the term "susceptible to, or unable to cope with" -->or--> "susceptible to, AND unable to cope with" (European Union)	Yes, so far as we are concerned it is still up-to-date.
G-TS-24	A	5	1	7	20	Section A2 is rather disjointed. Section A2 is a series of paragraphs that don't seem to be linked. They should be edited to address the title of the section, "Characterising the future in this assessment", rather than listing history and	We have now moved these sections to follow the observed impacts section and to precede the "Likely future effects". We have also

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						possible approaches. The difference between sections A2 and A3 is not clear. (Government of Australia)	reversed the order of the two sections to place methods ahead of scenarios and sub-divided the future characterisations section into 5 sub-sections. This should now lead logically into the impacts sections.
G-TS-25	A	5	3			Section A.2.1. It is a explained that many of the CCIAV studies in this WGII AR4 are based in SRES scenarios (page 5, lines 22-23). Again in page 6, lines 7-8 it is said that the greatest proportion of climate change scenarios used in CCIAV assessments are derived from SRES emission scenarios. However, in next par., lines 12-15, it is confirm that most of the new simulations assuming SRES scenarios and produced by WGI AR4 were not available for the CCIAV studies assessed by WGII AR4. So, among these sentences there is apparently some contradiction (Government of Spain)	There is NO contradiction. The first two statements (i.e., page 5, lines 22-23, and page 6, lines 7-8) refer to SRES-based experiments carried out prior to the publication of the TAR. These experiments and their results were assessed by WGI TAR. Scenarios derived from these experiments have been used for CCIAV assessments since the TAR and the assessments are being assessed in this volument of the AR4. The third statement (i.e., page 6, lines 12-15) refers to new SRES-based experiments performed after the TAR (i.e., with improved AOGCMs), which are assessed by WGI AR4. With a few exceptions, outputs of these experiments were not available for deriving climate scenarios applied in the CCIAV assessments reported in WGII AR4.
G-TS-26	A	5	5	5	5	It is proposed to insert "change" after "Climate" in order to be consistent with the language in Box TS-2. (Government of Austria)	Word added.
G-TS-27	A	5	5		5	Change “Climate impact” to “Climate change impact”. (Government of USA)	Word added.
G-TS-28	A	5	11	5	11	At the end of the parenthesis, add ", some based on the SRES scenarios" (Government of France)	This is not the case. To our knowledge, no CCIAV assessments were available at the time of the TAR that made use of SRES-based scenarios (climate scenarios or otherwise - e.g. see Table 3.5 of Chapter 3, WGII, TAR). scenarios.

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G-TS-29	A	5	14	5	18	This statement on "global to regional" downscaling wrongly suggests that the SRES scenarios are defined on the global level only. It should be clarified to emphasize that the SRES scenarios are defined for 5 world regions, and that most CCIAV assessments require further downscaling. (European Union)	Text changed to "…downscaling projections of population and GDP from the four SRES large world regions to national or sub-national scales)".
G-TS-30	A	5	14		25	Text gives the appearance that the SRES scenarios are the primary basis for CCIAV studies. While important, they are only one of many bases. In fact, most CCIAV studies are independent of these scenarios. The relationship between SRES scenarios and CCIAV studies should be made explicit. (Government of USA)	The wording of the statement about use of SRES scenarios has been revised as it is now based on a survey of chapters in the volume (there is a footnote in the chapter). We also have added a sentence explaining that some other studies did not employ SRES scenarios.
G-TS-31	A	5	24	5	26	In Fig TS-1 it is difficult to interpret how the 4 axis labels works. For example, not clear what are directions of strengthening/weakening of factors. It would be valuable to have a clear summary pictorial in the AR4 that represents simply the SRES scenarios. (Government of Australia)	Directional arrows have been added to the figure.
G-TS-32	A	5	34	5	34	It is proposed to use the following language: .. To assess risks of impacts. Comment: There may be more impacts and they may be associated with more than one risk due to uncertainties. (Government of Austria)	We have followed this advice.
G-TS-33	A	5				Figure TS-1: Given the importance of CO2 to each of the SRES storylines, a graphic showing the change in CO2 with time for each storyline presented alongside this figure could be useful in understanding the four storylines. (Government of USA)	We have now included TAR estimates of CO_2 concentration for the six illustrative SRES scenarios in section A.2.1.2.
G-TS-34	A	6	7	6	8	This sentence begs the question WHY the A2 scenario has been favored by impacts researchers (or modellers). If no answer is available, then at least explain what the A2 scenario is, for example, continue sentence by adding: …".(the A2 scenario) which is a high emission scenario." (Government of Canada)	A2 was favoured by impacts researchers until quite recently simply because the largest number of early (pre-TAR) GCM experiments were performed for the A2 scenario. Latterly, more experiments have been conducted for the other SRES scenarios, especially A1B and B1, but these were not available for CCIAV studies assessed in this volume. We have revised the text accordingly.
G-TS-35	A	6	12	6	20	It is true that the range of warming projected by current (AR4) AOGCMs is similar to that range projected by WGI TAR. However, this might not be true for precipitation data or other climate change variables (like sea level rise). It is strongly recommended to address that issue.	Summary of precipitation projections added, as this is reported in the chapter. Since this paragraph is on projections of climate change, it is inappropriate to discuss SLR here.

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						(Government of Austria)	
G-TS-36	A	6	14	6	20	For Fig TS-2 and the explanatory text in lines 14 to 20, it is difficult to know what are main messages being conveyed. If it is meant to be about showing greater convergence in modelled projections of temperature and precipitation, then concentrate on saying that. For the lay reader, Fig TS-2 alone is hard to interpret - and open to being misrepresented. Therefore, specific and careful supporting interpretive text is needed. (Government of Australia)	We have revised the text and the Figure caption to provide a more complete explanation. The Figure has also been simplified somewhat.
G-TS-37	A	6	28	6	30	A conclusion such as this- that non-climate drivers may be more important in determining outcomes/impacts is a concept that needs to be picked up in more detail in the section on "Sustainability". (Government of Canada)	This is an issue for the TS core author team to consider
G-TS-38	A	6	45	6	47	Some clarification on the concentration levels indicated with regard to the inclusion/exclusion of non CO2-GHGs would be welcome. (Government of Austria)	We have now included a new figure that shows temperature projections for WRE CO2 stabilisation profiles. This includes information on CO2-equivalence by 2100.
G-TS-39	A	7	1	7	3	The TAR had specified a range for sea level rise from 0.09 to 0.88 m. Projected sea level rise used in the text here does not relate to the TAR projections. Basis for choosing numbers required, even if it is referring to singular events. (Government of India)	Extreme sea level rise assessed here does not have any time reference. The TAR projection of 0.09-0.88 is for the end of the century. References with details of these singular events are provided in the main text of Chapter 2.
G-TS-40	A	7	11		11	Add “or probabilistic” after “on selected” so that it reads “conditional on selected or probabilistic emissions scenarios”. Delete the remainder of the sentence. This is based on the work of Webster et al. 2002 and Pepper et al. 2005. Pepper, W., A. Sankovski, J. Leggett (2005) Probabilistic Modeling of Sulfur and Nitrogen Controls and their Relations with Income, Journal of Environment and Development, 1 March 2005, Vol. 14, No. 1 pp 197-219. (Government of USA)	We have added these words but have only made wording changes that are consistent with the chapter in revising the latter part of the sentence, as this truly is a subject of debate. If Webster et al. and Pepper et al. have done this (and we cite some of their work in chapter 2) it doesn't make the procedure any less debatable.
G-TS-41	A	7	20	7	20	The following wording is proposed: .. In use expanding significantly. (Government of Austria)	The text has been revised to reflect revisions to chapter 2.
G-TS-42	A	7	23	7	23	The following wording is proposed: .. adaptation to climate change, …. (Government of Austria)	Additions made to read "climate variability and change"
G-TS-43	A	7	23	7	23	Add: "ECONOMIC and social vulnerability…" (Government of Canada)	No. Social vulnerability is a specific area of research focusing on vulnerability of populations and social groups.

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G-TS-44	A	7	26	7	30	This strong statement about risk management as an "appropriate unifying framework" is not contained in the SOD of Section 2. The statement in Ch. 2 SOD, p. 2, l. 16 reads "Risk management is a useful framework for decision-making." The text should be edited in order to reflect the current draft of Chapter 2. (European Union)	The text has been changed to reflect what is now in chapter 2.
G-TS-45	A	7	40	7	40	The following wording is proposed: .. are engaging stakeholders (Government of Austria)	The paragraph has been replaced with the revised text from chapter 2.
G-TS-46	A	8	2			Figure TS-2 might appear clearer when printed in colours, but it is difficult to grasp the details when the four images are so small and detailed. (Government of Norway)	Figure has been revised to provide easier reading.
G-TS-47	A	8				Figure TS-2: this figure is really hard to understand: What does the y-axis tell us? What is the exact meaning of the different coloured bars? (the description is not understandable for somebody who is not working on IPCC every day) (Government of Germany)	The text and caption have been clarified, a key has been added and the colours made more readily identifiable. Reference is also made to Chapter 2 for detailed explanation of the information presented in the figure.
G-TS-48	A	9	7	9	10	Both second and third sentences seem imprecise and unclear. (Government of Australia)	Please be more specific. The third sentence has been revised based on an expert's suggestion.
G-TS-49	A	9	12	9	12	The following wording is proposed: … observed changes related to climate change is made … (Government of Austria)	Done.
G-TS-50	A	9	12	9	14	Logical flow between the sentences of this paragraph needs to be clearer and tightened. Second sentence - not clear how this connects to first sentence. Third sentence - 'of major importance' to what. Fourth sentence - 'responses' to what. (Government of Australia)	Sentences rewritten.
G-TS-51	A	9	21	9	22	Would it perhaps be more correct to state as '…..a clear connection between observed changes in physical and biological systems and atmospheric forcing due to greenhouse gas and aerosol emissions'. (Government of Australia)	Text rewritten, no longer relevant.
G-TS-52	A	9	21	9	22	"balance of evidence … clear response … greenhouse gas and aerosol forcing." In this sentence "aerosols" should be excluded or "greenhouse gas and aerosol" be prefixed with "the combined influence of", in view of the fact that the impacts of aerosols on the biological systems is not so clear yet. (Government of India)	Text rewritten.
G-TS-53	A	9	30	9	33	Table TS-1. This table and the associated text does not account for the bias in looking for impacts associated with climate change. The key message is that we now have found hundreds of impacts associated with climate change. The issue of	Table no longer present.

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						attribution to anthropogenic climate change is more subtle, and also needs to be explained. In addition a more detailed explanation of Table TS-1 and what it represents would be useful. (Government of Australia)	
G-TS-54	A	9	30	9	40	Definition of "types" referred to in this Table are introduced first with the Figure on the next page- Maybe Figure should come first or "types" should also be defined in the Table caption. (Government of Canada)	No longer relevant.
G-TS-55	A	9	30		36	To be effective, tables, graphs, and figures need to stand alone. Table TS-1 needs to define Types 1, 2, and 3. Alternatively, they could be renamed to indicate increasing scale (e.g national, regional, global). Additionally, it is not clear what the entries are, and, 83 + 13 does not equal 106. Also, what the cells are is not clear. (Government of USA)	No longer relevant.
G-TS-56	A	9	30		34	Table TS-1 is very confusing. Define all terms and values, including Type 1, 2, 3. Table TS-1 summarizes presence/absence of responses to warming, not just warming. Numbers of cells in the table are not added correctly. Clarify the methods (this should be done in Chapter 1) used to develop the table and the statistical comparison cited in the preceding chapter. Key weaknesses identified in Chapter 1 affect this item and others in the Technical Summary associated directly with observations. (Government of USA)	No longer relevant.
G-TS-57	A	9	32	9	32	Types 1, 2, 3 used in table TS 1 are defined in figure TS 3 caption only (Government of France)	No longer relevant.
G-TS-58	A	9	32			Type 1, type 2 and type 3 are explained in figure TS-3, but should also be explained here (Government of Norway)	No longer relevant.
G-TS-59	A	9	Table-1	9	Table-1	Type I, Type II and Type III categorisation of sectors and systems is not clear and needs to be described. Similarly Fig TS-3 requires explanation. (Government of India)	No longer relevant.
G-TS-60	A	9		12		The section on observable impacts is lacking in content. This weakness stems from problems in Chapter 1; revisions to Chapter 1 are required as a prerequisite to a clearer and more useful summary in the Technical Summary. While the following section on likely future effects was nicely written, too little emphasis appears to have been placed on describing impacts that have already occurred. Suggest adding a subsection that describes the impacts on a region by region basis as was done in the future impacts section. Keep the observed changes (including regional ones) in the observed impacts section and the future impacts (including regional ones) in the	Text for Chapter one has been revised.

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						future impacts section. (Government of USA)	
G-TS-61	A	9				TS-1: This table is not self-explanatory. It can only be understood if T1.12 is consulted. It is proposed either to include explanatory text (e.g. explain Type 1, 2 and 3 studies, explain the criteria for qualifiying a change as being consistent or not consistent with warming or to insert, explain why not all studies have been included in the table or better include an additional row) or to include T1.12. (Government of Austria)	No longer relevant.
G-TS-62	A	9				Table TS-1: The 'type 1,2,3" observations need defining/explaining, either in the text or with the table. (Government of Canada)	No longer relevant.
G-TS-63	A	9				Table TS-1: Explain type 1,2,3. Is it important to distinguish between the three type to get the main message through? (Government of Germany)	No longer relevant.
G-TS-64	A	9				Table TS-1: Numbers here seem to be inaccurate. For instance, "2560" should be "2520" which appears in the original chapter. (Government of Japan)	No longer relevant.
G-TS-65	A	9				Table TS-1: A definition of "Type" is necessary. The following is an excerpt from Chapter 1, but is still difficult to understand. Type 1 studies: individual observations analyzed individually. Type 2 studies: individual observations that have been grouped and 'collectively' analyzed. Type 3 studies: studies corresponding to very large areas not associated with individual sites. (Government of Japan)	No longer relevant.
G-TS-66	A	10	1			Maps A, B and C could be labelled "Map A", "Map B" and "Map C" (Government of Norway)	No longer relevant.
G-TS-67	A	10				Figure TS-3: Is it important to distinguish between the three type to get the main message through? (Government of Germany)	No longer relevant.
G-TS-68	A	10				Fig TS-3: This Figure is difficult to read since the images and legends are so small. Suggest reconfiguring in a vertical (portrait) layout. (Government of Canada)	No longer relevant.
G-TS-69	A	11	13	11	14	Include in the list the tropical galciers in the South American Andes (Government of France)	No longer relevant.

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G-TS-70	A	11	17	11	24	A bit more explanation of what 'the hydrological cycle is intensifying' means would be useful. (Government of UK)	Statement no longer in TS.
G-TS-71	A	11	17		24	Points in this paragraph are unclear; some statements appear to be contradictory. Cleary define meaning of "intensifying hydrological cycle" on line 18. Explain how intensification of the hydrological cycle affects water quality, and if not remove phrase. Clarify increasing trend in runoff in this paragraph. Sentence on line 20 (starting with "areas most") is confusing and possibly inaccurate. (Government of USA)	Paragraph revised.
G-TS-72	A	11	20	11	22	It is proposed to have two sentences, each with a clear message, instead of one ambigous sentence. The wording could be as follows: Areas most affected by increasing long-term droughts are located in drier regions. However, decreasing run-off and decreases in some lake levels related in some cases not to climate change but to other human activities. (Government of Austria)	Text rewritten.
G-TS-73	A	11	22	11	23	The sentence "However, in wetter areas there is no consistent pattern of trends" is in contradiction with the next sentence that informs that lakes and rivers around the world are warming. The sentence may need some further qualification and could read as follows: "However, in wetter areas there is no consistent pattern of trends with respect to runoff and lake level". (Government of Austria)	Text rewritten.
G-TS-74	A	11	26	11	29	We suggest that the texts changed to: "Ocean acidification due to increasing atmospheric levels of CO2 is occurring with a drop in the pH of seawater (the measure of the balance of acidity and alkalinity) from 8.2 to 8.1 over the past 200 years. Because this issue has only recently been identified, the present knowledge about impacts so far on ocean and costal biology, although there are concerns about impacts e..g. for calcifying organisms such as corals, lobsters, crabs and oysters. These species rely upon building up calcium-based structures. If the increase in CO2 emissions continues the pH will drop further and it can be concluded with certainty that calcifying organisms will be negatively affected in the present century. Serious effects on other marine living resources cannot be ruled out." Rationale: The Acidification of the ocean is dealt with in a report from The OSPAR Biodiversity Committee (BDC) based on available scientific literature on this topic. The report is available at the OSPAR website http://www.ospar.org/eng/html/welcome.html. In a press release from the meeting in BDC 13 – 17 March 2006 th it is said that the report "Ocean Acidification" confirms that high levels of carbon dioxide (CO2) in the atmosphere are changing	Chapter 1 deals just with observed evidence.

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						ocean carbon chemistry at least 100 times faster than at any time in the last 100 000 years. The pH of seawater (the measure of the balance of acidity and alkalinity) has dropped from 8.2 to 8.1 over the past 200 years. Models forecast that it will drop to 7.8 by 2100, and may drop as low as 7.5 if there is a business-as-usual scenario. This would be lower than anything experienced in the last 10 – 20 million years. Marine species that rely upon building up calcium-based structures will be adversely affected. These include corals, crustaceans (e.g. lobsters, crabs) and molluscs (e.g. mussels, oysters). Higher levels of CO2 in seawater generally depress the physiological performance of sea creatures. It cannot be ruled out that these changes will also diminish other marine living resources. The OSPAR Biodiversity Committee said that: both acidification of the ocean due to elevated level of CO2 in the atmosphere caused by increased anthropogenic emissions of CO2 and climate change may have severe impacts on the marine environment. They therefore emphasised the need to find strategies and measures to mitigate these effects. (Government of Norway)	
G-TS-75	A	11	26		29	Evidence in chapter 4 contradicts these statements regarding the ocean acidification impact. Please reconcile this with the statements in Chap. 4. (Government of USA)	Text rewritten.
G-TS-76	A	11	28	11	29	Some historical context is needed in order to understand the significance of the 30% increase in concentration of hydrogen ions over the past 200 years. (Government of Canada)	Text rewritten.
G-TS-77	A	11	36	11	37	Penultimate sentence is imprecise and unclear. Is the sentence trying to convey that in some (is 'many' correct?) locations local sea level rise exceeds 1.7mm/y - because local land subsidence has a compounding effect. Should something be said about extent of any opposite effect - local land rising? (Government of Australia)	Text rewritten.
G-TS-78	A	11	36	11	36	It is noted that according to WGI SPM the sea level rise meanwhile amounts to 3 mm/yr. (Government of Austria)	Text rewritten.
G-TS-79	A	11	43	11	43	Switch "in marine and freshwater systems" with "relating changes". (European Union)	Done.
G-TS-80	A	11	44	11	45	The statement '…..systems are now being strongly influenced by observed warming' is itself a strong statement, and must therefore be carefully chosen on the basis of scientific evidence. By contrast, the TAR (see SPM 2.1 in TAR said 'recent regional climate changes, particularly temperature increases, have already affected many physical and biological systems'. This is an especially important	Following paragraphs rewritten.

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						point of drafting for a policy audience. The following paras (TS-11, line 47 to TS - 12, line 7) are not drafted in a way that indicates 'strong influence' systemically in biological systems. (Government of Australia)	
G-TS-81	A	11	47	11	47	It would be helpful for the policy reader to have a phrase explaining term 'phenology' - which is also used twice more in B.2. (Government of Australia)	Made clearer.
G-TS-82	A	11	49	11	50	Given the strength of this statement (and therefore its linkage to statement in lines 44 and 45 above), policy reader would be helped by some indication of how significant the climate change element has been relative to the climate variability and human impacts element. (Government of Australia)	Text rewritten.
G-TS-83	A	11	49	11	50	Elaborate on "substantial" damage; perhaps a % value of coral reefs destroyed in the last x amount of years (Government of Canada)	Text rewritten.
G-TS-84	A	11	51	11	51	Why compare the ocean change with that on land? The migration strategies are clearly very different. (Government of Australia)	Text rewritten.
G-TS-85	A	11	53	11	53	add in the list of effects "modifications of key limnological mixing processes" (Government of Spain)	Not a major change.
G-TS-86	A	12	6	12	7	The authors should explain why the disappearance of "key butterfly" species is important. (Government of Australia)	Text rewritten.
G-TS-87	A	12	10	12	12	Change text after the comma to "some impacts on agriculture and human health are now detectable". (European Union)	Text rewritten.
G-TS-88	A	12	17		18	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 ongoing drought in the Sahel when there are recently published papers to the contrary. The statements about rain use efficiency attributed to Hein and Ridder (2006—not 2007) are only based upon one site in the Sahel Zone and are contradicted by the Prince et al. (1998) paper below. 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	Sahel no longer included.

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						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). References: Anyamba, A. and Tucker, C.J., 2005. Analysis of Sahelian vegetation dynamics using NOAA-AVHRR NDVI data from 1981–2003. J. Arid Environment 63:596-614. 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. Nicholson, S. 2005. On the question of the ''recovery'' of the rains in the West African Sahel. J. Arid Environments 63:615–641. Olsson, L., Eklundh, L. and Ardoe, J. (2005) A recent greening of the Sahel – trends, patterns and potential causes. Journal of Arid Environments 63:556-566. 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. (Government of USA)	
G-TS-89	A	12	17		18	The text is confusing. Suggest replacing "temperature increases" with "increases in temperature". (Government of USA)	Change made.
G-TS-90	A	12	20	12	22	There should have been also documented impacts of storms on forestry (countries having been hit in Europe are France, Austria, Czech republic and Sweden). (Government of Austria)	Please provide specific references.
G-TS-91	A	12	20	12	20	replace "improvement of grape quality in Europe…" by "improvement of grape quality in some areas of Europe…". There are other areas in Europe that are already registering direct effects such as the increase of the brix levels (percentage of sugar) of the grapes, with negatives effects in wine quality. (Government of Spain)	Grape quality no longer included.
G-TS-92	A	12	26	12	29	This statement is misleading because as written it infers that the 2003 heatwave in Europe was directly caused by climate change. Although scientists can not assert	Text rewritten.

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						equivovally that the 2003 heatwave in Europe was caused by climate change, we believe that as an example illustrating the impacts on human health as a result of rising temperatures, this is a appropriate example. We recommend that this be clarified in the text so as to avoid unneccessary misinterprations of the texts inferences. (Government of Japan)	
G-TS-93	A	12	28	12	28	The authors should point out the link between climate change and the specific example of the 2003 European heatwave. This relates more broadly to the treatment of "joint attribution' of climate change, which has been done poorly throughout the report. (Government of Australia)	Text rewritten.
G-TS-94	A	12	28	12	29	The 2003 heatwave in Europe was not the only exceptional, and highly damaging heatwave recently. For instance, a heatwave in late May and June 2003 in India where temperatures exceeded 50 °C also claimed more than 2000 lives (see http://www.reliefweb.int/rw/RWB.NSF/db900SID/OCHA-64BP5V?OpenDocument&rc=&emid=ET-2003-0250-IND). Consequently, the phrase "although health effects related to increasing heatwaves elsewhere have not been demonstrated" should be deleted. (European Union)	Text rewritten. Please provide peer reviewed reference.
G-TS-95	A	12	31	12	34	This statement seems to be in contradiction with the SPM (p. 5, l. 46-48), which states that "because of increases in exposed value (...), the contribution of these weather-related trends to increased losses is at present not known." It is important that SPM, TS, and Chapter 1 are consistent with respect to this message, given the public debate about this very topic. (European Union)	Text rewritten.
G-TS-96	A	12	31	12	34	This bolded heading has too much jargon - the second sentence in particular. What does 'values of exposures at risk" mean? (Government of Canada)	Text rewritten.
G-TS-97	A	12	33		33	Specify “rising trend” – unclear what this refers to. What is the reference regarding a global trend in extreme weather-related events. Paragraph does not provide adequate support for a “global trend”. (Government of USA)	Text rewritten.
G-TS-98	A	12	36	12	41	WG1 AR4 indicates that increase of cyclone intensity is with low confidence. This should be pointed out here. (Government of Japan)	Text rewritten. Statement no longer in TS.
G-TS-99	A	12	36	12	41	Section C: The text does not exacly reflect a human system… (Government of Germany)	Statement no longer in TS.

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G-TS-100	A	12	36		41	Editorial: Suggest some word smithing – this paragraph reads a little rough. The first sentence ends abruptly. "Tropical cyclones" in the "Northwest Pacific" needs clarification. (Government of USA)	Statement no longer in TS.
G-TS-101	A	13	2			Section C: Chapter C does not only refer to likely future effects but also already observed impacts. As mentioned above, we propose to unify section B and C and rather distinguish between assessment of impacts/vulnerabilities and how to cope with them (adaptation, sustainability) (Government of Germany)	This wouldhave some disadvantages (i) the important messages in Section B would be diluted by being split between sector s (ii) We have now moved the sections on scenarios and methods to sit between Sections B and C, as being more appropriate. We therefore follow exactly the layout in the Plenary-Agreed Outline. No action, but chapters 3-16 have been asked to cover only the future in Section C (although they haven't always followed this request.)
G-TS-102	A	13	2			It would be very much welcome if the authors could identify those thresholds in terms of climate change that would avoid those impacts described under the various sectors (or those thresholds at which those impacts start to become significant in certain regions). This could help to inform the policy makers about the effort needed in order to avoid such impacts. (Government of Austria)	We have tried to do this in the Tables which appear in Chapter 20, and in the SPM (SPM-1 and SPM-2) and in the TS (Tables TS-3 and TS-4).
G-TS-103	A	13	3	13	3	It is proposed not to address adaptation in this chapter about likely future effects of climate change. This is because such structure implys assumptions of the authors with regard to future adaptation and any such assumption has to be regarded arbitrarly and policy prescriptive. (Government of Austria)	We have tried to separate adaptation and impacts between Sections (old) C and (old) D. Text has been added to the beginning of Section D (new) to state the context in which impacts are addressed in this section.
G-TS - 104	A	13	3			Section C.1: In order to improve readability and clarity it is suggested to have consistency between the structure of chapter C.1 and box TS-3. (water resources vs. Water, coasts versus coastal systems and low-lying areas). (Government of Austria)	Done.
G-TS-105	A	13	5	13	5	It is proposed to include an introduction to chapter C.1 in order to inform the reader about the time horizon investigated, any assumptions about future climate change in terms of temperature increase and/or GHG emissions and/or climate sensitivity and/or sea level rise and/or change in precipitation. It also would be the right place to put those assumptions into context of the recent findings identified by WG I in its contribution to the AR4. This introduction should also inform the reader that the literature does not cover all possible impacts in all regions worldwide due to gaps	Done – wording is from SPM and therefore brief. Section B (old) on Methods and Scenarios has been moved to lie just before Section C (old), so setting the context of the discussion in Section C (old).

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						and that this report can only identify those impacts of climate change that have been described in literature and that the authors did not try to prepare a full picture of all possible primary, secondary and higher order effects based on the limited studies available. The introduction could also inform the reader that the effects of climate change sometimes have been put into context with other impacts not resulting from climate change provided that such context has been included in the literature available. It might be important to inform the reader in this context about the difficulties to clearly differentiate between impacts from climate change and impacts induced by other drivers. (Government of Austria)	
G-TS-106	A	13	9	13	13	The statement on water resources relates to currently observed effects and not to future effects (the subject of section C). (Government of Australia)	There is place for a comment on observed changes at the opening of this section. The opening statement has been rewqritten so that it combines observeda dn projected.
G-TS-107	A	13	9	13	13	It is strange to start a chapter on current knowledge about the main likely future effects with information what has already been observed. It is proposed to shift those lines to chapter B. (Government of Austria)	There is place for a comment on observed changes at the opening of this section. The opening statement has been rewqritten so that it combines observeda dn projected.
G-TS-108	A	13	11	13	11	This should probably read "….STRONG increases in winter climate-related run-off" rather than 'increases in STRONG winter climate-related runoff". (Government of Canada)	Now rewritten.
G-TS-109	A	13	11		11	Wording “pristine” was removed from Chap. 3.2 – make consistent here. (Government of USA)	Also removed in Technical Summary.
G-TS-110	A	13	12		12	Rephrase sentence on snowmelt to explain how and why snowmelt has this impact. (Government of USA)	Made clearer – see page 18 lines 20-21 of Final Government Draft.
G-TS-111	A	13	15	13	20	This subtext does not link back sufficiently to the bolded header. If the first sentence/finding in the subtext is a consequence of increased temperature - which is the link back to the bolded header - then state this explicitly. That is, add the words "in turn caused by increasing temperatures" to the end of the first sentence that ends with "decreased snow water storage". (Government of Canada)	Headline statement, and supporting text, removed.
G-TS-112	A	13	15	13	19	The discussion on freshwater availability is confusing due to conflating of snow water storage, sea level rise and coastal effects. Suggest that these sentences are re-drafted with more clarity. (Government of Australia)	Headline statement, and supporting text, removed.
G-TS-113	A	13	15	13	19	It is suggested to address also the impacts of change in river flows with regard to power production from hydro and the associated higher emissions from fossil fuel	Headline statement, and supporting text, removed.

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						fired thermal power plants (example Spain). (Government of Austria)	
G-TS-114	A	13	15	13	15	It is proposed to insert "future" before "impacts of climate change". (Government of Austria)	Headline statement, and supporting text, removed.
G-TS-115	A	13	18	13	19	Suggest combining 3rd sentence into second, so avoiding possible interpretation that third sentence is a statement about the first. (Government of Australia)	Headline statement, and supporting text, removed.
G-TS-116	A	13	22	13	28	Changes in precipitation extremes are of much interest to everyone. It is not very satisfactory to read there will be changes in many areas of the globe and then to only have examples for 2 regions. Box TS-3 offers no greater detail to supplement this one paragraph. Suggest adding a line or two describing projections for other continents. (Government of Canada)	A table on extremes has been added (Table TS-5).
G-TS-117	A	13	22		37	Points in made in paragraph in lines 22-28 appear to contradicts those in paragraph in lines 30-37. Line 30-31 uses the expression “high confidence in uncertainty” which is confusing and counterintuitive. (Government of USA)	These points have been addressed through an extensive rewrite of the Water Resources section.
G-TS-118	A	13	23	13	23	For policy reader - is word 'hydrological' needed? (Is there another kind of drought?) (Government of Australia)	Reference to ‘hydrological drought’ removed.hapter 03.
G-TS-119	A	13	25	13	25	Suggest adding in parentheses a phrase that explains that precipitation extremes relates to both highly intense rainfall events and to extended abnormally low rainfall periods. (Government of Australia)	Headline statement on extremes and supporting text removed.
G-TS-120	A	13	27	13	28	How is third sentence different to related clause in line 26? (Government of Australia)	Text has been completely redrafted and statement no longer appears.
G-TS-121	A	13	28	13	28	Add: "An intensified precipitation will increase freshwater flooding and groundwater flow which in turn will immobilize pollutants at a faster rate." (Government of Sweden)	Text has been completely redrafted and statement no longer appears.
G-TS-122	A	13	30	13	37	This statement has been classified as “high confidence” however there remain a number of uncertainties (4 listed) therefore, a reference or other justification for the “high confidence” ranking is suggested. (Government of Japan)	Text has been completely redrafted and statement no longer appears.
G-TS-123	A	13	30	13	31	There will always be some uncertainty with projections. Uncertainty is inherent to data, even of data that have been monitored in the past. This sentence therefore is not very informative at all. In order to improve the meaning of the sentence it is suggested to insert "very" before "uncertain".	Text has been completely redrafted and statement no longer appears.

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						(Government of Austria)	
G-TS-124	A	13	30	13	31	Is the attachment of 'high confidence' (to a statement which says science remains uncertain), a correct application of practice in Box TS-1? (Government of Australia)	Text has been completely redrafted and statement no longer appears.
G-TS-125	A	13	30	13	37	example 1: This paragraph describes the shortcomings of models and not an impact (Government of Germany)	Text has been completely redrafted and statement no longer appears.
G-TS-126	A	13	31	13	31	Section C: a High confidence on remaining uncertainty seems to be a contradiction in itself (Government of Germany)	Text has been completely redrafted and statement no longer appears.
G-TS-127	A	13	32	13	37	It would be helpful to explain why even though quantitative projections of river basis flows are uncertain, it is still possible in lines 22 & 23 to say there is high confidence about greater risk of floods and droughts. (Government of Australia)	Text has been completely redrafted and statement no longer appears.
G-TS-128	A	13	33	13	34	Projections will never be perfect or match what actually happens. The following language is proposed: This has implications for adaptation procedures, which relay on robust projections of the change in river discharge. (Government of Austria)	Text has been completely redrafted and statement no longer appears.
G-TS-129	A	13	39		40	Change wording from "worsen different types of water pollution, with" to "adversely impact water quality, with potential adverse…". Viruses are not a pollutant per se, but is a contaminant, and some impacts on water quality can be addressed through common water treatment. (Government of USA)	Addressed through an extensive rewrite. 'Viruses' are no longer mentioned.
G-TS-130	A	13	41	13	42	Would be useful to expand on how warming and extremes affect nitrates, organic carbons, viruses, thermal pollution and enteric bacteria. (Government of UK)	Text has been completely redrafted and statement no longer appears.
G-TS-131	A	13	45	13	49	It is proposed to start with the impacts of climate change on water resources building on the information provided in the paras above. This would help to clarify which effects of climate change in which region are compared with other stresses. Being more specific seems to be important because of the readers being more familiar with water shortage in some reagions than others and the described relationship might not be valid for all such areas. (Government of Austria)	Text has been completely redrafted and statement no longer appears.
G-TS-132	A	13	45	13	47	is' on line 45 and 'can be' on line 47 make statements ambiguous as to whether they refer to the present or to the future. (Government of Australia)	Text has been completely redrafted and statement no longer appears.
G-TS-	A	13	48		49	Insert "many of " between "exacerbate" and "the effects".	Addressed through an extensive rewrite.

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133						(Government of USA)	
G-TS-134	A	13	51	13	55	This para sounds rather policy prescriptive because it says (with high confidence! - Did the authors speak to a representative number of stakeholders in this field?) that water management should incorporate climate change. Although the message is fully supported it is proposed to move this para into part D (this para does not say anything about likely future impacts of climate change on water management) and to delete any indication of confidence unless it can be based on empirical data. (Government of Austria)	Text has been completely redrafted and statement no longer appears.
G-TS-135	A	13	51	13	51	Replace "should" with "needs to" (Government of Netherlands)	Text has been completely redrafted and statement no longer appears.
G-TS-136	A	13	53	13	53	Explain what is meant by 'the past'. Presumably it relates to observational records of rainfall patterns (seasonal and multi-year) and to runoff flows. What is 'stationarity'? (Government of Australia)	Text has been completely redrafted and statement no longer appears.
G-TS-137	A	13	55	13	55	Add a phrase giving example(s) of what decisions are now receiving this risk management attention (eg water infrastructure capacity). (Government of Australia)	Text has been completely redrafted and statement no longer appears.
G-TS-138	A	13				Section C: we understand section C as the list of key impacts and vulnerabilities. Please check all statements if they reflect the main impacts/vulnerabilities (impact by impact) of climate change! Different levels of information mixed, examples follow: (Government of Germany)	We have tried to do this.
G-TS-139	A	14	1	14	2	Would be useful to explain how climate change will increase water demand. Assume this is through increased evapo-transpiration and greater need for irrigation. should separate the issues of increased water demand and decreased groundwater recharge: water supply is from many more sources that groundwater. (Government of UK)	Text has been completely redrafted and statement no longer appears.
G-TS-140	A	14	1	14	4	This para lacks coherent logic and a clear message. Seem to need three separate statements. (1) Climate change will increase water demand - give example of why. (2) Climate change will affect groundwater recharge. (3) Surface runoff to streams will decrease in a number of centres of major population. (Government of Australia)	Text has been completely redrafted and statement no longer appears.
G-TS-141	A	14	1		1	Must be consistent with comparable statement in Chapter 3. (Government of USA)	Addressed through an extensive rewrite.
G-TS-142	A	14	2	14	26	Language describing table and in table does not reflect level of uncertainty and these are projected consequences. (Government of USA)	Unsure about this – is the reviewer referring to the figure? The caption has been rewritten to make clear that this is a projection and that the

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							map is 'illustrative'.
G-TS-143	A	14	6	14	26	Figure TS4 is not particularly useful due to the high level of generalisation inherent in the diagram. Especially in relation to Australia it has little utility, as it seems to show that runoff in central Australia is in terms of mm/day when some areas get very little rainfall per year. Suggest reworking of the figure on a different scale or inclusion of an explanation that the figure is illustrative only and that in reality the picture could be greatly different. (Government of Australia)	Figure has been updated to match chapter. Caption has been modified to indicate that illustrative only.
G-TS-144	A	14	6		26	Update Figure TS-4 with the corresponding figure in Chap. 3. (Government of USA)	Done.
G-TS-145	A	14	28			It is proposed to mention in the text all key impacts identified in figure TSW-5. It is noted that the impact of climate change on boreal forests (as identified for China in figure TS-5) has not been mentioned in the corresponding text. (Government of Austria)	R – We simply don't have the space to do that. This is why we present the figure.
3G-TS-146	A	14	30	14	32	See general comments on the use of expressions of confidence. In whole chapter4, those expressions are not used besides the executive summary. If this is not changed statements about confidence should be deleted. (Government of Germany)	R – Uncertainty language used throughout the underlying chapter and chapter text discusses also criteria (Table 2 of uncertainty guidance (http://www.ipcc.ch/activity/uncertaintyguidancenote.pdf), i.e. amount of evidence and level of agreement) in depth (cf. eg. 4.4.1-4.4.11, and 4.8).
G-TS-147	A	14	31			Chapter 4 does not discuss threshold effects but rather evaluates tipping points that may be related. This discrepancy in terminology must be resolved. Chapter 4 does not treat lags in response or other complicated dynamics of ecosystem responses to climate change and concurrent responses to other forces, e.g., by human activities. Chapter 4 should address the dynamics of responses to climate change more fully; otherwise, the Technical Summary should not allude to such responses. (Government of USA)	R/A – We agree with the reviewer that the transient responses of ecosystems are important to understand impacts and biotic feedbacks. However, we do not understand why we should not allude in the TS to such effects, since chapter 4 does deal with dynamics of ecosystem responses throughout and in particular discusses also lagged responses at length. Then the terms "threshold effects" and "tipping points" are not well defined terms and unless the reviewer makes it better understandable what should be meant here, the comment is not particularly meaningful. To cite here from a recent contribution in Nature: "There are thresholds beyond which the past response of the system

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							no longer predicts the future, and there are positive feedbacks through which change can feed on itself. All these possibilities are now being discussed under the rubric of tipping points." (Nature, 441, 785). So what does the reviewer mean here? We define resilience of ecosystems as the magnitude of change they can "tolerate" without switching to another mode of behavior, typically another domain of attraction. If the separatrice between two domains of attraction are crossed, a threshold is reached and because the system falls now under the attraction of another attractor, a so-called non-linear response is triggered. One might call that a tipping point. The very same event of crossing a separatrice. So what does the reviewer mean?
G-TS-148	A	14	33	14	34	The meaning of global change is unclear, especially in how it differs from climate change. Further elaboration of the term "global change" is necessary. (Government of Japan)	A
G-TS-149	A	14	37	14	39	Some attention to drafting needed since line 30 speaks to both ecosystems and to individual species. Line 37 could say 'individual species'. Line 39 could say 'ecosystem functions'. (Government of Australia)	A
G-TS-150	A	14	41	14	41	Is grazing a 'natural' disturbance? (Government of Australia)	A – no it's not
G-TS-151	A	14	42	14	43	Important to recognise regional differences. higher latitudes are likely to see an increase in agricultural productivity, while lower latitudes are likely to see a marked decrease. (Government of UK)	R – agricultural productivity as such is treated in chapter 5. Chapter 4 discusses analogue effects with ecosystems in 4.4.10, notably F4.3.
G-TS-152	A	14	47	14	48	The meaning of this sentence is not understood. 1) Re. "anthropogenic drivers of biodiversity" How is biodiversity "driven" by anthropogenic forcing? Re-wording is suggested. 2) The wording "with few exceptions" is awkward, as it is not clear whether there is a very small number or whether there are some exceptions. If there are only a small number of exceptions, it is suggested to list them. (Government of Japan)	A

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G-TS-153	A	14	47	14	49	Phrase 'anthropogenic drivers of biodiversity' is incomprehensible to policy reader (and perhaps not good scientific expression either!). Suggest tightening up language in paragraph to make message clearer. (Government of Australia)	A
G-TS-154	A	14	47	14	49	Mention the interaction between climate change and anthropogenically induced environmental change (e.g. Pollution, pore water pressures etc..) (Government of Sweden)	A
G-TS-155	A	14	48	14	48	name some of the "few exceptions" and "several cases". (Government of Germany)	A
G-TS-156	A	14	51	14	54	This bolded heading to which high confidence is attached is an example of what occurs in more than one place in the Technical Summary - rather vague, all encompassing findings to which "high confidence" is assigned. All this heading says is that we have learned a lot but uncertainties remain. Perhaps this text should be 'subtext' and a stronger result could become the bolded heading. (Government of Canada)	A
G-TS-157	A	14	51	14	54	Clarify sentence. Does it mean, inspite of progress made there is still significant uncertainty with regard to projections of system thresholds and irrevesible development and this uncertainty is highly confidential? This would mean in essence: we can forget about all statement with regard to tresholds and irreversible developments? (Government of Germany)	A
G-TS-158	A	14	51	15	4	example 2: this paragraph describes the process of assessment, but not a climate impact. Besides, the last two sentences do not have any content. (Government of Germany)	A
G-TS-159	A	14	53	14	53	Add 'in'…..and in irreversible developments. (Government of Australia)	A
G-TS-160	A	14	55	14	55	specify reference, chapter 4.2 and 4.4 are quite long chapters with several subchapters and give explicite examples.. (Government of Germany)	A – But there are general rules to which we have to adhere
G-TS-161	A	14	55	14	55	It is unclear what the first sentence means and it is not a complete sentence - responses to what? If 'species specific responses' mean each species will respond differently, suggest adding further explanation such as " because species differ in both their adaptive and evolutionary capabilities to respond to a changing environment/habitat. (Government of Canada)	A
G-TS-162	A	14	55	15	1	First three sentences of paragraph are hard to understand. '…..suggest mostly species - specific responses' seems to contradict last two sentences in the paragraph	A, TR

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						(TS 15, lines 1-4). (Government of Australia)	
G-TS-163	A	14				figure TS-4: further explanation of the footnotes required. (Government of Austria)	Caption now improved
G-TS-164	A	15	1	15	1	insert after "such" "novel" (Government of Germany)	A
G-TS-165	A	15	6	15	8	Fig TS-5, explain the meaning of the two dashed curves on the figure, and of the labels HadCM2/GHG and S750/2.5 (Government of France)	A
G-TS-166	A	15	6	15	8	explain meaning of colours. (Government of Germany)	A
G-TS-167	A	15	6			It is difficult to read the text in the dark, upper part of figure TS-5. What is "OBS"? (Government of Norway)	A, "OBS" stood for observed, now removed and curves explained in caption
G-TS-168	A	15	6			Figure TS-5 suffers from underlying problems in the synthesis presented in Chapter 4. Unless, problems with Table 4.2 and Figure 4.5 are fully resolved, Figure TS-5 should be deleted from the Technical Summary. This synthesis is complex, and any abbreviation in presenting the results must be carefully derived. For example, while deleting the event numbers from Figure 4.5 in the Technical Summary may seem appropriate, this suggest broader applicability of the terms on the graph. Comments on Table 4.2 and Figure 4.5 in Chapter 4 follow. Section 4.4.11 Global synthesis including impacts on biodiversity Table 4.2 and Figure 4.5 represent a useful approach for synthesis but are not well enough explained to be understood. Additionally, underlying uncertainties in this synthesis are not presented or described. Since these syntheses are likely to be incorporated into the Summary for Policy Makers and receive widespread citation and reprinting, these shortcomings are troublesome. Table 4.2 and Figure 4.5 should only be retained if measures of confidence, as defined for use within IPCC assessments, are incorporated. Where numerical estimates of impact are stated as ranges (e.g., 18 – 20%), clarify whether the ranges imply a measure of uncertainty around a mean estimate or some other measure of confidence. If there are significant differences in the confidence in different impacts listed in Table 4.2, the means of reconciling differences in uncertainties such that a tabulated summary is sensible must be presented. For example, Table 4.2 event 18 is that 42% existing Arctic tundra remains stable while event 35 is extinction of 21 – 40% of Proteaccae. Is the stable tundra more certain than extinction of Protaeccae? Is it reasonable to compare these events within the same synthesis table?	A – 1) The synthesis in the underlying has been substantially revised and all estimates carefully checked and explained in detail including uncertainty estimates throughout. The latter are now given in the new Table 4.1. These findings are discussed in various sections of 4.4, notably in 4.4.11. Moreover, details which would have been beyond the page limits given to us, but which do in particular pertain to the comments made here are now provided in the supplementary material. The latter features a table which describes the methodology followed for each assessment contained in the revised Table 4.1 (was in SOD Table 4.2). 2) The figure does contain carefully selected, illustrative examples of effects from climate change on ecosystems as they are mostly tabulated in Table 4.1 or as they are discussed in the underlying chapter's text. All can be fully traced back to the chapter and the underlying scientific literature, respectively. 3) Regional differences are the result from the downscaling and upscaling done as now

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						In Table 4.2, events that have the same impact titles (e.g., extinction of plants) and refer to the same region (e.g., Europe), appear in substantially different warming ranges. Presumably, this is because different models are involved. Is there useful information in these differences or are the models just inconsistent? Is the 0.1 °C significance on the rows of Table 4.2 meant to imply that the event in that row will occur above exactly that temperature? It's important to reflect the temperature ranges over which these events will occur and the uncertainty in some way, else readers may over interpret the authors intentions. Model simulations and analyses were used to derive many of the estimates in these syntheses. The models used and analysis approaches should be described more fully. In particular, the degree to which the models incorporate human activities including land use and land cover change should be explained. Unfortunately, the explanations of Table 4.2 and Figure 4.5 are inadequate to all reasonable evaluation of their contents and implied conclusions. The color codes and abbreviations should be defined carefully. Relationships between the same colors in different parts of Table 4.2 (e.g., orange within light yellow versus orange across table rows) must be explained. Assuming that all numbers in the event number column of Table 4.2, on the map in Figure 4.5 (a), and on the plot in Figure 4.5 (b), refer to the same thing, the numbers do not seem consistent. On Figure 4.5 (b), labels such as Amazon collapse appear to be aligned with numbers that appear on the map in Figure 4.5 (a) outside of Amazonia. Numerous similar inconsistencies seem to occur between (a) and (b) in Figure 4.5. If the formatting and description of Table 4.2 and Figure 4.5 cannot be improved substantially, these items should be deleted from the chapter and should not appear in the TS or Summary for Policy Makers. (Government of USA)	described in detail in the supplementary material for each effect. Since many of the synthesized impact studies were using regionally and temporarily differentiated results from state-of-the-art GCMs, such regional differences are not only inevitable, but also represent a useful, more realistic picture than mere globally averaged changes. This is valid for the climate scenarios as well as for the impacts. 4) Despite the remaining uncertainties, impact studies as synthesized here deserve to be recognized and we feel we would do a disservice to decision makers if we would ignore that rich literature. Relating regionally and otherwise well differentiated results on impacts from climate change to a common denominator such as global mean temperature does in our view help decision makers to regionally differentiate impacts from global climate change and thus having a valuable basis to evaluate and value associated risks, which need to be addressed globally (GHG mix in the atmosphere well and fast), while impacts are typically showing their effects at particular and spatially confined sites and regions. 5) Colors were dropped from Table 4.2, also for the reasons given here by the reviewer. However colors in the figure were retained, since they have a meaning as explained in our synthesis (cf. SPM, 4.ES, 4.4, notably 4.4.11 and 4.8). Predominantly yellow for global average temperature increases <2°C, predominantly orange for 2-3°C, and red for >3°C where risks as described in the underlying chapter and the reviewed literature

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							become substantive (e.g. >15% of uncultivated land area are affected by major changes such as a change from one biome type to another). However, to express the inherently remaining uncertainties we have blurred the change of color, using the same "burning amber" approach as used in the TAR. 6) Any inconsistencies were removed. In rare cases numbers and statements in Figure 4.4 do not always agree, but this is done deliberately to illustrate either ranges (as given in Table 4.1) or to indicate uncertainties (also given in Table 4.1 and as resulting from the methodology used as explained in the supplementary material).
G-TS-169	A	15	8	15	8	The policy reader would be assisted greatly by some explanation of how to read this Fig TS-5 - as was done for the TAR, Fig SPM-2. What are the two dotted lines? What is symbolic interpretation of 'burning embers' colours? - note that in the TAR, Fig SPM-2 included an interpretive legend. Difficult to reconcile some of the impacts listed with their colour codes- e.g. in case of Australian examples, why would coral reefs becoming functionally extinct (presumably as ecosystems) score 'yellow', when extinction of Queensland rainforest species scores 'red'? (Government of Australia)	A – Will do our best despite the page limitations. Partly TR
G-TS-170	A	15	11	15	12	example 3: The headline does refer to the importance but not to an impact (Government of Germany)	A
G-TS-171	A	15	17	15	22	Better referencing to Fig TS-5 should be made in this paragraph. It is difficult to see from the Figure how it is concluded that one fifth to one third species may be committed to extinction by 2050. Need more interpretation of this important Figure in the text. (Government of Canada)	A
G-TS-172	A	15	17	15	17	At what temperature and at what rate of temperature increase should be specified for comment "Species ranges are likely to shrink by 2050". Quantification of shrinkage would benefit readers. (Government of Japan)	A – Statement no longer refers to a time slice, but ΔT
G-TS-173	A	15	17			Insert endemic prior to the word species. Chapter 4 describes overwhelming impacts on endemic species. (Government of USA)	R – Albeit it is true that the chapter discusses literature which has focussed on endemic species and that endemic species ar at

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							particular risks, this insertion would not be correct. Several studies have also looked at non-endemic species and our assessment was on purpose targeting at being as comprehensive as possible.
G-TS-174	A	15	19	15	19	"Particularly vulnerable HABITATS (add word) are MOUNTAIN ECOSYSTEMS, polar regions... (Government of Canada)	A
G-TS-175	A	15	20			The discussion of carbon sources and sinks and other carbon cycle issues in Chapter is limited and does not provide sufficient context in terms of the total carbon cycle to support conclusions about carbon cycle responses to climate change. Several studies using fully coupled models of the global carbon cycle and the climate system provide insight into potential feedbacks of climate change within this coupled system. Chapter 4 does not summarize these analyses clearly and does not cite recent important papers (e.g., Angert, et al. PNAS 2005) (Government of USA)	R – We do not feel this comment does justice to the manner by which we address these issues. While it is true that we have improved our text in the underlying chapter substantially since the SOD, it is also true that we have devoted large portions of our chapter to discuss precisely issues of the C-cycle (compare e.g. length of 4.4.1 vs. length of other sections in 4.4) much more so in the new version (This is particularly relevant in view of the strict page limitations). We have also avoided overlaps with WGI, chapter 7 in order to be as complimentary as possible. Moreover, we have been criticized for citing too much literature, yet we have again cited the most recent literature (giving preference to work as recent as possible) extensively, including that pertaining to the C-cycle and biotic feedbacks in particular. Our discussion is now also based on making use of important studies recently attempting to study vegetation-atmosphere interactions in a fully coupled mode such as Friedlingstein et al., 2006 (J. Clim. 19(14): 3337-3353). Moreover we have extensively made use of articles in press, which are made available to all reviewers of the SOD as well as the latest drafts at http://se-server.ethz.ch/Staff/af/AR4-Ch4_Grey_Lit/).
G-TS-	A	15	21	15	21	see comments to page 3, in chapter 4.4.5 the natural adaptive capapcity is not	A – Text in underlying chapter changed

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176						explicitely meantioned. Change underlying chapter or delete reference. (Government of Germany)	
G-TS-177	A	15	24	15	27	this paragraph confuses mobile species with stationary species such as corals and species for which migration is not possible such as amphibians in tropicl montane cloud forest. (Government of UK)	A
G-TS-178	A	15	27	15	27	montane ??? Is it not mountain ? (Government of France)	A
G-TS-179	A	15	29	15	30	example 4: what is the impact? High confidence on progress? (Government of Germany)	A – TR
G-TS-180	A	15	29	15	30	Another heading which says very little to which high confidence is attached. "Considerable progress has been achieved….." Suggest moving lines 7-10 on the next page up into the header as an alternative. (Government of Canada)	TR
G-TS-181	A	15				Table TS-5: Please, improve the characters inside the red area because it is difficult to read them. (Government of Spain)	A
G-TS-182	A	15				Fig. TS-5: This figure does not take into account the temporal relationship to the rate of temperature increase. It is necessary for the policymaker to be able to understand when the impacts listed will occur, be they 100 years from now or several centuries from now. Therefore timescale information is essential and without it, this graph is misleading. It is suggested that a brief comparison be made between the impacts and the timescale in which they will occur(i.e. temperature degrees & severity of impact.) (Government of Japan)	R – This is precisely why the figure shows two trajectories of temperature evolution as developed by WGI. Depending on future development, readers can read out when this will happen. The only problem is with delayed responses, where the time that global mean temperature is reached and the impact takes place may be lagged by significant time spans (up to centuries, see 4.4.5 for a discussion on this)
G-TS-183	A	15				Fig TS-5: The dotted lines need better explanations. S750 presumably means stabilization at 750ppm CO2 equivalents, but what is the 2.5? And which model was used? And what does the HadCM2 GHG run assume in terms of emissions? Was this an SRES scenario run or not? Also, it is not clear whether the y-axis (change in temperature) is referring to global temp change or regional temp change, and this is important - presume global temp change, but should be explicitly stated. (Government of Canada)	A – Figure shows WGI model means for the given SRES emission scenarios (see also new caption text)
G-TS-184	A	16	2		3	The statement, "CO2 fertilization is expected to be more constrained than was previously thought..." is based on FACE (Free-Air CO2 Enrichment) studies. While such systems are useful in looking at plant communities, it is also clear that rapidly	A/R – See extensive discussion of these issues in underlying chapter. Our overall assessment is made there with reasons explained there.

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						fluctuating CO2 concentrations within a FACE system may, in fact, **underestimate** plant responses (e.g. Holtum and Winter, Planta 218:153-158). That is, the response of plants to elevated CO2 is less when the CO2 environment is changing between ambient and elevated values than if elevated CO2 were given at a constant concentration. This sentence (and see comment below) should be omitted or qualified within the summary and wherever else it occurs within the 4th AR. (Government of USA)	While we agree that the problem is very important, the reviewers comments covers only a limited aspect of the problem. Our discussion has been as comprehensive as possible within the given page limitations. The cited study by Holtum & Winter (2003) was done with two species, seedlings, artificial oscillations only and concludes not only that FACE experiments may underestimate CO2 fertilisation but also the possibility that plants may show reduced growth under elevated CO2 concentrations if the described effect is considered. Thus generalisations are to be done carefully, using much more literature than just one study, featuring an artifically triggered effect (regular 40s lasting oscillations), as we do in the chapter's text.
G-TS-185	A	16	3	16	3	name some "other effects" (Government of Germany)	A
G-TS-186	A	16	4	16	4	Are mentions of 'albedo and surface roughness' relevant to WG2 report? - or is that commentary more relevant to WGI report? (Government of Australia)	A – It is indeed more fully covered by WGI, our attempt here is to be complementary and focus on C-cycle relevant biotic feedbacks potentially resulting from climate change impacts on ecosystems
G-TS-187	A	16	7	16	10	The information provided in this para is not very informative because this para does not inform about the temperature required to trigger this behaviour of the biosphere and about the associated concentrations of GHGs in the atmposphere as well as about the associated emission pathways. (Government of Austria)	A
G-TS-188	A	16	7	16	10	The finding that biospheric sinks may turn into a net carbon source towards 2100 is important enough that it warrants its own "bolded" heading. (Government of Australia)	A – Is now also in the SPM
G-TS-189	A	16	10	16	10	delete "turn into a net carbon source" and insert "become almost zero", rational F 4.2 doesnt show a source in 2100 (Government of Germany)	R – The final F4.2 differs slightly inasmuch as fluctuations have now a much smaller amplitude. While the strong fluctuations in SOD variant of F4.2 happened to show indeed by 2100 a sink and not a source, the overall

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							trend (not shown) towards a net source is significant and clear. Moreover, it is reasonable to expect the terrestrial biosphere becoming a net source considering the underlying mechanisms at least partly mimicked by the model. Such an effect is also to be expected considering many other studies, including those looking at detailed aspects of the underlying causes and mechanisms (e.g. CO2 fertilisation effect changes with ambient concentrations, other climate variables such as the concomitant temperature and precipitation regime etc.'")
G-TS-190	A	16	12	16	12	Phrase 'future human drivers' is vague. (Government of Australia)	A
G-TS-191	A	16	12	16	17	Mention the interaction between climate change and anthropogenically induced environmental change (e.g. Pollution, pore water pressures etc..) (Government of Sweden)	A
G-TS-192	A	16	12	16	13	Clarify the sentence and make the message more clear. If I understand it rightly the message is:"It is not possible to project impacts on species under climate change as strong interactions between species, and other unknown drivers such as human drivers are with high confidence significant uncertain." If this is correct delete old sentence and insert the suggested new one. (Government of Germany)	A – Thanks for the suggestion, but no, this is not exactly what we wanted to express, so we do not use the suggested text, yet text was substantially revised
G-TS-193	A	16	13	16	13	Section C: High confidence on significant uncertainty? (Government of Germany)	A - Yes, you can have high confidence in significant uncertainty (e.g. due to a large body of evidence and a high concensus among scientists interpreting that evidence that there is a significant uncertainty. Then you have a well established finding of significant uncertainty for a given mechanism or other phenomenon. See also Uncertainty guidance for AR4 authors, http://www.ipcc.ch/activity/uncertaintyguidancenote.pdf, or Moss, R.H. & Schneider, S.H., 2000. Uncertainties in the IPCC TAR: Recommendations to lead authors for more

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							consistent assessment and reporting. In: Pachauri, R., Taniguchi, T. & Tanaka, K. (eds.), Guidance Papers on the Cross Cutting Issues of the Third Assessment Report of the IPCC. Intergovernmental Panel on Climate Change (IPCC) c/o World Meteorological Organisation (WMO), Geneva, Switzerland, pp. 33-51). But sure, this is not particularly useful, thus TR.
TS - 194	A	16	14	16	17	Difficult to relate these two sentences to the bolded text in lines 12-13. Pests/invasives seems only a small part of the bolded text theme. (Government of Australia)	A
G-TS-195	A	16	23	16	23	3°C increase with respect to what temperature reference point: today, 1990, 1900,…..? (Government of Australia)	Will make clear in next version, but it is mean annual temperature with respect to 1990 temperature.
TS - 196	A	16	29	16	29	Not clear how 'artisan fishers' relates to topic of crop and pasture yields. (Government of Australia)	The topics covered are effects of average warming and changes in extremes on food and fibre—we believe artisan fisheries qualify under that heading.
G-TS-197	A	16	31	16	31	We suggest replacing "smaller effects on crop and forest systems" by "smaller effects on crops and similar effects on forests" (Government of France)	This has been reworded.
G-TS-198	A	16	31	16	39	The above comment also applies. Please omit this section. (Government of USA)	Not sure how to interpret “The above comment also applies.” Not sure what the basis for this recommendation is. Not sure how to respond. However, this statement has been rewritten and so that it now clarifies several points left unclear in the original statement.
G-TS-199	A	16	31	16	34	Take into account comments made to the underlying chapter page 14 (First sentence gives cause for some questions: when experiments suggest smaller CO2 fertilisation effects however crop models not, does this mean that the models dont build up the reality propoerly? Clarify. Furthermore, in what do we have now higher confidence; that the models are now close to the upper range of new research? but not to reality? and than it is stated that models may overestimate CO2 effects with medium confidence, that is we have lower confidence in the forest models tah in crop models?. Please clarify or delete all text from "however"	We believe that the rewritten statement now properly interprets our position on differences between FACE and previous experimental results and how those differences influence previous crop modeling experiments.

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						(line18) to (medium confidence)(line19).) (Government of Germany)	
G-TS-200	A	16	31	16	34	Not clear whether this paragraph deals with CO2 fertilisation as a single change factor; or whether it is constructed to support the multi-factor conclusion presented in TS-16, lines 2-3. (Government of Australia)	There is coordination between Chapters 4 and 5 on statements concerning overall effects of CO_2 plants but most of the details concerning agricultural crop plants and their representation in models are dealt with here.
G-TS-201	A	16	32	16	32	Please replace "estimates" by "effects" (Government of France)	Has been rewritten to eliminate this problem.
G-TS-202	A	16	32	16	33	Clause 'crop models include CO2 estimates close to upper range of new research' seems very confused, and hard for policy maker to understand. (Government of Australia)	Has been rewritten to eliminate this problem.
TS - 203	A	16	33	16	33	We would add "slightly" between "may" and "estimate" (the slightly accounts for the small acclimation that has been observed in some Face experiments. (Government of France)	Has been rewritten to eliminate this problem.
G-TS-204	A	16	36	16	36	Add to the sentence "and forest productivity by 20 to 30%" (Government of France)	We disagree with these numbers and have preferred to ignore numbers for forest response because of high uncertainty.
G-TS-205	A	16	41	16	42	Take into account comment to the underlying chapter page 40(Clarify with statement at page 4, line 13 -17, where medium confidence is stated.) (Government of Germany)	This now reconciled.
G-TS-206	A	16	41	16	41	Suggest change 'with' to 'due to'. (Government of Australia)	We prefer our language.
G-TS-207	A	16	41	16	41	Replace " to change only modestly" by "to increase" (Government of France)	We prefer our language because we cannot preclude a decrease.
G-TS-208	A	16	41	16	45	It is noted that forestry production, especially on a global scale, is not so relevant compared to impacts on forests in various regions. Furthermore the time frame until 2050 is also not so relevant because what is really relevant is the sustainablitiy of forests in various regions in principle, independent of time. (Government of Austria)	We are not sure of the point being made here. The relationship between sustainability and forest production is rather obvious. Industry has no incentive to allow production from forests to be done unsustainably.
G-TS-209	A	16	43	16	43	Replace "a modest" by "an" (Government of France)	We disagree.
G-TS-210	A	16	45	16	45	Replace "changes" with "variations" (Government of Netherlands)	We prefer our language because we do not know enough about how variations will affect our conclusion here.
G-TS-211	A	16	45	16	45	Last sentence in paragraph seems loose and to contradict the previous sentence dealing with aggregate global picture. Perhaps recast along lines: 'In some regions	We think it is stated clearly enough that while the global aggregate may increase, there will

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						and localities, large changes in forest production……' and indicate whether this is still true in short-medium term against prefacing statement in lines 41 and 42. (Government of Australia)	be important shifts of production viz trade.
G-TS-212	A	16	47	16	49	Make clear that statements are linked to climate change, indicate whether there are factors that are contributing to pressures on species/ranges, and indicate timeframe applicable to conclusion. (Government of Australia)	The linkage of these statements to climate change seems obvious to us.
G-TS-213	A	16	47		47	Chapter 1 and Chapter 4 do not document important impacts on fish populations in the Bering Sea (Gredmeier et al. Science 2006) should be consulted. This oversight should be resolved in Chapter 4 and reflected in the Technical Summary. The lack of a chapter dedicated to marine impacts is telling in the Technical Summary. The Observations and Ecosystems chapters do not provide sufficient evaluation of impacts on fisheries and other marine resources. (Government of USA)	We will consider this in the final revision.
G-TS-214	A	16	50	16	51	The sentence "Emerging evidence … potential consequences for fisheries.", may be modified as "Concerns that the Meridional Overturning Circulation could also have potentially serious consequences to fisheries". This modification would be in line with the "incomplete understanding of underlying mechanisms' of this process stated at pg. 6, under A.2.1.4, lines 55-56. (Government of India)	Our language is more precise in conveying the appropriate level of certainty.
G-TS-215	A	17	1	17	2	First sentence is hard to interpret and seems to be drafted loosely. Whose purchasing power is increased? - doesn't include the developing countries highlighted in TS-16, line 55. (Government of Australia)	This is standard FAO nomenclature, but we will consider revising in the final version.
G-TS-216	A	17	6	17	6	Suggest deleting 'additional'. (Government of Australia)	This appears to be an incorrect line number in the comment.
G-TS-217	A	17	7	17	9	Sentence needs to be checked "although adaptation may stress water……..". This should read as "this entails stress on water……..". (Government of India)	Stress is commonly used as a verb as is the case here.
G-TS-218	A	17	7	17	7	Replace 'are' by 'is'. (Government of Australia)	Cannot find the use of 'are' in line 7.
G-TS-219	A	17	7	17	21	It is proposed to move this para in section D. Section C should be limited to impacts of climate change without taking adaptation into account. When comparing scenarios with adaptation it seems crucial to consider at the same time the associated costs in relation to other regions and possible shifts in competitiveness. (Government of Austria)	It is agreed that simple, autonomous adaptations, that would be done without any government or industrial intervention, may be included in this section.
G-TS-	A	17	7	17	9	In line 7, it would help reader to spell out that the adaptation pertains to production	We agree and will endeavor to change at the

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220						yields of food, fibre and forest products. In line 8 there is reference to 'environmental resources'; but lines 10 to 20 do not discuss or explain this element. (Government of Australia)	next opportunity to revise.
G-TS-221	A	17	7	17	45	example 5: Here, coping with CC is addressed. This seems to belong into section D. (Government of Germany)	See response to comment 219
G-TS-222	A	17	8	17	9	Suggest clarification of "environmental resources" (Government of Japan)	Seems fairly obvious to us.
G-TS-223	A	17	15	17	16	Logic of paragraph needs to be made clearer and better ordered. Sequence seems to be sea-level rise causes biophysical impacts on coast which in turn produce socio-economic and environmental consequences. (Government of Australia)	This seems to be out of place and not relevant to Chapter 5.
G-TS-224	A	17	16	17	16	Redraft 'are' to convey future tense. (Government of Australia)	Has been redrafted.
G-TS-225	A	17	47	19	15	The text should be supplemented by a description on the consequences of flooding on low-lying areas. (Government of Sweden)	Text has been redrafted –impacts are more quantified – both historical and potential future impacts
G-TS-226	A	17	49	18	2	It is proposed to change the sequence of sentences in the text following the bold text and to start with the last two sentences. The first two sentences might either be deleted or put at the end of this para. (Government of Austria)	Text has been redrafted – first bullet stresses obervations and historic perspective
G-TS-227	A	17	50		50	Clearly explain the phrase "globally significant numbers" or use a different phrase that clarifies the sentence. (Government of USA)	Agree – populations are quantified
G-TS-228	A	17				figure TS-6: It is proposed to either merge figures a and b and figures c and d or to use the same y-axis in order to allow for a quick and fair comparison. Because now for the eye the difference between temperate and tropical regions is small; however, this is mainly due to different scaling. (Government of Austria)	Axes now the same.
G-TS-229	A	18	4	18	4	The authors should rephrase the sentence "climate change for coastal systems and low-lying areas is more than sea level rise" to make the meaning of the sentence more clear. (Government of Australia)	Agree – text has been subsitantially redrafted.
G-TS-230	A	18	4		5	Replace the wording "is more than" with "poses threats other than". (Government of USA)	Text has been subsitantially redrafted and the compounding effects of different climate change factors noted.
G-TS-231	A	18	6		9	Rising CO2 concentration in and of itself does not threaten coastal areas, it's the impacts that are already described in lines 6-9 that are relevant – delete phrase. In	Agree – we now talk about ocean acidification

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						line 8, delete “extreme events due to” since tropical cyclones are extreme events. (Government of USA)	
G-TS-232	A	18	15	18	20	This para needs further specifications because it is clearly not true for land-locked countries. Furthermore it seems premature to to identify those impacts among the most costly given the slow increase in sea level rise and the difficulty in comparing impacts across very long time scales. Without identifying the underlying assumptions and without being more specific this para might be rather misleading. (Government of Austria)	Agree – remark has been deleted.
G-TS-233	A	18	33	18	33	Insert: ", pollutants" after "spreads diseases". (Government of Sweden)	Disagree – Chapter wriitng team did not see this as a major issue.
G-TS-234	A	18	40	18	40	Suggest re-write of the terms “winners and losers” (Government of Japan)	Agree – done.
G-TS-235	A	18	49	18	54	It is proposed to move this para to section D. (Government of Austria)	Text retained here and impact and adaptation implications developed
G-TS-236	A	18				Why is rising atmospheric CO2 concentration is included here? It doesn't seem to make sense as a direct contributor to coastal impacts. Rising CO2 (and other GHG) is obviously the reason for the changes that result in impacts but if this is the idea than it should be mentioned in every section. (Government of USA)	Agree – we now talk about ocean acidification
G-TS-237	A	19	1	19	4	Section C: This part seems to belong into section D. (Government of Germany)	Text retained here and impact and adaptation implications developed
G-TS-238	A	19	1	19	4	It is proposed to move this para to section D. (Government of Austria)	Text retained here and impact and adaptation implications developed
G-TS-239	A	19	6	19	10	It is proposed to move this para to section D. (Government of Austria)	Text retained here and impact and adaptation implications developed
G-TS-240	A	19	9	19	9	Is example of nuclear power stations relevant here when in paragraph bolded text (lines 6-7) timeframe context is presented as 'centuries'. (Government of Australia)	Agree – example used.
G-TS-241	A	19	12		12	Insert “potential” before “relative”. (Government of USA)	Disagree – this map shows vulnerability based on today’s issues – climate change will exacerbate these numbers. Caption improved Chapter 06
G-TS-242	A	19	24	19	28	This para needs further clarification. In order to increase clarity it is proposed to substitute "predict" by "compare" and "from" by "with". (Government of Austria)	Paragraph edited
G-TS-243	A	19	28	19	28	This notion is fully supported. The whole section C should focus on a description of vulnerabilities to impacts due to the significant uncertainties about the adaptation	Thank you

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						and therefore the associated uncertainties of the (residual) impacts. Those uncertainties may relate e.g. to the uncertainty with regard to the willingness to pay for adaptation, the lack of institutional prepardness, the lack of information, lack of knowledge, speed of climate change. Recent examples (effects of hurrican Kathrina) demonstrate that even for very high developed countries the potential for adaptation may be used only to a very small extent. (Government of Austria)	
G-TS-244	A	19	30	20	11	Those paras seem to be relevant. It is proposed to include those also in the SPM. (Government of Austria)	Thank you. Communication to TSU.
G-TS-245	A	19	30		30	Define "key vulnerabilities". (Government of USA)	We do not believe that the value of a definition here is commensurate with the space requirement for such an addition, given the brevity of this summary material. For more detail, see Chapter 7.
G-TS-246	A	19	35	36	1	This statement (which is indeed copied from 7.ES) seems to largely neglect the threats to infrastructure etc. from sustained "smooth" climate change. While extreme events are currently the largest climate-related threat to infrastructure and settlements in most regions, this is not necessarily true in the future. Thawing of permafrost soils, gradual but sustained increases in sea-level rise, sustained shifts in precipitation regimes and other climatic features would all threaten the sustainability of infrastructure and human settlements. Consequently, the text should strive for more balance between the threats from extreme events and from gradual climate change. (European Union)	Edited to include this perspective.
G-TS-247	A	19	36	19	36	Word missing : …are mainly due to extreme weather... (Government of France)	Inlcuded
G-TS-248	A	19	36			Not only the number and magnitude of catastropåhes is increasing but also the variability/volatility (Government of Finland)	See chapters 1 and 2
G-TS-249	A	19				Fig TS-7: Please clarify the place names. Are they rivers, deltas, regions? (Government of USA)	Table completely redone.
G-TS-250	A	20	13			Table TS-2: This table does not mention the threats to settlements and infrastructure in some regions from thawing permafrost soils. This should become a separate category under "(b) Changes in means / Temperature". (European Union)	Table completely redone.
G-TS-251	A	20	14	20		Table TS-2 is very useful and includes a reference to abrupt climate change, which is clearly a key risk due to its possibly significant adverse impacts. The treatment of	Table completely redone.

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						abrupt climate change is not as detailed in the TS as it should be. The authors should review the findings on abrupt climate change and provide further information. (Government of Australia)	
G-TS-252	A	20				Under changes in means it is relevant to include the disappearance of glaciers due to their relevance for water supply in many regions as well as the break down of permafrost in arctic regions and high alpine regions (There is significant infrastructure in Siberia at high risk like nuclear power plant, gas supply infrastructure). (Government of Austria)	Table completely redone.
G-TS-253	A	20				Table TS-2: It is proposed to limit the row 3 to heat waves. This is because there are little or no indications that cold waves are driven by climate change. The effect of climate change seems to be that there are more heat waves but less cold waves than before. This means that climate change is beneficial effects with regard to reducing the number and magnitude of cold waves whereas climate change results in more heat waves and its associated second and third order negative impacts. The combination of heat and cold waves in one row might lead to completely misleading interpretation. (Government of Austria)	Table completely redone.
G-TS-254	A	20				table TS-2: it is noted that relevant extreme weather events have not been mentioned, like hail, thunderstorms, heavy precipitation. All those extreme weather events may induce significant damage to human systems and might change with regard to frequency and magnitude and vulnerable area. It might also be relevant to include landslides. (Government of Austria)	Table completely redone.
G-TS-255	A	20				Table TS-2: Drought is not only an issue for regions already suffering from poor water availability but drought might also become an issue in areas with good water supply. It is much more relevant how current weather extremes (e.g. number of days without rainfall) are changing under the conditions of climate change. Therefore the sentence should read as follows: Reduced water availability compared to past (baseline) conditions. (Government of Austria)	Table completely redone.
G-TS-256	A	20				Table TS-2: Abrupt climate change: The information on "Evidence for vulnerability" should be reconsidered and differentiated with regard to their nature. A new publication by Richard Seager (The Source of Europe's Mild Climate, American Scientist, 94, Nr.4) might provide a helpful basis with regard to the thermohaline circulation. Other literature might be used to guide with regard to the	Table completely redone.

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						stability of the great ice shields in Greenland and Antarctica. (Government of Austria)	
G-TS-257	A	20				Table TS-2 row 9, column 4. Add aspects on landslides (Government of Sweden)	Table completely redone.
G-TS-258	A	20				Table TS-2 row 9, column 2. Special concerns should include: "Increased transport of pollutants in the groundwater will result from an increase in precipitation i.e. an increase in fresh and groundwater flow." (Government of Sweden)	Table completely redone.
G-TS-259	A	20				Table TS-2 row 9, column 2. Add: "and landslides" after "see flooding" (Government of Sweden)	Table completely redone.
G-TS-260	A	21	4	21	4	It is proposed to use already existing terminology and to avoid introducing new one. Following this general rule it is suggested to substitute "sensitivity" either by the term "impact" or "vulnarability" or both. (Government of Austria)	Disagree- sensitivity is part of the vulnerability definition pf Tar – however text is modified.
G-TS-261	A	21	20	21	25	It is suggested to include this para under section B.3 (impacts observable now). (Government of Austria)	Agreed.
G-TS-262	A	21	26	21	27	Here, as in many other places on human health, only the change in distribution of disease vectors is discussed. On the other hand, at least as important could be the change of dynamics of carrier and/or vector species. Climate related changes in the community structure of host species (species abundance relations) will result in changing dynamics, even if there were no new species involved. (Government of Finland)	We agree but these are the only studies which were available.
G-TS-263	A	21	27	21	38	It is proposed to mention also the increase spread of ticks borne disease. (Government of Austria)	Ok – but it is not.
G-TS-264	A	21	27	21	28	Another vague heading to which high confidence is attached. Changes in climate will have a RANGE OF health impacts…..try to be more specific. Will health impacts increase or decrease with increasing change? (Government of Canada)	Addressed now.
G-TS-265	A	21	29	21	38	Here is a case where it is unclear to the reader why sometimes a likelihood statement is used and at other times the word 'could' is used. Bullet two uses the word 'could' and yet in the Figure on the next page (Fig TS-8), air pollution related health outcomes are expected with very high to high confidence. (Government of Canada)	Addressed now.
G-TS-266	A	21	41	21	45	Which effects on health (positive or negative) will eventually win out? Do positive effects outweigh the negative ones? (Government of Canada)	Addressed, predominantly negative.
G-TS-	A	21	42	21	43	To improve the clarity of the language it is suggested to insert a full stop after	Addressed.

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267						diseases, and to delete the full stop before "the degree". (Government of Austria)	
G-TS-268	A	21	47	21	48	Another heading which says very little…..how about "Some specific populations have been identified that are likely to be particularly vulnerable to……, including the following: " (Government of Canada)	Addressed.
G-TS-269	A	22	3	22	3	It would be helpful to note meaning of width of arrows. (Government of Australia)	Addressed.
G-TS-270	A	22				Fig. TS-8: A meaning of length and width of arrows shown in the figure is unidentified. This figure has to be fundamentally re-written since the length and width of arrows seem to be very subjective and could cause misunderstanding. (Government of Japan)	Addressed.
G-TS-271	A	22				Fig TS-8: This Figure needs a lot more explaining. What determines the length and width of the arrows? There are 7 different lengths in the red arrows shown - what does this mean? How many 'units of length' are distinguished? Ditto for width. (Government of Canada)	Addressed.
G-TS-272	A	23	1	23	1	The title of Box TS-3 should be reconsidered as the examples used, provide only limited detail concerning adaptation. (Government of Australia)	Title changed.
G-TS-273	A	23	3	23	3	There is no reference to timeframe/degree of climate change to which the water resources impacts are linked (with exception of the final point). (Government of Australia)	Further information is available from the chapter
G-TS-274	A	23	5	23	7	The reference [3.4.2] for this statement seems to be wrong, since section [3.4.2] doesn't mention soil moisture. (Government of Japan)	All sources in chapter have been carefully checked. This statement no longer appears.
G-TS-275	A	23	8	23	9	The bullet point does not specify where the change in spring recharge is expected. In chapter 3, page 17, line 41 it refers to "many aquifers of the world". Additionally, the statement of "by up to 50%" seems to refer to one aquifer in England. It is therefore suggested to alter the sentence to "In many aquifers of the world, spring recharge is expected to retreat towards winter, and summer recharge is expected to decline dramatically". (Government of Norway)	Rechanrge no longer addressed.
G-TS-276	A	23	21			Authors exaggerate the impact of potential sea level rise on coastal ground water aquifers. In many areas, seawater intrusion is already a problem for the basin. Sea level rise would add to the problem, but only slightly. As a typical example, for a coastal California basin of about 80,000 hectares, with a specific yield of about 0.1,	The language has been moderated and the statement rewritten – see page 29 line 19-20.

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						and an average safe extraction rate of, say, 120 million cubic meters per year, the change would show little effect. Even if the sea level rise would double estimated current rates to be 4 mm per year, the amount of water involved to balance the aquifer would be 0.32 million m3, which would be 0.27 percent of the annual yield. This is not a major impact, since it can be accommodated by reducing pumping by about one quarter of 1 percent. Multiple layer aquifers are more complicated and might show more impacts to underground water movement and quality. As such, change the adjective from "strong" impact to "some". (Government of USA)	
G-TS-277	A	23	22	23	27	Point mostly repeats lines 8 - 9. (Government of Australia)	Text has been completely redrafted and statement no longer appears.
G-TS-278	A	23	24		24	Define the term "intensify" as it relates to the hydrologic cycle. (Government of USA)	'intensify' is no longer used.
G-TS-279	A	23	25	23	27	"Many aquifers" should be more specific. Where are these aquifers? (Government of Japan)	Text has been completely redrafted and statement no longer appears.
G-TS-280	A	23	26	23	27	Bullet point nearly identical to earlier bullet point. Suggest to delete bullet point. (Government of Norway)	Text has been completely redrafted and statement no longer appears.
G-TS-281	A	23	28	23	29	It is noted that according to WGI SPM the sea level rise meanwhile amounts to 3 mm/yr. This means that the increase of 10 cm will be achieved within about 3 decades and not 8 decades as it seems rather unlikely that the increase in sea level rise will decline in the this century. (Government of Austria)	Text has been completely redrafted and statement no longer appears.
G-TS-282	A	23	32	23	33	neither executive summary of chapter 4 nor Figure 4.2 show a net soucre in 2100. Figure 4.2 shows a source 2080 and 2090, however in 2100 curves for both Scenarios B1 and A2 show a sink again. Delete sentence from "but" to scenarios. Furthermore, neither in the executive summary nor in chapter 4.4.5 there is a statement about expanding Taiga. in contrary, see page 28, lines 17 -22 and page 29, lines 47-49. delete reference to Taiga and Tundra as well (see comment to page 29, lines 21- 29 above). Rewrite the sentence. (Government of Germany)	A/R – See also G-TS-189A. 4.4.5 and 4.4.10, notably F4.3, discuss expanding taiga, but yes, TR.
G-TS - 283	A	23	32	23	32	It is difficult to interpret the range of warming indicated in the brackets (0.5 - 1.0oC warming). The current warming is about 0.7 degrees abobe the preindustrial level and according to WGI report the rate of warming is 0.2oC per decade independent of all SRES scenarios until about 2040. (Government of Austria)	A
G-TS-284	A	23	37	23	38	The possibility that the Kakadu wetlands will be inundated with warming over 3 degrees is not included in Chapter 11, and at Table 4.2 impacts to Kakadu are	TR

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						linked with a temperature increase of 1.8 degrees. The authors need to provide an accurate reference for this finding that can be found in the body of the WG2 report, or delete this example. (Government of Australia)	
G-TS-285	A	23	42	23	42	Text states, "including some biodiversity loss". "Some" should be quantified. (Government of Japan)	A
G-TS-286	A	23	50	23	51	It is suggested to indicate by when this change is expected and what the effect of mitigation could be. (Government of Austria)	A
G-TS-287	A	23	53	23	54	This box represents "Main Likely Future Impacts" due to climate change, therefore "Annual coral bleaching is expected between 2030 and 2050 for the Great Barrier Reef, due to climate change and other pressures." "And other pressures" weakens the argument for climate change and the impact of this statement. (Government of Japan)	R – Other factors as explained in chapters 4 and 6 are known to have also a significant impacts on coreal reefs. Not to include them in the assessment might be misleading decision makers and we prefer to state these other influences, regardless whether that "weakens" a statement or not.
G-TS-288	A	23	53	23	54	It is suggested to indicate either that no studies have been made for the period after 2050 or that coral riffs may have already been practically completely damaged by 2050 already. (Government of Austria)	A
G-TS-289	A	23	53	23	54	Don't understand the specification of annual coral bleaching between 2030 and 2050.Coral bleaching is already happening…what happens between now and 2030? (Government of Canada)	A
G-TS-290	A	23	54	23	54	It would be more correct to rephrase 'by between 2030 to 2050'. Section 4.4.9 and Chapter 11, GBR case study (page 33) do not address 'other pressures' (whatever they may be - but presumably relates to resource management pressures. Review since GBR is a well-managed World Heritage Area. (Government of Australia)	A/R – Thanks for the suggestion. 4.4.9 as well as Box 4.4 do discuss "other pressures" (see e.g. end of Box 4.4).
G-TS-291	A	23		23		Line 58-60: We suggest a second sentence is replaced by: "Recent findings forecast a drop in pH to 7.8 by 2100, and it may drop as low as 7.5 in a business-as-usual scenario changing ocean carbon chemistry at least 100 times faster than at any time in the last 100 000 years to a pH lower than anything experienced in the last 10 – 20 million years. Species relying upon building up calcium-based structures will be adversely affected including corals, lobsters, crabs and oysters. Higher levels of CO2 in seawater generally depress the physiological performance of sea creatures. It cannot be ruled out that these changes will also diminish other marine living resources." Rationale: The Acidification of the ocean is dealt with in a report from	A – Thanks for the suggested text. We have made extensively use of the OSPAR report, thanks, and yes you raise a very important point.

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						The OSPAR Biodiversity Committee (BDC) based on available scientific literature on this topic. The report is available at the OSPAR website http://www.ospar.org/eng/html/welcome.html. In a press release from the meeting in BDC 13 – 17 March 2006 th it is said that the report "Ocean Acidification" confirms that high levels of carbon dioxide (CO2) in the atmosphere are changing ocean carbon chemistry at least 100 times faster than at any time in the last 100 000 years. The pH of seawater (the measure of the balance of acidity and alkalinity) has dropped from 8.2 to 8.1 over the past 200 years. Models forecast that it will drop to 7.8 by 2100, and may drop as low as 7.5 if there is a business-as-usual scenario. This would be lower than anything experienced in the last 10 – 20 million years. Marine species that rely upon building up calcium-based structures will be adversely affected. These include corals, crustaceans (e.g. lobsters, crabs) and molluscs (e.g. mussels, oysters). Higher levels of CO2 in seawater generally depress the physiological performance of sea creatures. It cannot be ruled out that these changes will also diminish other marine living resources. The OSPAR Biodiversity Committee said that: both acidification of the ocean due to elevated level of CO2 in the atmosphere caused by increased anthropogenic emissions of CO2 and climate change may have severe impacts on the marine environment. They therefore emphasised the need to find strategies and measures to mitigate these effects. (Government of Norway)	
G-TS-292	A	23		29		Boxes TS-3 and TS-4: These should be organized consistently. For TS-3 it comes after the discussion but TS-4 comes before the discussion. (Government of USA)	Done
G-TS-293	A	23		29		Boxes TS-3 and 4: Eliminate and include in text, avoid redundant information (this is a summary) (Government of Germany)	We considered this, but instead have worked to try to ensure that redundancy is removed – there should be plenty of new information to fill the boxes with detail and the main text with more general information.
G-TS-294	A	23				Box TS-3: WHERE are very wet and very dry days being observed? (Government of Canada)	Not understood – this looks like a WG1 comment.
G-TS-295	A	23				Box TS-3: It is noted that only some statements include an indication of their uncertainty. Some guidance would be needed in order to get the right sense in interpreting the lack of such indication. (Government of Austria)	We have tried to put a confidence estimate on every statement in the boxes.
G-TS-296	A	23				Box TS-3: In the WATER section there is a repeated bullet point (2 and 9) (Government of Spain)	Text has been completely redrafted and statements no longer appear.

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G-TS-297	A	23				Box TS-3, WATER: It is suggested to merge intent 2 and 9. (Government of Austria)	Text has been completely redrafted and statements no longer appear
G-TS-298	A	23				Box TS-3, WATER, line 15: Without knowing how to adapt in a specific location such general statement might need some further qualifications, e.g. with regard to options (e.g. building storage reservoirs, use of more distant water resources, improved water management, desalinization of sea water), change in land-use. (Government of Austria)	Text has been completely redrafted and statement no longer appears.
G-TS - 299	A	24	1	24	32	check all references, some chapters and statements cannot be found in the underlying chapter 5 (Government of Germany)	Fixed.
G-TS-300	A	24	3	24	4	The following wording is suggested:In temperate regions, increases in temperature of 1 to 3oC, with … and In tropical regions, even those temperature increases are likely ....This is because it should be avoided to qualify any temperature incerase as being moderate etc. because what might be moderate for one region/one sector might be severe for another region/another sector. (Government of Austria)	We redrafted in spirit of this suggestion.
G-TS-301	A	24	5	24	5	10-15% reduction in yield of what? (Government of Australia)	All crops—will be clarified at final editing stage.
G-TS-302	A	24	9	24	11	This sentence says that globally there should be more potential agricultural land, i.e. that the losses in many southern countries would be compensated by gains in Russia and North America. It mentions para 5.5.3, which does not exist in the text. The lack of studies in Africa, Asia and South America does not allow to be so precise. It seems that the uncertainties are too large to be so much affirmative on this point. There should be at least a mention of the degree of confidence. (Government of France)	This bullet has been deleted.
G-TS-303	A	24	9	24	11	There is no such statement in the executive summary of chapter 5, furthermore, reference is wrong, there is no chapter 5.5.3 (Government of Germany)	This bullet has been deleted.
G-TS-304	A	24	9	24	10	The use of the words "there should be" seems a bit strong. Additionally, the use of the word "substantial" seems relatively strong when referring to a 9% loss compared to "major" when referring to an increase of up to 70%. The reference to section [5.5.3] is incorrect, it should be [5.6.4]. The following text is therefore suggested: "Globally, there can be major gains in potential agricultural land by 2080, particularly in North America (20-50%) and the Russian Federation (40-70%). Losses of up to 9% are predicted for sub-Saharan Africa, due to increased frequency of drought [5.6.4]". (Government of Norway)	This bullet has been deleted.

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G-TS-305	A	24	9	24	9	Check Chapter cross-reference - there is no 5.5.3. (Government of Australia)	This bullet has been deleted.
G-TS-306	A	24	15	24	15	There is no such statement in the executive summary of chapter 5, furthermore, reference is wrong, there is no chapter 5.5.3 (Government of Germany)	This bullet has been deleted.
G-TS-307	A	24	17	24	17	The assumption that there is a region with grassland now that does not experience a shift in rain fall pattern associated with a global temperature increase of 3oC seems rather theoretical given the indication of shifts in rainfall pattern already now visible with a temperature increase of about 0.7oC. Therefore it is proposed to either indicate the likelyhood of that assumption or to delete this sentence about humid and temperate grassland. (Government of Austria)	This has been redrafted.
G-TS - 308	A	24	18	24	19	Check reference chapter 5.4.2.2 is not about pasture. (Government of Germany)	This has been redrafted.
G-TS-309	A	24	20	24	22	This statement on productivity needs some qualifications in order to indicate the time period and the climate change assumed. Without significant adaptation regional kodelling shows that e.g. in Europe beyond a temperature increase of 2oC significant loss of boreal forests would occur. See also figure TS-5 referring to China. (Government of Austria)	This statement has been redrafted and made more general.
G-TS - 310	A	24	20	24	22	check all references, There are no chapters 5.4.4.1 and 5.4.4.2 (Government of Germany)	Corrected.
G-TS-311	A	24	23	24	23	aquaculture is not mentioned in chapter 5.4.5.1 (Government of Germany)	Bullet has been dropped.
G-TS-312	A	24	23			The reference to section [5.4.5.1] is incorrect, it should be [5.4.6.1]. Additionally, it is suggested to use some of the text from section 5.4.6.1 or the 3 bullet points on page 7 in chapter 5 instead of just referring to TAR. (Government of Norway)	Bullet has been dropped.
G-TS-313	A	24	24	24	26	There is no such statement in chapter 5.4.5.1 (Government of Germany)	Bullet has been dropped.
G-TS-314	A	24	27	24	29	check all references, There are no chapters 5.4.4.1 and 5.4.2.6, and chapter 5.4.5.1 is not about pests. (Government of Germany)	Bullet has been dropped.
G-TS-315	A	24	28	24	28	Add after "poleward" "and upward in mountain regions" (Government of Spain)	Bullet has been dropped.
G-TS-316	A	24	30	24	32	There is no such statement in the executive summary of chapter 5, furthermore, reference is wrong, there is no chapter 5.4.2.6	Bullet has been dropped.

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						(Government of Germany)	
G-TS-317	A	24	30	24	32	Explain that tonnes relates (presumably) to neat production. Is Chapter cross-reference correct? (Government of Australia)	Bullet has been dropped.
G-TS-318	A	24	30		32	The disease Malignant Catarrhal Fever is not mentioned in Chapter 5. Also the referred to section (i.e., section 5.4.2.6) does not exist in Chapter 5. (Government of USA)	Bullet has been dropped.
G-TS-319	A	24	34	24		The text should be supplemented by a description on the consequences of flooding on low-lying areas. (Government of Sweden)	Bullet has been dropped.
G-TS-320	A	24	34			This section should be written in terms of "future impacts and adaptation" not "key vulnerabilities", to match title of box and content of other sections in the box. Eg., delete lines 36-45, and revise wording in lines 46-51. (Government of USA)	Agree – text deleted
G-TS-321	A	24	34			It is suggested to include in the section on coastal systems some information about the reduction of sea level rise by mitigating climate change because such information is very policy relevant. (Government of Austria)	The last point in the main section talks about the need to combine adaptation and mitigation in coastal areas.
G-TS-322	A	24	36	24	45	Present day impacts (or impacts observable already now) are the topic of section B. Present-day key vulnerabilities therefore might be shifted to section B. (Government of Austria)	Agree – text deleted
G-TS-323	A	24	36		36	Define "key vulnerabilities". (Government of USA)	Text deleted
G-TS-324	A	24	37		45	Identify where this information is supported in other chapters, and indicate confidence levels for these statements. (Government of USA)	This is summarising Chapter 6 findings
G-TS-325	A	24	44		44	Clarify meaning of "significant extreme water levels". (Government of USA)	Text deleted
G-TS-326	A	24	52	24	54	This is very interesting information that should be included in the SPM. However, there is a question about the baseline of SLR (is the baseline the current sea level or the sea level at the beginning of industrialization?). (Government of Austria)	Agree
G-TS-327	A	24	52		54	Indicate confidence level. (Government of USA)	Agree
G-TS-328	A	24	55	24		This para as well as the next para (starting in lines 58) are very policy relevant and therefore should be included in the SPM. (Government of Austria)	Agree

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
G-TS-329	A	25	1	25	28	The text should be supplemented by a description on contaminated land and the threats to soil, groundwater and surface water. (Government of Sweden)	Not addressed as as major issue in Chapter 7
G-TS-330	A	25	2			Due to the expected significant increase of migration of people from very vulnerable regions to less vulnerable ones (especially in developing countries) and the associated significant consequences for society this second order effect of climate change should be highlighted. (Government of Austria)	Lack research literature as an authority for such a statement
G-TS-331	A	25	5			Add into the sentence: "landslides and coastal erosion" after "areas subject to flooding," (Government of Sweden)	Bullet revised.
G-TS-332	A	25	7	25	9	It seems to be evident from the information included on page 24, lines 52 to 54, that also the increase in sea level will contribute significantly to the vulnerability for industry, settlement and society in coastal areas and consequently to effects of climate change assuming that no adaptation will occurr in time (Experience shows that society usually starts adaptation frequently only after significant damage has occurred). (Government of Austria)	Bullet edited, but the adaptation point is not made specifically by the chapter.
G-TS-333	A	25	10	25	2	The first dot point under health does not concern climate change. It should be deleted. (Government of Australia)	Issues for Chapter 08 not 7
G-TS-334	A	25	15	25	15	“In most parts of the world…”, the meaning of “most” should be explained or quantified. (Government of Japan)	Issues for Chapter 08 not 7
G-TS-335	A	25	21			Health aspects are also important for insurers and pension schemes (Government of Finland)	Issues for Chapter 08 not 7
G-TS-336	A	25	29			Health: It is noted that this section of box TS-3 does not address impacts of storms (including hurricans) on human health although even such hurricanes resulted in significant number of casualities in one of the highest developed countries of the world and although WGI report includes information that the frequency of hurricans of classes 4 and 5 are expected to further increase in the future. Furthermore there are indications that also the area vulnerable to hurricans might become larger. Given the high importance of that issue it is suggested to address it in box TS-3. (Government of Austria)	Addressed
G-TS-337	A	25	37	25	37	It is suggested to provide additional information on Malaria consistent with the results provided on page 31, lines 9 to 18 of the TS.	I do not understsand this!

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						(Government of Austria)	
G-TS-338	A	25	52	25	52	Insert at the end of the sentence: ", as well as in highly polluted areas." (Government of Sweden)	Not addressed – this is addressed in the Africa chapter
G-TS-339	A	26	1	29	55	Box TS 4, the authors should ensure that consistent time scales and scenarios are used for each of the regional impacts, or if this is not possible specify the scenario and timescale used for each dot-pointed impact. In addition the authors should ensure that each impact has a likelihood estimation that follows the IPCC standard, (use of the words "could", "will", "may" and "expected" are not helpful). Finally terms such as "substantial" need quantification to be of use to the broader TS readership. (Government of Australia)	Addressed
G-TS-340	A	26	1			It is proposed to move box TS-4 to section C.2, after having discussed thze effects in the various regions (current after page 43). This would make section C.2 consistent in structure with section C.1. (Government of Austria)	Done.
G-TS-341	A	26	7	26	7	In order to improve clarity it is proposed to insert "people" after "many" because section C also addresses vulnerabilities of ecosystems. (Government of Austria)	Done.
G-TS-342	A	26	10	26	10	It is proposed to specify the underlying temperature increase or emissions scenario (in combination with climate sensitivity) in order to rpovide a more complete and thus more meaningful information compared to "by 2080". (Government of Austria)	"the AEZ, under various climate change scenarios" has been added after '2080s'.
G-TS-343	A	26	12	26	16	This information is very relevant and might be included in the SPM. However, it would be even more helpful to include projections until 2040 because there is high certainty about the temperature increase until this point in time (plus 0.2 degress centigrade by 10 years or 0.7 degress additional to the current level). (Government of Austria)	Text now relates up to the 2050s.
G-TS-344	A	26	17	26	18	It would be welcome to specify the time period for which those figures have been estimated (and the underlying assumptions e.g. with regard to population increase and other drivers). (Government of Austria)	Text removed..
G-TS-345	A	26	19	26	22	It is proposed to specify the time period in which the fish yield is expected to decline with the indicated percentage and the underlying assumptions. (Government of Austria)	Chapter 09: Not addressed.
G-TS-346	A	26	21	26	21	30% reduction in yield by when? (Government of Australia)	Chapter 09: Not addressed.
G-TS-	A	26	27	26	27	Is there already a robust evidence that periods with extreme wind will increase due	Text removed.

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347						to climate change for that region? If such linkage has been demonstrated it is proposed to include it in the SPM. (Government of Austria)	
G-TS-348	A	26	28	26	30	It would be very useful to learn more about the percentage of water losses that could be compensated by such methodology and what the additional costs would be. However, adaptation is expected to be addressed under section D and not C. (Government of Austria)	Text removed.
G-TS-349	A	26	36	26	37	It is noted that a sea level rise of 1m is unlikely to occur during the 21st century. Furthermore it would be very helpful to put the value of 250,000 ha into context (percentage of total area of mangrove in Asia). (Government of Austria)	Context inserted.
G-TS-350	A	26	36	26	39	A time-scale reference for a 1 meter sea-level rise is necessary. Without it, the policymaker reader has no idea of when the referred impact will occur. It is also critical that time-scale references are consistent with the findings published by WG1. (Government of Japan)	Time scale can be obtained from WG1.
G-TS-351	A	26	38	26	39	Although the area to be flooded is interesting even more interesting would be the figure of people being at additional risk of being flooded due to increased risk of storm surges because of sea level rise. (Government of Austria)	Number at risk are given on page 50 lines 48-49.
G-TS - 352	A	26	40	26	41	It seems to be more relevant to learn about the mass of glacier loss in the Himalyan region associated with temperature increase of 3 degrees centigrade and the associated consequences for the river discharge and the water management of the regions in the river basins and the number of people being challenged by this climate change impact. (Government of Austria)	Information is given about Himalayas – page 50 lines 44-45, but we can only make statements which the literature supports.
G-TS - 353	A	26	44	26	46	In addition it would be interesting to learn more about the figure of availability of freh water for the years 2040 and 2080 (depending on the emission scenarios). (Government of Austria)	We are dependent on the literature, which doesn't give this information
G-TS-354	A	26	47	26	48	It is proposed to provide a figure for the warming rate of 0.2 degrees centigrade per decade until 2040 because that figure has been identified as the warming rate in the next decades irrespective of the emission scenario. (Government of Austria)	No action – this information should be in WG1.
G-TS-355	A	26	49	26	50	A figure without indicating the time period and underlying assumptions with regard to climate change seems of little value in general. Therefore it is proposed to provide more specific information on those underlying assumptions. (Government of Austria)	Reader should refer back to the chapter to get the detail on this sattement.

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G-TS-356	A	26	49	26	49	"Part of Asia" is too general. This statement needs to be more specific about where in Asia decreases in crop yield are expected to occur. (Government of Japan)	Statement made more specific (within what the literature will support).
G-TS-357	A	26	51	26	51	Again this information is unclear: does the tempearture increase relate to the local temperature or the global increase? If it is the local temperature what is the associated gloabl temperature increase? Furthermore it would be relevant to provide information on the availibility of water resources for irrigation. (Government of Austria)	Reader should refer back to the chapter to get the detail on this sattement.
G-TS-358	A	26	53	26	54	It is strange to find such information on carbon sequestration in a box highlighting future impacts of climate change. This seems to be an issue for WGIII report. (Government of Austria)	Statement removed.
G-TS-359	A	26		29		Box TS-4. Impacts by Region Table. It appears to be more a collation of impact studies than a systemmatic and prioritised review of risks of impact by Region. For example, the impacts for N. America, the implications of reduced snowpack ice melt in the W Corillera for Water management is discussed. Should we infer that, elsewhere in N America, the risks from climate change to water supplies is low? See also comment on SPM. (Government of UK)	Or that there is greater certainty because this impact arises from a changes in temperature and hence in the snowpack, whereas elsewhere in North America statements about water resources would concern rainfall changes about which there is much less certainty.
G-TS-360	A	26				Box TS-4/Asia Section: Suggest more points be included for Asia, specifically points concerning East Asia, Northern Asia. (Government of Japan)	A point has been added on North Asia.
G-TS-361	A	27	4	27	6	It seems to be very important to link those impacts to the time period by when it is expected and what the assumptions about the corresponding climate changes are. (Government of Austria)	Noted. This opening sentence is now followed by a series of dot point exmples in which time periods are specified.
G-TS-362	A	27	15	27	15	It is proposed to insert "global" before "warming" in order to add clarity to the text. (Government of Austria)	Disagree. This is a regional warming range, not global.
G-TS-363	A	27	20	27	21	It would be intersting to learn for which range of global warming this statement is robust and at which threshold of global warming the impacts of climate change become negative. (Government of Austria)	Noted. We are seeking further information from the paper by Attwell et al (2003).
G-TS-364	A	27	23	27	24	It would be helpful to learn more about the assumption of the global temperature change. (Government of Austria)	Noted: The details of the regional temperature change by 2050 are given in the report by McMichael et al, (2003). This is not the place to provide such details.
G-TS-365	A	27	24	27	25	The dot point relating to "expected" heat related deaths in Australian capital cities is unhelpful as it does not clearly replicate the findings of section 11.4.11 and contains so many caveats (i.e.. no adaptation and allowing for population growth)	Noted. A statement about additional deaths now appears in 11.4.11. The word "expected" has been removed. There is only one caveat –

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						that it has very little utility for the TS readership. If the point is to be retained, it needs to make clear that the issue is heat stress becoming a greater cause of death in aged persons, without preventing more persons from exposure. There is no statement at section 11.4.11 concerning the possible number of additional deaths (Government of Australia)	the exclusion of adaptation – we think this is reasonable, given the available literature.
G-TS-366	A	27	27	27	29	It is strongly proposed to include such information in the SPM because it would not only be valid for Australia and New Zealand but also for other regions worldwide. If possible some quantitative indication of shift of probability of certain extreme events would be very helpful (e.g. an extreme event that occured once in 100 years is expected to occur once in 10 years by 2050). (Government of Austria)	Noted. A slghtly revised dot point appears in the latest version of the TS: "Risks to major infrastructure are likely to increase. Design criteria for extreme events are very likely to be exceeded more frequently by 2030. Risks include failure of floodplain levees and urban drainage systems and flooding of coastal towns near rivers". This doesn't appear in the SPM due to space limitations. We have very few examples of quantified changes in return periods, and they are very location-specific and event-specific, e.g. storm surges in Cairns, floods in Westport.
G-TS-367	A	27	33	27	34	This information would be much more helpful if being linked with the underlying global climate change. (Government of Austria)	Done.
G-TS-368	A	27	35	27	36	This is very relevant information. However, it would be even more informatrive if the associated global climate change would be indicated in order to put this information into proper context. (Government of Austria)	IS92a is stated – if reader is unfamiliar with this, he/she can refer to underlying chapter.
G-TS-369	A	27	39	27	40	This figure needs to be put into context, e.g. by comparison with the number of people affected by coastal flooding under current conditions (e.g. in the 90ties). (Government of Austria)	No action – this is a summary and for more information reader needs to refer to underlying chapter.
G-TS-370	A	27	39	27	40	The text ought to specify where in Europe this coastal flooding is expected. Table 20.3 in section [20.6] states a range of 0.2-1.6 million additional people in Europe being affected by coastal flooding in the 2080s. Does this indicate that 0.9 million Europeans are already affected by coastal flooding? The text should reflect the additional number of people being affected. (Government of Norway)	No action – not available from underlying reference.
G-TS-371	A	27	42	27	43	It is proposed to merge this information with the information in lines 35 and 36 on the same page.	Insurance statement removed.

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						(Government of Austria)	
G-TS-372	A	27	44	27	45	This is very relevant information that should be included in the SPM because it seems to be indicative for the changes that are to be expected all around the world. (Government of Austria)	Noted.
G-TS-373	A	27	46	27	47	It would be very helpful to infor4m also about the associated global climate change. (Government of Austria)	Timing and scenario given. Not sure what further information desired but se Tbale TS-3 and TS-4.
G-TS-374	A	27	53	27	53	The sentence seems to be too "strong", and it needs to be tinged or put in context: According to the same source (Araujo et all, 2006), increases in aridity could trigger contractions in the distributions of nearly all species of the amphibians and reptiles studied in the southwest of Europe, including Portugal, Spain and France. Impacts in these three countries are not trivial because, together, they hold 62% of the amphibian and reptile species present in Europe. (Government of Spain)	Statement expanded and qualified.
G-TS-375	A	27	54	27	54	There are many others mountain areas in Europe with glacier systems, and some of them are very valuable and relictic. So, instead "Small Alpine glaciers", it can be said "Small high mountain glaciers across Europe" (Government of Spain)	Statement qualified.
G-TS-376	A	27	54	27	55	It would be very helpful to infor4m also about the associated global climate change. In addition it would be helpful to inform about that global climate change that would result in total disappearance of alpine glaciers. (e.g. Germany: 2 degrees, Austria: 3 degrees, all alpine glaciers 5 degrees) (Government of Austria)	Global change context given. Statement can only cover what literature provides - this geographical detail not available.
G-TS-377	A	27	54			Write "Small glaciers in the different Alpine regions" instead of "Small Alpine glaciers" (Government of Spain)	Statement reworded.
G-TS-378	A	27	55	27	55	This statement refers to lines 58-61: A very important impact of a shutdown of the THC is neglected here, namely a rapid regional sea-level rise up to 1m within a few decades. Reference: Levermann, A., Griesel, A., Hofmann, M., Montoya, M., and Rahmstorf, S., 2005: Dynamic sea level changes following changes in the thermohaline circulation, Climate Dynamics, 24, 347. (European Union)	This is a WGI comment. The statement is based on what is available from the WG1 SPM, we would be encroaching on their territory to go directly to the literature assessed by them.
G-TS-379	A	27				on North Atlantic thermohaline circulation: it would be key to indicate the associated changes in regional change in temperature, in comparison to current temperatures as well as about the associated time frame. It is noted that there are some recent publication, that may indicate some different understanding (Richard Seager, American Scientist, 94, Nr. 4).	This is a WGI comment. The statement is based on what is available from the WG1 SPM, we would be encroaching on their territory to go directly to the literature assessed by them.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Government of Austria)	
G-TS-380	A	27				BOX TS-4, page 27, lines 58 to 61: these affirmations are based on only one study by Arnell and all., which is a technical report of a research organisation and has no status as peer reviewed litterature. Furthermore, the conclusions of this report are mostly based on "experts" jugements, which does not represent a scientific approach. We propose to delete those lines, because they could harm the reputation of IPCC, and give a more balanced view on this subject based on the results of WG-I, which concludes that even with a shutdown of the North Atlantic meridional overturning circulation the temperatures in most of Europe would still warm up. The exact quotation from the SOD draft SPM of WG-1 is: "Models suggest a weakening of the Atlantic meridional overturning circulation (MOC) ranging from small values up to 60% by 2100. Temperatures over the North Atlantic Ocean and Europe are projected to warm despite such changes, due to the much larger radiative effects of the increase of greenhouse gases. No models suggest an abrupt MOC shutdown during the 21st century." (Government of France)	No, not based only on Arnell et al. This is based on careful reading of WG1 SPM and discussions between WG2 chapter authors. It has been slightly reqworded to improve rigour and conformity.
G-TS-381	A	28	5	28	6	It is suggested to inform about the global climate change that would also change the trend with regard to soybean yields. Otherwise there might be the wrong impression for the reader that under all climate changes soybean yields would increase in Latin America. (Government of Austria)	Soybean yields are very likely to increase only in **temeperates zones** of South America if CO2 effects are considered. Increases in temperature will have a beneficial impact. All futures sceneraios used are consistent with the results.
G-TS-382	A	28	7	28	7	It is suggested to provide some relevant details on this important issue, such as: global temperature increase that results in such decline, amount of decline expected by 2050 (corresponding to the expected temperature change of about 1.5 degrees centigrade relative to the pre-industrial level). (Government of Austria)	In the new version the temperature increase was added.
G-TS-383	A	28	8	28	9	It is suggested to indicate also the underlying changes in global temperature increase compared to the pre-industrial level in order to include this effect easily in a figure comparable to figure TS-5. (Government of Austria)	It was included in the new version.
G-TS-384	A	28	10	28	10	In order to make this statement more relevant it is suggested to be more specific with regard to the time (indication of year) and underlying climate change in terms of temperature increase of global average surface temperature compared to the pre-industrial level. (Government of Austria)	We don't have this data.
G-TS-	A	28	11	28	20	In order to make this statement more relevant it is suggested to be more specific	We don't have this data.

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385						with regard to the time (indication of year) and underlying climate change in terms of temperature increase of global average surface temperature compared to the pre-industrial level. (Government of Austria)	
G-TS-386	A	28	22	28	28	It is strongly suggested to move this para on adaptation to section D and to focus in section C on future vulnerabilities and possible impacts under the assumption of no adaptation. (Government of Austria)	Not accepted.
G-TS-387	A	28	29	28	29	It would be helpful to also indicate the underlying change in globval average temperature. (Government of Austria)	It was indicated.
G-TS-388	A	28	33	28	36	This information is very policy relevant and should be included in the SPM. (Government of Austria)	Included in the SPM.
G-TS-389	A	28	37	28	37	It is proposed to substitute "any" by "the" because at least for the non-native speaker "any" could be interpreted such that there might be a sea level rise without associated increase in tidal surge and flooding. (Government of Austria)	Done.
G-TS-390	A	28	40	28	41	WHERE in North America are heat waves expected to increase? Across the continent? Is Canada affected too? Adding details for a Canadian city is recommended if such data exist in the underlying chapter. (Government of Canada)	Reworded to indicate Canada and US and exacerbating exisiting conditions.
G-TS-391	A	28	40	28	42	It is suggested to indicate also the underlying changes in global temperature increase compared to the pre-industrial level in order to include this effect easily in a figure comparable to figure TS-5. (Government of Austria)	See GTS 392 below as repeat.
G-TS-392	A	28	45	28	45	It is suggested to indicate also the underlying changes in global temperature increase compared to the pre-industrial level in order to include this effect easily in a figure comparable to figure TS-5. Furthermore it is suggested to substitute "probably" by language included in box TS-1 in order to help identify the uncertainty of that statement. (Government of Austria)	Reworded to indicate 2050.
G-TS-393	A	28	47			Phrases like “Supply and demand mismatches” are common in the press but in reality they make no sense. Along a given set of supply and demand curves, there is only one point where supply and demand are not mismatched. That point is the equilibrium point – which is also the point that is observed. Suggest replacing, “Supply and demand mismatches” with “Decreases in supplies of water coupled with increases in the demands for water”.	Reworded and now less supply and increase in demand as requested.

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						(Government of USA)	
G-TS-394	A	28	48	28	49	It is suggested to include that statement in the SPM as well as in box TS-3 under the section on "industry, settlement and society" because it seems to be valid in general. (Government of Austria)	Vulnerable groups identified in SPM but not role of Chapter 14 to include in industry, settlement secton.
G-TS-395	A	28	50	28	51	It is suggested to substitute the term "moderate climate change" by the actual underlying changes in global temperature increase compared to the pre-industrial level in order to include this effect easily in a figure comparable to figure TS-5. (Government of Austria)	Changed sentence to make more specific in terms of time slice.
G-TS-396	A	28	52	28	55	Reading both paras, those starting in line 52 and in line 54, is somehow confusing because it remains unclear whether or not the effects of pests, diseases and fires have been included in the calculations reported in the first para. Furthermore it should be stated for which underlying changes in global temperature these results are valid. By the end of the 21 century the temperature increase compared to preindustrial could be in the range from about 2 to 6 degrees. (Government of Austria)	Removed sentence.
G-TS-397	A	28				line 59, 60: it is likely that this statement is valid not only for North America but in general. Therefdore it should be included in the SPM. (Government of Austria)	Coastal issues one of key points for chapter in SPM.
G-TS-398	A	28				Define “coastal squeeze” or use a more appropriate term. Line 57 (Government of USA)	Reworded to indicated that structures prevent landward migration.
G-TS-399	A	29	1	29	31	Why is all the discussion about the Arctic, but none about the Antarctic? (Government of Australia)	The 4AR was required to focus on new insight since the TAR and the Chapters of WGII are focussed on the impacts of climate change. From this perspective we believe that we have adequately reflected the balance of new research on impacts of climate change in polar regions, given recent advances and the severity of impacts this necessarily focussed on the Arctic issues. Furthermore, the prescribed section headings which were the original government specification for the task to be untaken by WGII, tended to focus more on human impacts, adaptation and sustainable development. These subject areas have only limited

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							significance in the Antarctic, and this does tend to skew one part of the chapter coverage. Finally, the new chapter in WGI which is devoted to changes in the cryosphere has reduced the need for a long discussion of those impacts in WGII, and hence reduced our coverage in WGII Ch15.
G-TS-400	A	29	1	29	1	Do you mean Box TS-3? (Government of Australia)	This comment appears to be mis-placed – there is no reference to a Box on this line.
G-TS-401	A	29	3	29	5	Suggest providing results for summer sea ice too. Second sentence is puzzling….a complete loss of sea ice is projected by some models for Antarctica? Meaning a totally ice-free ocean around Antarctica all the time? (Government of Canada)	The sentence was rewritten.
G-TS - 402	A	29	3	29	5	It is suggested to indicate also the underlying changes in global temperature increase compared to the pre-industrial level in order to include this effect easily in a figure comparable to figure TS-5. (Government of Austria)	We already indicated that this is expected by the end of the century. Due to strict page limitations the underlying temperature increase is not given here.
G-TS-403	A	29	5	29	5	The statement that there have been recent examples of island abandonment is not included in the WG2 chapters and should be deleted. (Government of Australia)	Comment misplaced.
G-TS-404	A	29	11	29	12	It is suggested to indicate also the underlying changes in global temperature increase compared to the pre-industrial level in order to include this effect easily in a figure comparable to figure TS-5. Furthermore it is suggested to inform about the consequences of permafrost thaw for the release of additional GHG emissions. (Government of Austria)	We already indicated that this is expected by the end of the century. Due to strict page limitations the underlying temperature increase is not given here.
G-TS-405	A	29	28	29	29	Destruction of permafrost does not only threatens community infrastructure but also industrial infrastructure (e.g. gas and oil pipelines, power plants including one nuclear power plant) and transport infrastructure which would require very high investments in new infrastructure. (Government of Austria)	Sentence changed as suggested.
G-TS-406	A	29	33			Language used should indicate level of uncertainty (eg., line 39-41, line 44-46); avoid terms such as "will" when referring to future projections. (Government of USA)	We used uncertainty words where they are appropriate.
G-TS-407	A	29	36	29	38	Remove sentence starting 'In November …' as this is not an expected change but rather an example of an extreme weather event on a vulnerable population. (Government of Australia)	We have deleted this sentence.
G-TS-	A	29	37	29	37	It is suggested to provide in addition to the absolute figure on damage also a	We have deleted this sentence.

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408						relative figure as percentage of the GDP in order to put that figure into context. (Government of Austria)	
G-TS-409	A	29	42	29	43	This already quite complete information could be made even more useful if also the underlying change in global temperature would have been indicated. (Government of Austria)	We added the global temperature rise change as suggested.
G-TS-410	A	29	44	29	46	Information could be made even more useful if some indication on the global change in temperature would be provided that would significantly reduce the beach area. (Government of Austria)	We merged this bullet to the first bullet on the impacts of sea-level rise and increased sea temperature on beach erosion and coastal ecosystem. This is a useful suggestion, but as the coral bleaching and beach erosion is considered as general reasons for tourists' unwillingness, we cannot identify the specific degree of global temperature rise, and resulting degree of bleaching and beach erosion.
G-TS-411	A	29	47	29	49	This quite interesting information would be better located under section B. Section C should focus on future vulnerabilities and impacts. (Government of Austria)	We deleted this bullet.
G-TS-412	A	29	51	29	52	This quite interesting information would be better located under section D. Section C should focus on future vulnerabilities and impacts without taking adaptation into account. (Government of Austria)	This sentence is merged to the future impacts on coastal tourism to make a new bullet, where this sentence is used to support the assessment of future impacts.
G-TS-413	A	29	53	29	54	This is very relevant information. However, it would be even more informatrive if some indication about the number of people effected as well as the action taken by those people would be included. (Government of Austria)	We have deleted this bullet.
G-TS-414	A	29	53		54	Are specific examples of island abandonment given in chapter 16? If so, please provide here or remove statement. (Government of USA)	We have deleted this bullet.
G-TS-415	A	29	55	29	55	(Lines 57-59) The point is more relevant to WG3 report, since it does not deal with impacts of climate change on small Islands. (Government of Australia)	We feel that the issue of renewable energy systems is not only related to mitigation, but equally so to adaptation and sustainable development of islands. We feel strongly that cost-effective renewable energy solutions will not only reduce GHG emissions (and we are aware that the emissions from small islands are

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							minuscule) but will also (a) decrease the present dependence on importation of expensive fossil fuels (b) save foreign exchange, and (c) provide an opportunity for tropical islands to exploit resources with which they are well-endowed, such as all-year high receipt of solar radiation and a consistently high number of sunshine hours. These contribute to enhancing their resilience.
G-TS-416	A	29				lines 60 to 61: This information is relevant. However it does not fit well under box TS-4. It is suggested to move it to section D on adaptation and to interprete it as reduction of risks from climate change by insurance. (Government of Austria)	We have deleted this bullet.
G-TS-417	A	29				lines 57 to 59: This information is relevant. However it does not fit well under box TS-4. It is suggested to move it to section D on adaptation and to interprete it as reduction of risks from climate change by mitigation of climate change. (Government of Austria)	Same as the response to G-TS-415.
G-TS-418	A	30	1			section C.2: It is noted that many impacts are only discribed in qualitative terms. The writing team is encouraged to provide as much quantitative information as possible. This relates in particular to the associated climate change in terms of increase of global average temperature compared to the pre-industrial level. It would be also very helpful if as much as possible quantitative information on impacts could be provided. (Government of Austria)	We have attempted to do this, and have also provided Tables TS-3 and TS-3.
G-TS-419	A	30	5			Africa: It is noted that this overview is quite about some impacts that are expected to be relevant also for Africa, e.g. sea level rise, temperature increase in the region of rain forests, change in precipitation patterns. It might be useful to include a para on gaps with regard to investigations on impacts for every region. (Government of Austria)	Knowledge gaps and uncertainties are addressed in section H.
G-TS-420	A	30	7	30	7	Expression 'is arguably' seems meaningless when twinned with (high confidence). Rephrase in terms of 'likelihood' terms in Box TS-1. This is a general issue for Section C.2. (Government of Australia)	Changed to ‘possibly’.
G-TS-421	A	30	11	30	13	% GDP losses by when? (Government of Australia)	References to losses in terms of GDP removed.
G-TS-422	A	30	12	30	12	What is 'IGAD'? (Government of Australia)	Acronym removed.

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G-TS-423	A	30	12	30	12	It is suggested to provide the full name for the acronym "IGAD". (Government of Austria)	Acronym removed.
G-TS-424	A	30	20	30	20	Sentence not clear : ….areas suitable of suitable climate… Delete the first suitable :"areas of suitable climate"? (Government of France)	Text rewritten.
G-TS-425	A	30	20			Delete first occurrence of "suitable". (Government of USA)	Text rewritten.
G-TS-426	A	30	25	25	33	This is very relevant information. However, it would also be intersting to learn whether second order impacts on the management of water resources in the rivers linked to the Kilimanjaro have also been investigated. (Government of Austria)	Readers need to refer to underlying chapter for further information – space constraints prevent provision of detail.
G-TS-427	A	30	32	30	32	Add a descriptive phrase on value of 'fog water'. (Government of Australia)	'water' removed from text.
G-TS-428	A	30				Title of section is hard to understand in expressing purpose and scope of the section. Content of the section is uneven for the various regions - each region needs a common general structure. (Government of Australia)	Section heading has been altered to clarify purpose and scope of section.
G-TS-429	A	30				Fig TS-9: Second picture of FEBRUARY 2000 is pre-TAR. Is it not possible to get 2004-2006 photo? (Government of Canada)	2000 photo remains – it was not possible to obtain an update.
G-TS-430	A	31	1	31	2	Statement seems to be about current water access conditions. Rephrase to link current and future vulnerability. (Government of Australia)	Heading rephrased.
G-TS-431	A	31	17	31	17	Specify that this is in relation with malaria, and give the entire name of the parasite in question (Government of France)	Sub-section rewritten.
G-TS-432	A	31	32	31	38	It is suggested to remove this para to section D because it addresses primarily adaptation issues but not impacts and vulnerabilities. (Government of Austria)	This has been removed from Section C.
G-TS-433	A	31	42	31	50	This para might better fit into section B on current impacts of climate change. (Government of Austria)	No action – seems OK as an introduction, and there isn't a sub-section on regions under Scetion B.
G-TS-434	A	32	3	32	3	It is suggested to insert "In particular" before "Subsistance farmers" because also other farmers might be at such risk from climate change. (Government of Austria)	No action. – this information not available beyond what we have said about declining production.
G-TS-435	A	32	21	32	21	Add at the end of sentence: "and can result in increased emissions of methane." (Government of Netherlands)	This would be a WG3 statement – no action.

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G-TS-436	A	33	1	33	22	figure TS-10: Any information about the underlying associated climate change in terms of increase of temperature compared to pre-industrial level would be very much welcome. (Government of Austria)	No action – reader needs to refer to underlying chapter.
G-TS-437	A	33	25	33	32	This para might better fit into section B on current impacts of climate change. Otherwise there would be the impression that there are almost no impacts of climate change already occurring now. Reading section C however shows that there are already a lot of impacts occurring now. (Government of Austria)	Noted. Section B has been significantly modified and now includes lots of evidence of observed impacts. The ANZ dot point now reads "The region is already experiencing impacts from recent climate change and adaptation has started in some sectors and regions".
G-TS-438	A	33	26	33	29	Question the "high confidence" attributed to intensity of Australian droughts (what is baseline?) (Government of Australia)	Noted. Section 11.2 states that "Droughts have become hotter since about 1973 because temperatures are higher for a given rainfall deficiency". Hence the warming has increased the intensity of Australian droughts. The increase in temperature is known with high confidence.
G-TS-439	A	33	30			Delete 'New Zealand' as Australia's Heard Island also had glacial changes (table 11.1) (Government of Australia)	Agree. Delete "New Zealand"
G-TS-440	A	33	31	33	31	Redraft 'from'. (Government of Australia)	Agree. The sentence has been rewordeed as "Some adaptation has occurred in sectors such as water, agriculture, horticulture and coasts".
G-TS - 441	A	33	34	33	35	The reference to increased frequency of future droughts in 11.3.1 was "moderate confidence". (Government of Australia)	Noted. This whole dot point has been reworded as: "The climate of the 21st century is virtually certain to be warmer with changes in extreme events [moderate to high confidence]. Heat waves and fires are virtually certain to increase in intensity and frequency (high confidence) [11.3]. Floods, landslides, droughts and storm surges are very likely to become more frequent and intense, and snow and frost are likely to become less frequent (high confidence) [11.3.1]. Large areas of mainland Australia and eastern New Zealand are likely to have less soil moisture, although

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							western New Zealand is likely to receive more rain (medium confidence).
G-TS - 442	A	33	40	33	54	The potential impacts without adaptation mentioned in Chapter 11 included a range from medium to very high confidence. This implies a uniform level of confidence. (Government of Australia)	Disagree. The dot points under this heading do not have individual confidence levels. If theye did, they would not be uniform. The heading was given high confidence based on the synthesis of all potential impacts.
G-TS-443	A	33	41	33	41	It is suggested to indicate also the underlying changes in global temperature increase compared to the pre-industrial level in order to include this effect easily in a figure comparable to figure TS-5. (Government of Austria)	Noted. Figure TS-5 has been replaced with a table that indicates some of the impacts for different level of global warming. Australian impacts for different levels of global warming are documented in the report by Preston and Jones (2006). The authors of Ch 11 prefer to express impacts as a funtion of year and emssion scenario rather than global warming. This was requested by the IPCC TSU from the beginning.
G-TS-444	A	33	41	33	41	It is made clear that first point with general picture relates to 2050. It is not clear what timeframe(s) apply to statements in following points of the sub-section. (Government of Australia)	Agree. All dot points now have a specified year.
G-TS-445	A	33	53	33	53	It is proposed to substitute "degraded beaches" by "degradation of beaches". (Government of Austria)	Disagree. The current wording is OK.
G-TS-446	A	33		34		Section C: the whole Australia and New Zealand paragraph seems to be of different character, it mixes the character of information of section C and D (see respective headlines) (Government of Germany)	Disagree. All regional summaries address observed changes, potential impacts, adaptation and vulnerability.
G-TS-447	A	33				Figure TS-10: This figure needs some work. Recommend identification of countries and ocean. (Government of USA)	Countries have been identified. Ocean was felt to be unnecessary.
G-TS-448	A	34	24	34	26	It is strongly suggested to include the sentence starting with "By the end of the century.." also in the SPM because that finding seems to be quite robust and policy relevant. (Government of Austria)	Agree. The spirit of this sentence is now mentioned in the SPM under Adaptation.
G-TS-449	A	34	31	34	31	word missing : "…based on the following criteria…" (Government of France)	Agree. Text now reads “based <u>on</u> the following criteria”.
G-TS-450	A	34	31	34	31	It is suggested to insert "on" after "based". (Government of Austria)	Agree. Text now reads “based <u>on</u> the following criteria.

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G-TS-451	A	35	1	36	19	The subsection on Europe makes inconsistent use of confidence language. The rule is that a sentence with a confidence statement should not contain any other qualifiers about its likelihood. A sentence such as "Climate change is very likely to magnify the differences within Europe in terms of natural resources and assets (low confidence)." (p. 36, l. 13-14) is not clear enough. The same problem occurs on p.35, l. 3 (delete"It is expected that the"), p. 35, l. 22 (change "are expected to" into "will"). The same principle refers to other statements involving "may", "could", "are expected to". All these terms should be replaced by confidence or likelihood according to the IPCC terminology. (European Union)	A major effort has been made throughout the TS to improve the use of confidence and likelihood language.
G-TS-452	A	35	13	35	13	The authors should include figures as to the numbers of people who will be under water stress, to enable cross-regional comparison. (Government of Australia)	This is given in the bullets of (new TS) page 51.
G-TS-453	A	35	19	35	20	In order to improve clarity the following wording is proposed: It is likely that the existing water reservoirs in Southern and South-eastern Europe will not be adequate for water management in the future. (Government of Austria)	Paragraph extensively reworded see page 39 lines 19-25 in new TS.
G-TS-454	A	35	29	35	30	In order to be more consistent with some recent investigations in Austria on climate risks the following wording is suggested: Mountainous regions are expected to see thawing of permafrost due to changes in temperature. This increases considerably the risk of rock falls but also the risk of avalanches may increase due to changes in precipitation of snow. (Government of Austria)	Sentence on mountainous areas removed.
G-TS-455	A	35	30			Add new sentence: "In Northern Europe increased precipitation may cause an increased risk for landslides in soft/finegrained soils." after "…[12.4.2]." (Government of Sweden)	This sentence removed.
G-TS-456	A	35	45	35	45	Replace "and permanent ones shrink" by "and permanent ones shrink or become seasonal instead " (same source) (Government of Spain)	Have added 'and become ephemeral'.
G-TS-457	A	35	53	35	54	This assumption is critical and thus should be part of the SPM. Also there is a slight discrepancy in timing (by 2080/end of 21st century) (Government of UK)	Now states 'by end of this century'. Also see Tables SPM-1 and SPM-2.
G-TS-458	A	36	19	36	19	Remove "than in the South" (Government of Netherlands)	Text removed.
G-TS-459	A	36	21	36	24	Table TS-3: This is very relevant information that might be indicative for many river basins. Therefore it should be included in the SPM and box TS-4. It would be also very welcomed if some indication of the underlying changes in global	Table removed; since we could only use one figure or table due to space constraints, and we preferred to use the figure on the 2003

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						temperature increase compared to the pre-industrial level would be included in order to insert this effect easily in a figure comparable to figure TS-5. (Government of Austria)	drought.
G-TS-460	A	36	21	36	24	Table TS-3 should be moved to line 36 on page 35. (Government of Australia)	Now removed.
G-TS-461	A	36	27	36	41	This para might better fit into section B on current impacts of climate change. Otherwise there would be the impression that there are almost no impacts of climate change already occurring now. Reading section C however shows that there are already a lot of impacts occurring now. (Government of Austria)	Section B is not regional.
G-TS-462	A	36	35	36	35	typo : sea level rise (an a is missing) (Government of France)	Corrected.
G-TS-463	A	36	48	36	48	The melting of glaciers in the Andes is certain, and after the melting of the ice, the flow in rivers will be limited to a fraction of precipitation, but the water that used to come as snow will now come as rain, with a shift in the seasonal availability, not necessarily a reduction of the amount (Government of France)	Not in the litterature.
G-TS-464	A	37	5	37	9	Figure TS-12: Some information on the underlying sea level rise in terms of cm compared to pre-industrial level would be welcome because the reader might have a very differnt understanding about the worst SLR scenario. Furthermore some indication of time would also be relevant. In addition it would be helpful to inform the reader also about the losses in tree species if the temperature increase would be 3 degrees centigrade and if the text clarifies that this figure relates to the global average temperature. With regard to the sharp increase in extinctions of mammals it would also be very helpful to learn more about the associated underlying change in global temperature increase compared to the pre-industrial level in order to insert this effect easily in a figure comparable to figure TS-5. (Government of Austria)	We don't have this pre-industrial data. Taken into account for next stage.
G-TS-465	A	37	5	37	6	Caption of Figure TS-12, one before last : The melting of glaciers in the Andes is certain, and after the melting of the ice, the flow in rivers will be limited to a fraction of precipitation, but the water that used to come as snow will now come as rain, with a shift in the seasonal availability, not necessarily a reduction of the amount (Government of France)	Not in the litterature.
G-TS-466	A	37	10	37	18	It is suggested to move this para to section D that addresses adaptation. (Government of Austria)	Not accepted.
G-TS-	A	37	13	37	13	It is suggested to remove "confront" by "manage".	Not found in text

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467						(Government of Austria)	
G-TS-468	A	38	1			North America: It is noted that the TS does not include any quantitative information on impacts of climate change in North America for the future (e.g. the years 2050 or 2100). If such gaps in research really exist it would be worth noting. However, if such infomation has been published it should be included in the TS. (Government of Austria)	This has been included in Box TS-4.
G-TS-469	A	38	3	38	10	It is proposed to include this para in section D that addresses adaptation. (Government of Austria)	This section is being written by another Chapter
G-TS-470	A	38	7	38	8	Insert "to extreme weather events" after "adaptive capacity". (Government of Australia)	Done.
G-TS-471	A	38	12	38	14	It is proposed to include that message in the SPM because it seems rather robust and is very policy relevant. (Government of Austria)	Kept as key summary point for North America.
G-TS-472	A	38	20	38	20	It is not clear how having 'diverse ecological and cultural resource base' is relevant to the discussion - how does this increase vulnerability to extreme events? (Government of Canada)	Removed.
G-TS-473	A	38	52	39	2	It is proposed to include this para in section D that addresses adaptation. (Government of Austria)	Kept here as key point for North America summary
G-TS-474	A	39				Figure TS-13: Inflation adjusted damages appear to have decreased from 1940 through 1990. Can a mention of this be added to the text? (Government of USA)	Table reformatted
G-TS-475	A	40	28	40	28	Typo : (high confidence)…) instead of 0. (Government of France)	Fixed.
G-TS-476	A	40	29	40	31	What is the trend for rivers in the North American Arctic? (Government of Canada)	There is no trend
G-TS-477	A	40	36	40	36	The sentence (on sovereignty) should be deleted. It is speculative and rather political as opposed to scientific. (Government of Canada)	CF: This statement is supported by the publications cited in Chapter 15.
G-TS-478	A	40	41	40	48	This point is supposed to relate to Antarctic Peninsula but text below (lines 45-48) seems to apply to the northern polar oceans (not southern ones). (Government of Australia)	This point was divided into two, one for Antarctic Peninsula, the other for the Arctic.
G-TS-479	A	41	12	41	14	This paragraph about weakening of the THC would be greatly enhanced if linked to findings in WG1 report about the probability of such an event. What do model simulations say about the likelihood of increased freshwater flow from the Arctic weakening the THC? (Government of Canada)	The THC is dealt principally in the TS on page 60 lines 40-47 (new draft). Here we refer to WG1.
G-TS-	A	41	19	41	20	There should be a comparison with the present global anthropogenic emissions of	We deleted the statement indicating the

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480						methane, and a short discussion of the possible consequences of these emissions from permafrost. The point is that the methane concentration in the atmosphere has not been growing anymore in the recent years. Would they be expected to grow again because of permafrost thawing ? (Government of France)	projected increase of methane emission from Russian permafrost since it is largely the domain of IPCC WG-1. However we keep a note in the text about the potential emission of methane from thawing permafrost.
G-TS-481	A	41	21	41	44	Figure TS-14: It is suggested to indicate also the underlying changes in global temperature increase compared to the pre-industrial level in order to include this effect easily in a figure comparable to figure TS-5. (Government of Austria)	Instead of this we indicated the time slice.
G-TS-482	A	41	46			Section C: a general introduction on the specific problems of small islands and the assessment of concrete examples is recommended here, this may sum up the aspects better (Government of Germany)	We appreciate this suggestion. However, as this section has a common format, Small Islands also follows it. In addition, the first bullet is put here to show the general characteristics of small islands in terms of vulnerability.
G-TS-483	A	41	48	43	6	Language used should indicate level of uncertainty (eg., line 39-41, line 44-46); avoid terms such as "will" when referring to future projections. (Government of USA)	We used uncertainty words where they are appropriate.
G-TS-484	A	41	48		48	Section intro should provide definition of small islands. (Government of USA)	We understand the reviewer's point, but the IPCC has not given a definition of small islands for AR4. In TAR the equivalent chapter dealt with Small Island States which were easier to define. We gave the history on how to deal with small islands in the IPCC assessments in 16.1 of the main text. However it is not mature to give a clear short definition suitable to TS.
G-TS-485	A	41				Figure TS-14: Grassland is included in the figure legend, but there does not appear to be grassland vegetation in either map. Are grasslands intended to be shown near 70-100E, 60N in the 2090-2100 projection? (Government of USA)	This figure has been improved to make this clear.
G-TS-486	A	42	6	42	6	Typo : The threat from sealevel rise will be… delete to (Government of France)	We changed the sentence according to this comment.
G-TS-487	A	42	6	42	6	It is proposed to delete "to" so that the sentence reads as follows: The threat from sea-level rise will be …. (Government of Austria)	Same as above.
G-TS-	A	42	7	42	7	Add another classical society adaptation to climate change : migration. People	We have addedd a new section (16.5.4.4.) on

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488						move out of certain areas and into better ones. This is called environmental migrations, and is currently already going on. (Government of France)	emigration and resettlement as an adaptation mechanism, and deal specifically with the Tuvalu situation based on refereed journal articles rather than media and government reports. This issue still needs careful study, we did not mention this in TS and Executive Summary of Chapter 16 though it is included in the main text as mentioned above.
G-TS-489	A	42	20	42	20	What are ENSO events? (Government of Netherlands)	We elaborated as El Niño-Southern Oscillation (ENSO).
G-TS-490	A	42	36		36	Change "will cause" to "is likely to contribute to". There are many other factors that impact beach erosion, degradation of coral reefs, etc. (Government of USA)	We accepted.
G-TS-491	A	42	48		54	Lines 48 and 49 state that warming has already led to extinctions on some small island states. This headline is not developed in the following text. Somewhere in lines 50-54 some examples of species that have gone extinct due to warming, and not due to other factors. (Government of USA)	We have changed extinctions to replacement of some local species according to the comment. Furthermore, examples are shown in Table TS-2.
G-TS-492	A	42	48		49	Language implies that warming alone resulted in extinction. There are many factors that contribute to extinction of a species. (Government of USA)	We have changed extinctions to replacement of some local species according to the comment. We focused on the effect of warming here, which does not exculde the fact that there are many other factors.
G-TS-493	A	42	54		54	The term "freak storms" is not an accepted technical term. Please clarify or use a different descriptor. (Government of USA)	We have changed the word to storm.
G-TS-494	A	43	1	43	2	Very little of the preceding summary points on pages 41 and 42 supports the statement that 'some islands are clearly experiencing the adverse effects of climate change'. The preceding summary points (with the exception of one at bottom of p.42) address future impacts. Additionally, the summary conclusion in lines 1-2 fails to distinguish between natural climate variability pressures and those due to anthropogenic climate change. (Government of Australia)	We have deleted this bullet, and added other bullets indicating threats more concretely.
G-TS-495	A	43	3		6	Authors should also note that policies that implemented by the Small Island States themselves may hamper adaptation and/or contribute to their vulnerability. (Government of USA)	We have deleted this bullet about the adaptive capacity.
G-TS-	A	44	1			It is noted that section D addresses many relevant topics. However, the risk of mal-	Addressed in complete rewrite of section

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496						adaptation has not been addressed although it seems to be of significance. In particular it seems relevant to address the need of screening larger investment of climate change and to develop good practice standards. (Government of Austria)	
G-TS-497	A	44	4			It isn't clear how "significance" is determined. The chapter authors might want to back away from using this word. The chapter doesn't really provide an objective metric to support using it. Also, what kind of adaptation does the statement refer to—natural/baseline behavioral and institutional adjustments, or climate adaptation policy? Please clarify the statement. The adaptation and mitigation benefits of reducing climate impacts uncertainty is a very useful and fairly novel part of the literature that is worthy of a bit more emphasis. I didn't find a discussion of this topic in chapter 17 or 18. The chapters should consider discussing it. Gary Yohe is an excellent person to consult on this. (Government of USA)	Addressed in complete rewrite of section
G-TS-498	A	44	16			The first phrase (without "but") would make for a good bullet, with the rest of the paragraph as supporting discussion. (Government of USA)	Addressed in complete rewrite of section
G-TS-499	A	44	26	44	26	Maybe sentence needs to include the following words at the end "to a certain degree", otherwise it gives the impression that it is largely in place. (Government of India)	Addressed in complete rewrite of section
G-TS-500	A	44	26	44	49	A clear distinction needs to be made earlier in the document between natural and human adaptation. I assume the terminology has been changed from the TAR where the terms were autonomous and planned respectively? (Government of UK)	Addressed in complete rewrite of section
G-TS-501	A	44	26	45	44	The subsection on Adaptation assigns many -surprisingly low- confidence statements that are pretty much self-evident. One example (p. 44, l. 51-52) is: "Adaptation measures can be no-regrets but may also entail significant costs (medium confidence)." This is just obvious. Authors may wish to remove all confidence statements in this section. If this is not acceptable, assign "very high confidence" to all statements because all of them are obviously true. (European Union)	Addressed in complete rewrite of section
G-TS-502	A	44	27	44	27	Early responses to wild species' to what? (Government of Australia)	Addressed in complete rewrite of section
G-TS-503	A	44	46	44	49	The examples given are all in the form of engineering solutions. It could also be mentioned that Governments increasingly are developing adaptation policy frameworks to prepare for future unavoidable climate change impacts. (One	Addressed in complete rewrite of section

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						example is the Council of Australian Governments announcement in February 2006 to develop a national framework on adaptation to climate change). (Government of Australia)	
G-TS-504	A	44		54		The concept of Adaptation as developed by this report seems not to address some very important issues. Intrinsically, the assumption underlying the report (but not spelled out) is that each country will cope with the consequences of climate change with its own resources within its own boundaries. In reality, mankind has never reacted to climate changes (or environmental disturbances) like that, the population has moved out of the impacted areas and into other land. Remember for instance the consequences of the Dust Bowl in the US in the 1930's. This possibility should be at the very least mentioned. The most likely consequences of severe damage to the environment and resources in developing countries due to climate change, where there is no additional land to develop, will be massive imigration into developed countries, or undeveloped land in other countries, and, if these immigrants are not accepted (as the boat people out of Vietnam), massive conflicts and death. This scenario should at the very least be mentioned. The real issue that needs to be addressed is how many humans can live an acceptable life on planet earth, in present climatic conditions, and how many in modified climatic conditions. And then where is the land that needs to be developed for hosting that many people. (Government of France)	Addressed in complete rewrite of section
G-TS-505	A	44				Section D: the whole section would be expected in the SPM also (Government of Germany)	There is a section in the SPM on responding to climate change, although this is necessarily shorter than in the Technical Summary
G-TS-506	A	44				Section D: the whole section could run under "Coping with climate change" (Government of Germany)	The section has been retitled to 'Responding to Claimte Change' where 'responding' is the word used in te Plenary Agreed Outline for the WGII AR4.
G-TS-507	A	45	1	45	1	As worded, this statement gives the impression that the benefits of adaptation, per se, are not well known. Rather this statement would be clearer if it read: " less is known about QUANTIFYING the benefits of adaptation, in terms of damages avoided"… (Government of Canada)	Addressed in complete rewrite of section
G-TS-508	A	45	7	45	53	This section would benefit from some assessment of the relationship between the adaptation deficit to current climate and climate variability and capacity to adapt to climate change. (Government of Canada)	Addressed in complete rewrite of section

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G-TS-509	A	45	19	45	19	The term 'globalisation' is a generic, political term; instead provide scientific statement of some socio-economic activity/consequences. Perhaps an expression like 'trade barriers' would capture the sense of the following example for India. (Government of Australia)	Addressed in complete rewrite of section
G-TS-510	A	45	25			Consider moving this statement to be the 2nd or 3rd bullet in this section of the TS (D). However, we suggest rewriting the subsequent discussion to re-focus on constraints to adaptation capacity and the amount of adaptation required. We would characterize the current discussion as being primarily focused on the later, as well as planning (more akin to vulnerability), but saying little about the former. Ideally, the new discussion would provide a tangible regional/sectoral representation (table maybe) of adaptive capacity. The page 45, line 7 bullet and discussion would make a good sub-bullet or follow-on bullet to this new discussion. (Government of USA)	Addressed in complete rewrite of section
G-TS-511	A	45	28	45	28	What is a "potentially hazardous glacial lake"? Is the danger from sudden flooding? (Government of Canada)	Addressed in complete rewrite of section
G-TS-512	A	45	28	45	42	It is noted that these examples are limited to human systems. However, there is expected a significant impact also on natural systems, demonstrated by the expected decline in biodiversity driven by climate change and the rate of climate change. Given the natural heritage that is at risk the issue of loss of biodiversity should be included as well in those examples. (Government of Austria)	Addressed in complete rewrite of section
G-TS-513	A	45	35	45	37	Awkward sentence. Suggest: If climate change occurs faster than is anticipated, and if extreme events increase in frequency, many developing countries will not be able to adapt by shifting resources from one sector to another because this would leave other sectors impoverished/under funded. (Government of Canada)	Addressed in complete rewrite of section
G-TS-514	A	45	45		53	Not very useful. Is it really a point to make in the TS. Seems like other chapter points would be better suited for the TS, e.g., Development policies can influence adaptive capacity and there may be synergies to exploit. (Government of USA)	Addressed in complete rewrite of section
G-TS-515	A	46	12	46	14	Does there also need to be a thought added that for natural ecosystems (& perhaps some other systems) there is only a limited tolerance to future climate change impacts and no practicable adaptation strategies for the long-term (point is picked up on TS-50). (Government of Australia)	Addressed in complete rewrite of section
G-TS-516	A	46	23	46	23	Caption for Fig TS-15 uses term 'globalisation' - see preceding comment on TS 45,19.	Addressed in complete rewrite of section

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						(Government of Australia)	
G-TS-517	A	47	1			Section D: The items under this chapter do not exacly run under the title "damages", better: coping with CC (Government of Germany)	Retitled to 'Adaptation-mitigation issues'
G-TS-518	A	47	3	47	3	Change "help to" to "can". (European Union)	Done.
G-TS-519	A	47	5		6	This statement is misleading and could be misconstrued. Because of climate change commitment, mitigation MUST begin far in advance of the expected climate effects. Also, there are other benefits in the form of air quality, energy efficiency, etc, some of which are immediate. Finally, I think WGIII Ch3 should also be cited here since long-term stabilization modeling is being presented in that chapter. (Government of USA)	Rewritten.
G-TS-520	A	47	8		14	These sentences seem to be appropriate support for the second bullet. You might consider moving. (Government of USA)	Rewritten.
G-TS-521	A	47	13	47	14	The current wording might result in the misleading conclusion that adaptation will be possible independent from the rate and magnitude of climate change. However, there are limits to adaptation, especially for natural systems but also for human systems as indicated on page 45, lines 25 to 42 of this TS. Therefore the following addition is proposed in order to capture such notion: ... and economic costs and adaptation could not prevent the loss of current ecosystems function. (Government of Austria)	Rewritten.
G-TS-522	A	47	16		17	This point is not supported in the chapter. Depending upon the scale of decision making, a portfolio of adaptation and mitigation strategies will be required for addressing climate change, I didn't find a discussion supporting this point in the chapter. Also, consider replacing this opening line with Lines 23-24 on page 4 of chapter 18. (Government of USA)	Rewritten.
G-TS-523	A	47	21	47	21	Not just future tense- actions are on-going now. Change "would be involved" to "ARE involved"? (Government of Canada)	Accepted.
G-TS-524	A	47	22	47	23	The industrial sector is an important sector missing in the list of primary sectors involving mitigation. (Government of Netherlands)	Done.
G-TS-525	A	47	22	47	23	Add the industrial and the residential sector. There are many industries that are not related to the energy sector and they are involved into the mitigation strategies (for	Done.

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						example the F-gases industries). The residential sector is a key sector in demand management. (Government of Spain)	
G-TS-526	A	47	22		22	Useful to modify the sentence to read "Mitigation primarily involves both the supply and demand sides of the energy, …" (Government of USA)	Done.
G-TS-527	A	47	33	47	33	Insert after "international agreements", "and unilateral national actions" as not all mitigation actions are driven because of international agreements. (Government of Australia)	Accepted.
G-TS-528	A	47	36	47	36	Sentence should read as " adaptation and mitigation may exist ……" as we are assuming that options address the inter-relationships between the two which is not true. (Government of India)	Accepted.
G-TS-529	A	47	36	47	36	Add:" Inter-relationships…CAN exist at each level…." This is consistent with lines 53-55 same page that informs that these synergies do not always exist. (Government of Canada)	Accepted.
G-TS-530	A	47	52		53	This is an important caveat to the bold text opening statement of this paragraph. So much so, you might consider including it at the beginning of the paragraph in bold. (Government of USA)	Rewritten.
G-TS-531	A	48	4	48	6	Unclear - please rephrase: It is only possible to estimate a tradeoff between A and B and than decide on a sensible balance between A and B. Decisionmakers do constantly decide how much to invest in mitigation and how much in adaptation (including the possible decision not to invest). Additional information might help to base this decision on better empirical grounds but, in essence, you cannot not decide. (European Union)	Rewritten.
G-TS-532	A	48	8		9	Most global integrated assessment models do not model feedbacks from impacts very well, so it is worth saying something about the state of modeling of feedbacks from impacts in IAMs within the context of this chapter and the implications for mitigation-adaptation tradeoffs. (Government of USA)	Accepted.
G-TS-533	A	48	13		13	Consider adding "property rights" after "and value systems" (Government of USA)	Accepted.
G-TS-534	A	48	14		17	"Optimal" is a broader concept than zero-sum that depends on how mitigation and adaptation are defined. If mitigation and adaptation are represented as anything other than perfect substitutes, as suggested by the chapter, than the optimal mix will not be zero-sum. The authors should go a step further and provide a sentence on	Rewritten.

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						the future of analyses of this type. Currently, the text implies that it is and always will be hopelessly complex. (Government of USA)	
G-TS-535	A	48	29	48	30	Table TS-4 is useful, however, in the first row on "Global Policy" tends towards implicit value judgements. Suggest deletion of "policy lobbying by ENGOs". (Government of Australia)	Accepted.
G-TS-536	A	48	29	48	30	In Table TS-4, explain the meaning of the different acronyms : ENGO, CDM, MEA, … (Government of France)	Accepted.
G-TS-537	A	48	29		29	"ENGOs" may not be familiar to all readers. Suggest using something more familiar, e.g., NGO. (Government of USA)	Accepted.
G-TS-538	A	48	31		31	Add "Examples of…" to the beginning of the table caption. (Government of USA)	Accepted
G-TS-539	A	48				Table TS-4:The Table includes a mix of positive and negative effects of one to the other which makes the overall significance lost. Perhaps split into two sections- one identifying where negative effects may arise, one where positive effects might be captured. (Government of Canada)	Rewritten.
G-TS-540	A	48				Table TS-4: This table has to be fundamentally re-written. For instance, it is not understood why fuel tax increases adaptation costs. Also, CCS does not necessarily affect livelihoods. The far right column "Adaptation and mitigation trade-offs and synergies" also requires clarification. (Government of Japan)	Rewritten.
G-TS-541	A	48				Table TS-4: It is unclear what "Fossil fuel tax increases cost of adaptation through higher energy prices" is intended to mean. Perhaps a clearer example could be used. (Government of Canada)	Rewritten.
G-TS-542	A	48				Table TS-4: add: "Examples of -> relationships…. (Government of Germany)	Accepted.
G-TS-543	A	49	8	49	9	TS Page 50 line 7-8 seems a very important point to add here where defining key vulnerabilities -impacts that cannot be adapted to are likely good candidates for what might be considered "dangerous" . Suggest to add at end of line 8: ".., and where the risk-reducing potential of planned adaptation may be particularly limited." (Government of Canada)	All criteria (including potential for adaptation) included here.
G-TS-544	A	49	36	49	39	It is noted that the following intents inform about the underlying climate change in terms of temperature increase. It is proposed to indicate also the temperature	Baseline period clarified in revision.

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						change compared to the level of 1990 that has already occurred until 2006 (about 0.25 degrees centigrade). (Government of Austria)	
G-TS-545	A	49	37			"increases in human mortality" vaguely described like this, does not provide enough context for including this statement as a key vulnerability. We do not find the research justification for this in the underlying chapter. It should be provided in the chapter or deleted. (Government of USA)	Revised for consistency with Chapter 8.
G-TS-546	A	49	38			Increases in extreme events (what kind of increases? Too vague.) may not qualify as a key vulnerability since extreme events like hurricanes and cyclones sometimes follow decadal cycles that track climate variability and not only long-term change and therefore may not meet the criteria of persistence and reversibility in line 22. Loss of glaciers is the only example of the three that seems to meet the definition the authors use for a current key vulnerability. In addition, the bullet has not been substantiated by research in the underlying chapter. Either add substantiating research discussion or delete. (Government of USA)	Text clarified to mean increases in frequency and/or intensity of extreme events.
G-TS-547	A	49	40	49	52	There are no timeframes attached to the temperature thresholds. Doesn't it matter whether the 2 degree increase occurs over 100 years or 50 years for example? Some timeframe for reaching the temp increase would be useful. (Government of Canada)	Yes, issue of transients addressed in chapter 19.
G-TS-548	A	49	40		42	The literature, including the 2001 IPCC Assessment cites some positive impacts at this level of temperature change (such as productivity of some agricultural systems) but this is not mentioned. A clear and strong statement needs to be added in section E to state that the chapter is addressing only vulnerabilities (adverse) and not describing the many potential positive benefits or opportunities of climate change. (Government of USA)	As we now clearly state in the text, Vulnerability to climate change is the degree to which systems are susceptible to, and unable to cope with, adverse impacts from climate change. As we also now clearly state, given this focus on vulnerability, the analytic emphasis of this chapter is on people and systems that may be *adversely* affected by climate change, particularly where impacts could have serious and/or irreversible consequences. Positive impacts are addressed where relevant to this assessment of key vulnerabilities. We have added a statement about possible benefits to global agricultural productivity here.
G-TS-	A	49	42	49	42	The statement that "some high latitude regions could have economic benefits", is	Positive impacts are addressed where relevant

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549						displaced in this section about "key vulnerabilities", which are defined in Chapter 19 (p. 5, l. 17-19) in relation to "people and systems that may be adversely affected by climate change". (European Union)	to the assessment of key vulnerabilities.
G-TS-550	A	49	50	49	52	It is noted that this intent does not inform about the likely climate change in this century. Based on WGI report the assumption of an increase of 0.2 degrees centigrade until 2040 seems to be reasonable in this context and the lower value for the end of this century could be estimated by the assumption of a further increase of 0.1 degrees centigrade increase per decade assuming no additional anthropogenic GHG emissions at all. If GHG emissions remain at current level it becomes evident that only this century would induce a climate change in the order of 2 degrees centigrade, if emissions continue to increase even 3 degrees global warming could be induced. Such information could help to highlight the significance of mitigation in relation to the global warming during this century which might be as low as 1.5 or as high as 3 degrees centigrade (compared to the level of 1990). (Government of Austria)	This information is provided elsewhere (including chapter 19).
G-TS-551	A	49				Section E: since vulnerabilities are more assessment-oriented rather than action oriented in the report, it seems more logical to include this section in section C or directly behind it. (Government of Germany)	We have followed the Plenary-agreed Outline in constructing the Technical Summary.
G-TS-552	A	50	1	50	15	Section E: This paragraph seems to be more appropriately situated in section D (how to deal with CC) (Government of Germany)	Specifically related to key vulnerabilities, and thus included here.
G-TS-553	A	50	1		2	Change title to “Adaptation, Mitigation and Investments in better information and capacity can reduce key vulnerabilities”. Add a couple of sentences to that section addressing the importance of better information and capacity. (Government of USA)	Changed.
G-TS-554	A	50	4			Planned adaptation is used, as is autonomous adaptation p15 line 24, so consistency is needed. (Government of UK)	Revised.
G-TS-555	A	50	7	50	10	Especially for non-native English speakers this language could imply the vision that there are even viable options to stop melting down of glaciers by adaptation. Therefore a more direct language such as: In addition, there are no practical ways and means for adaptation for some key vulnerabilities, ...is suggested. (Government of Austria)	Text revised for clarity.
G-TS-556	A	50	8	50	8	Add "or non-existent" after "very limited". (European Union)	Considered, not adopted.

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G-TS-557	A	50	20	51		The authors should consider whether the possible risk of the terrestrial carbon sink becoming a source before 2100 is important enough (due to possible impacts) to warrant inclusion as a new "reason for concern". (Government of Australia)	The "reasons for concern" themselves are not re-assessed.
G-TS-558	A	50	20		47	As stated in comments provided for Ch 19, the use of this construct to discuss key vulnerabilities is a poor fit. Extreme events are not, with high confidence, persistent or irreversible and aggregate impacts are understood with lower confidence than in the TAR. This section needs to be amended in accordance with changes recommended for chapter 19. (Government of USA)	See responses to chapter 19 comments.
G-TS-559	A	50	28	50	31	It is suggested to indicate also the underlying change in global temperature increase compared to the level in 1990 (about 0.25 degrees centigrade) order to include this effect easily in a figure comparable to figure TS-5. It is also strongly recommended to use a consistent reference level; whereas figure TS-5 uses the temperature in the year 1900 as base section E uses the year 1990 as reference level. This might confuse the reader and definitely reduces the userfriendlyness of the report. (Government of Austria)	See G-TS-544. Fig. TS-5 revised.
G-TS-560	A	50	37	50	42	It is suggested to also highlight in the context of aggregate impacts the gaps in knowledge (and lack of models) with regard to the understanding and representation of second and third order effects of climate change. (Government of Austria)	See chapter 19 for such discussion.
G-TS-561	A	50	42	50	42	Change "benefits" to "economic indicators". (European Union)	Text revised, relevant text removed.
G-TS-562	A	50	43	50	47	There are two problems with this text. Firstly, the use of the term threshold. It seems odd and rather misleading to use the term threshold in this context, specifically when discussing the phenomena of melting ice over a time span of tens of thousands years. The second problem with this text is that we do not agree with the comparison between TAR findings and AR4 WG1 chapter 10.6.4.2 and Question 10.2. Threshold discussions in TAR were concerned with phenomena observable over a period of five to seven centuries where as in AR4 the discussion related to temperature changes is concerned with a tens of thousands of year span. The timespans are different and thus direct comparison of TAR with AR4 is inappropriate in this context. We suggest this be fundamentally rewritten. (Government of Japan)	Clarified that thresholds are associated with initiating changes that do not occur instantaneously. We disagree that comparison cannot be made between TAR and AR4. Please refer to chapter 19 for detailed discussion which is consistent with WGI.
G-TS-563	A	51	0			TS-5 provides a valuable overview of key vulnerabilities. However, it is necessary to provide carefully selected explanations given the brevity necessarily used. For example, in describing current day impacts it is necessary to say what extent this is	Table and caption substantially revised for clarity and precision.

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						generally due to natural climate variability, a measure of anthropogenic climate change, other pressures, or some combination of these. Caption for TS-5 should indicate temperature rise references related to above 1990 level global rise. Term 'not net impacts' should be rephrased to explain that summary on vulnerability does not consider possible impacts through adaptation. (Government of Australia)	
G-TS-564	A	51	0			Text in second column is not only about criteria, but also about critical levels. For instance in the last row both criteria and critical levels are mentioned in the 2nd column ("triggering of partial deglaciation possible at 1-2 C"). (Government of Netherlands)	No longer applicable to revised table.
G-TS-565	A	51	0			Table TS-5 R6, C2. Insert at the end of the sentence: "and spreading of pollutants from polluted areas." (Government of Sweden)	No longer applicable to revised table.
G-TS-566	A	51	0			Do not understand the text in the 2nd column in the row Infrastructure ("non-linear impacts due to design criteria being exceeded") (Government of Netherlands)	No longer applicable to revised table.
G-TS-567	A	51	6			Terrestrial ecosystems - explain cause of current day threat/affect. (Government of Australia)	Not appropriate in this table.
G-TS-568	A	51	11			Coastal communities and infrastructure does not convey a sense of 'timing'. (Government of Australia)	No longer applicable to revised table.
G-TS-569	A	51				Table: The criteria column does not actually state the criteria developed by the authors for use in Ch 19 (magnitude, persistence, ability to adapt, etc.). It is not just the threat that something could be problematic that constitutes a key vulnerability. This section needs to be amended in accordance with changes recommended for chapter 19. This table must be consistent with the key vulnerabilities identified in the sectoral chapters. (Government of USA)	Criteria and cross-references appear in revised table.
G-TS-570	A	51				Table TS-5:(Greenland Ice Sheet, West Antarctic Ice Sheet) replace "Triggering of partial deglaciation possible 1-2C… millennium above 2.5-5C" with "Triggering of partial deglaciation/disintegration. Potential for ten or more metres SLR over several centuries to millennium." It is not appropriate to refer to specific temperatures as 'criteria for "key" vulnerability'. (Government of Japan)	No longer applicable to revised table.
G-TS-571	A	51				Table TS-5: This Table is awkward and doesn't deliver much impact compared to Page 50 lines 20-47 on reasons for concern. Column "key vulnerability" seems mislabeled. Might better describe the potential impacts (using words such as	Criteria and cross-references appear in revised table.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						complete loss, disappearance, threshold, irreversible, change, increase, decrease, exceed capacity). Not clearly explained what is so "key" about the impacts and vulnerabilities listed here. (Government of Canada)	
G-TS-572	A	51				table TS-5: It is suggested to substitute the language "implementation of adaptive potential for Arctic ..." by the following language in order to add clarity: "There are substantial limits and constraints to adaptation for the Arctic as well as Africa." (Government of Austria)	No longer applicable to revised table.
G-TS-573	A	52	3	52	5	The first sentence of the chapter is a key statement, "The aggregated global impacts on climate change are expected to be negative..." However, it is not clear. What metric is used: people at risk, monetary figures? How was aggregated: with equity weights, or neglecting the differential marginal utility of monetary wealth? (European Union)	Clarified thoroughly.
G-TS-574	A	52	3		5	The first bulleted point might be more appropriate in Section C (along with the suggested caveat that readers should not add-up sector/regional results and stress how global estimates like those in this chapter are to be used. (Government of USA)	Caveat added; really goes here per the organization of ES and PAO.
G-TS-575	A	52	12	52	12	It is suggested to insert the following before "Climate sensitivity": Uncertainties with regard to ….. (Government of Austria)	Done in revision.
G-TS-576	A	52	19	52	21	It is suggested to indicate also the underlying change in global temperature increase compared to the level in 1990 (about 0.25 degrees centigrade) order to include this effect easily in a figure comparable to figure TS-5. (Government of Austria)	Figures completely revised.
G-TS-577	A	52	21	52	21	The estimate of the number of people subject to hunger in 2080 (200-600 millions) does not seem correct. The current estimate for 2005 of people suffering from hunger is already 850 million (FAO) and has been increasing during the last four years. How could it be lower in 2080, when the World population will be most likely around 10 billions or more, and including the climated change effects on water resources ? Reference :Rockström J. (2004). Magnitude of the hunger alleviation challenge – Implications for consumptive use. Proc. Stockholm International Water Institute seminar « Balancing food and environmental security : finding opportunities for improving livelihoods ». Other Reference : Behrman JR., Alderman H., Hoddinnott J. (2004). Hunger and malnutition. Copenhagen Consensus Challenge Paper. (Government of France)	Care was taken for consistency.
G-TS-	A	52	21			The text concerning the number of people affected by climate change (coastal	Care was taken for consistency in revisions.

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578						flooding) is unclear. The text specifies "2-7 millions or more" whereas table 20.2 in section [20.6] states a range of 2-29 million additional people. (Government of Norway)	
G-TS-579	A	52	38	52	40	As per, inter alia, lines TS page 6 lines 28-30 that non-climate drivers may be more important in determining outcomes/impacts than climate change, TS page 13 lines 46-49 "anthropogenic pressures such as population and economic growth, land use and urbanization, rather than climate change, can be the most decisive factors behind adverse changes in freshwater resources" the importance of these non-climate drivers on vulnerability, and their potential to override efforts to adapt to climate change, need more detailed consideration in this section on sustainability. (Government of Canada)	Revised.
G-TS-580	A	52	42	53	9	This block of text, and the accompanying Figure TS-16 is based on a single study by one of the CLAs (Yohe et al., 2006) that has not been peer-reviewed and has not been mentioned in the FOD of Chapter 20. A first assessment of the methodology raises substantial questions about the validity of the results and the conclusions. It should therefore be seriously questioned whether this text (as well as the 5 pages in Chapter 20 based exclusively on this study) should be included at this stage, or in its current form. (methodology does not seem to justify the conclusions, is too simplistic and not validated. A simple change of category definitions would completely change graph). (European Union)	Emphasis reduced and discussion clarified.
G-TS-581	A	52	46	52	49	There are two points to be made: the first one is to inform already the reader of this para about the value what is considered to be a low climate sensitivity and what is a high one. For the time being only the reader of the caption to Fig. TS-16 gets such idea. The second issue is that it is proposed to limit consideration of impacts to a range that describes what figure the climate sensitivity is likely to have according to current understanding. Based on figure TS32 of WGI report this range is about 2 to 4.5 degrees centigrade. Irt is unlikely that the true value is below or above that range. We should provide the policy makers with a message as clear as possible. (Government of Austria)	Revised and emphasis reduced.
G-TS-582	A	52	46	52	46	Expression 'through 2050' is vague - perhaps authors mean 'By 2050'. (Government of Australia)	Ok.
G-TS-583	A	52		53		See chapter comments regarding recommendation for an expanded discussion and characterization of sustainability (which should then be reflected here) (Government of USA)	Definition, approved by plenary for the TAR, employed and noted.
G-TS-584	A	52				Section F: This section would be expected in the SPM also (Government of Germany)	Yes.

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G-TS-585	A	52				Section F: Could be integrated under aspect "How to cope with CC", in the light of sustainability (Government of Germany)	But borderline prescriptive.
G-TS-586	A	53	4	53	9	These lines are ambiguous as it is not clear that who will bear the cost of impacts and adpatations and hence these sentences should be appropriately rephrased or deleted. (Government of India)	Revised and clarified.
G-TS-587	A	53	7	53	9	This statement may be misleading. Presumably, developing countries are more vulnerable and regardless of scenario, global mitigation will benefit developing countries the most. If line 8 is intended to suggest that the exception is the case where developing countries' adaptive capacity has been overwhelmed to the extent that mitigation will no longer help, and that any benefits of mitigation would only be realized by developed countries, then this needs to be made clearer. (Government of Canada)	Revised and clarified.
G-TS-588	A	53	24	53	36	This does not add much since the TAR. Page 56 lines 43-45 suggest that "future research is required to determine the factors which contribute to this synergy....", but surely since that time there have been some developments, consideration of policies, experience gained, lessons learned, good practice and barriers identified… (Government of Canada)	But there is more literature to underscore the point.
G-TS-589	A	54		54		Determinants of adaptive capacity should be summarised. (Government of India)	Within space limits, they are.
G-TS-590	A	54				Fig TS-16: According to this Figure, enough is presumably known about adaptive capacity, and enhancing it, to produce such a map. However, the extent of this knowledge is not explained in the text, which would be very useful. (Government of Canada)	Text clarified, but the map reports results of an illustrative what if experiment.
G-TS-591	A	54				Fig TS-16: A Figure such as this would be a good way to communicate the importance of multiple stresses and of dealing with the non-climate drivers to reduce future vulnerability to climate change. (Government of Canada)	Have added a new figure to show climate is itself a source of multiple stress in some places at least.
G-TS-592	A	55	1			It should be mentioned that there are no large-scale modeling studies of adaptation-mitigation feedbacks, in large part due to the rudimentary modeling of feedbacks from impacts. This should be an important research agenda. In my opinion, this is an important conclusion of this chapter that would be worth adding to the executive summary and technical summary. (Government of USA)	I don't understand what is being asked for here. No action.
G-TS-593	A	55	5	55	15	Section G: This part should be located more in the beginning of the whole summary (Government of Germany)	It would be quite odd to move this section. How can we discuss knowledge gaps before

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							we present the current state of knowledge?
G-TS-594	A	55	5	55	5	It is suggested to substitute "principle" by "most significant". (Government of Austria)	Done.
G-TS-595	A	55	17	55	22	Too much emphasis on costs, and not enough on facilitating actual adaptation actions. For example, If the preceding section on sustainability is any indication, there has obviously been little advance on understanding and developing methods for dealing with the linkages between adaptation to climate change and sustainable development. (Government of Canada)	Section reduced and moved to end.
G-TS-596	A	55	18		18	The phrase, “Costing the impacts of climate change” is grammatically incorrect. Consider rephrasing to “the cost of climate change.” (Government of USA)	Done.
G-TS-597	A	55	22	55	23	It is suggested to add the following bullet point: second and third order effects of climate change. (Government of Austria)	A definition is required of what is meant by ‘second and third order’ for clarity – no action.
G-TS-598	A	55	22	55	23	Add a new point: "Enhanced impact as a result of interaction between climate change and other anthropogenically induced environmental changes." (Government of Sweden)	Done.
G-TS-599	A	55	23	56	45	Section G: This is what policy makers look for in a summary, therefore, it should also be included in the SPM. (Government of Germany)	Given space constraints, only a very short version is included in the SPM.
G-TS-600	A	55	23			Section G.2 "Future research needs". The improvement of the global and regional scenarios should be also considered as future research needs. (Government of Spain)	Done.
G-TS-601	A	55	25			The need for future research on costing the impacts is a crucially important point! (Government of Finland)	And included. No action.
G-TS-602	A	55	36	55	36	It is suggested to substitute "accurate" by "better". (Government of Austria)	Done.
G-TS-603	A	55	48	55	49	are Climate model(ler)s not mainly focussing on "emission scenarios" rather than "development pathways"? - authors may wish to rephrase and talk about integrated (climat and socio economic) modelling (European Union)	More relevant to WG1. The whole point is that outputs from climaet models do not meet the needs of impacts analysts. No action.
G-TS-604	A	55				Section G: also in SPM? (Government of Germany)	See G-TS-599.
G-TS-605	A	56	4	56	8	It is suggested to include part of that information in the SPM due to its critical importance for policy makers - indicating that those results are based on few studies only.	Added brief sentence to SPM Section E.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Government of Austria)	
G-TS-606	A	56	13	56	13	It should be insisted also on the fact that future climate scenarios are still very unprecise as regards the hydrological cycle and extreme weather events. This is a major obstacle for assessing risks and costs. The IPCC should insist on the fact that there has not been enough high resolution global models experiments, capable to address the local scale, and recomend an increased effort on access of the community to petaflop supercalculators. (Government of France)	Senetence added about climaet models.
G-TS-607	A	56	14	56	14	It would be helpful to Governments, in thinking about directions in climate change science investment, to provide a little more geographic scale specificity in speaking about 'regional scale'. (Government of Australia)	Very difficult to do and not attempted here.
G-TS-608	A	56	15	56	15	We suggest to add to the research needs ;…precipitation changes and their hydrological consequences on the water resources, and extreme events. (Government of France)	Done.
G-TS-609	A	56	27	56	27	At the end of this line, we suggest to add : The current availability of hydrologic data (discharges of rivers, rainfall,…) to the research community is rapidly diminishing, in developed countries because these data are now considered proprietary,and must be paid, and in many developing countries, because of uncertain data collection. This situation should be improved by an international data collection and exchange program and agreement. (Government of France)	This is too close to policy prescriptive, and has not been added.
G-TS-610	A	56	42	56	42	Add "more" before "resilient". (European Union)	Done.

LATE COMMENTS

G-TS-1	LATE	3	7	3	7	Suggestion to change "The report..." to "The WGII report…" (Government of Mexico)	Done.
G-TS-2	LATE	7	39	7	39	More explanation about what is referred to as "stakeholder participation" in the assessment process might be relevant at this point. (Government of Mexico)	More detail now given.
G-TS-3	LATE	12	10	12	29	Suggestion to add the impacts in housing and tourist infrastructure caused by increasing extreme events, such as a higher intensity of tropical storms (Government of Mexico)	This subject is covered in Section 1.3.8 Disasters and Hazards of the chapter, with limited studies documenting these effects. Confounding factors of increases in

							infrastructure and insurance coverage make them difficult to discern. Therefore it has not been brought forward to the TS and SPM.
G-TS-4	LATE	19	1	19	4	Suggestion to add an example of socio-ecological resilience for coastal communities (Government of Mexico)	Text deleted – we have removed any mention of socio-ecological resilience.
G-TS-5	LATE	20	TS-2	20	TS-2	Suggestion to add under Mayor storms, in coastal areas combined with SLR: damages in ecosystems (Government of Mexico)	Not appropriate for Industry, Settlements and Society section – no action.
G-TS-6	LATE	28	3	28	29	Suggestion to add Mexico as an example for the impacts on: low-lying areas; buildings and tourism; mangroves. (Government of Mexico)	Added.
G-TS-7	LATE	36	25	36	32	Suggestion to add hurricane Katrina as an example for ...and the record hurricane season of 2005 in the North Atlantic (eg. Katrina). (Government of Mexico)	Reworded to refer to Caribbean region. Katrina not added since more relevant to North America.