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

Government and Expert Review of Second Order Draft

Specific Comments

EXPERT REVIEW COMMENTS

TECHNICAL SUMMARY

Author responses - December 2006

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 expert review comments and record keeping

IT IS RECOMMENDED THAT:

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

Substantive comments

- The chapter writing team should discuss all substantive expert 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
E-TS-1	A	0				Future greenhouse gas emissions and the evolution of their underlying driving forces are highly uncertain, so research priority should be given to exploring hypothesized interactions and linkages between key variables by using scenarios analysis, and how these might be affected by policy interventions. (James Bero, BASF)	Yes, but such approach is qualitative and descriptive, and doesn't really address the need for quantitative estimates amongst the policymaker and research communities, which is what we have tried to do in the SPM and TS. Also, the assessment is driven by what is in the literature, and if the literature emphasises this emission-based approach, then it is hard, and not justified, for us to do otehrwise.
E-TS-2	A	0				There is a clear need to place more emphasis on risk management as a means to deal with uncertainty and that this means that low probability outcomes having large magnitude must be taken seriously. This is a key to reaching many readers who are worried by the uncertainties and might be persuaded at present that uncertainty means do nothing about it. There is a need to note the many recent observations and refereed papers in late 2005 and 2006 that indicate rapid changes due to global warming, some of which will act as amplifiers of the original change, e.g., retreat of Arctic sea ice, melting of permafrost, some cases of the biomass becoming a source rather than a sink of CO2, acceleration of Greenland and some Antarctic outflow glaciers, the role of surface meltwater in triggering breakup of ice shelves and acceleration of glaciers (both not in cryospheric models), etc. See the long reference list and article in EOS "Are Scientists Underestimating Climate Change?", due out in July 2006. TSU has copy. There is serious duplication between Boxes TS-3 and TS-4 and the related text, but the box entries are shorter and less accurate and inclusive. I think the Boxes should go in favour of the more measured text. Many of the comments made by me (Pittock) on this TS are made without reference to the relevant chapters, as I expect is the case with many other reviewers who do not have time to read the whole report at this stage. Where the comments here are not consistent with the underlying chapters they should be referred to the authors of the chapters concerned so that they can decide if changes should be made to the chapters. Often reading a broad overview may reveal weaknesses that can then be addressed in detail in the chapters. (Pittock Barrie, CSIRO (retired))	There is more in the TS on rapid changes (and key vulnerabilities). We have considered at l;ength the issue of impacts occurring more rapidly than was expected in the TAR, but have not found sufficient sound evidence to support such a statement. However, this is to flag that it has been considered. We have decided to keep this structure, and try to improve the separation – the main text should set out the genral headline statements and the bullets in the boxes should contain the detail and specificity.
E-TS-	A	0				The Technical Summary is disappointing. It has major inconsistencies. The	We have done our best – hopefully this

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
3						section C2 gives good summaries of the impacts of climate change globally - however the body of text in the preceding sections bears little resemblance. It repeatedly downplays negative impacts. Repeatedly it attempts to insert potential positive impacts - however laughably unlikely or trivial in consequence. This attempt perhaps to be "balanced" or "even-handed" fails entirely. It undermines and discredits the whole document. |Assuming some parties are arguing for this approach - then perhaps a consistent rating is needed, akin to that for confidence and likelihood - of the significance of an impact. Many of the positive ones mentioned are utterly trivial - and should be identified as such. (James Curran, Scottish Environment Protection Agency)	reviewer will think more highly of the FGD.
E-TS-4	A	0				The authors need to do a scrub on the word "may" and other similar words not in the lexicon, replacing them with "is likely to" or whatever is appropriate--sentences with the word "may" are essentially meaningless> (Michael MacCracken, Climate Institute)	We recognize this failing in the SOD, and have worked to try and remove 'may' and related words from the FGD.
E-TS-5	A	0				Thank you for your work on this most important of documents. I hope my comments are helpful. The structure of this report, following from Box TS-1, is to give a probability of an impact ocurring (using exceptionally unlikely through to virtually certain) followed by a confidence in that prediction (from very low confidence to very high confidence). When a prediction is considered particularly important, it is shown in bold. Predictions in bold are usually followed by a justification. This is an excellent structure but is often not adhered to. The most common sources of failing to follow this structure are (1) the failure to use these defined words. For example phrases such as "often", "probably" and "is expected to" are used to loosely state the likelihood of an impact. In suggesting alternative wording, I have found myself inserting "likely/very likely/virtual certain" because the word used did not confer the likelihood accurately enough for me to know what was meant (point continued in No2). "Probably" is particular awkward, since all likelihoods have a probability. I have not commented on all statements with an ill-defined likelihood descriptor - only those that are potentially misleading. A more thorough critique would re-word almost every bold statement in the document. (2) the use of confidence in a tautological sense. i.e. we have high confidence that the research conducted since TAR has resulted in more knowledge. This trival use of the confidence structure is awkward, and resulted in me loosing faith in the use of confidence levels. Any statement like this should not be given a confidence level because it is not a prediction; (3) the use of these now specially defined likelihood or confidence phrases loosely. For example Box TS-3 lists the "main likely impacts". Should I	We are aware of all these shortcomings in the SOD, and have done our best to address them in the FGD.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						infer this to be impacts that are predicted to have a 66 and 90 % probability of ocurring and of any confidence level that are consider important. I suspect that TS-3 is a list of likely, very likely and virtually certain impacts that have a high or very high confidence level and are considered important. But I am not sure. (Mark Baird, University of NSW)	
E-TS-6	A	0				All references to glaciers, ice caps and other cryospheric components should be carefully cross checked with WG1 Ch 4. (Georg Kaser, Geo and Atmospheric Sciences)	Done – a very extensive exercise has been underatken with respect to not only the cryospeher but also SLR, MOC etc.
E-TS-7	A	3	17	3	18	In some cases, a balanced assessment has not been presented. Specific examples to be provided in individual comments. (Sharon Smith, Natural Resources Canada)	No response required (this comment very similar to E-TS-12)
E-TS-8	A	3	17			Comment in full first mention in chapter. After 'literature' write 'since the third assessment report TAR' (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Done
E-TS-9	A	3	18	3	18	Change "and" to "and especially appropriate"--one does not want to say that one will consider absolutely everything. (Michael MacCracken, Climate Institute)	Done
E-TS-10	A	3	20			Delete 'the major aspects of' (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Done
E-TS-11	A	3	21	3	21	Change "in 2006" to something like "as of 2006" or "up through literature published in 2006" (Michael MacCracken, Climate Institute)	Not done – in UK English this text is OK
E-TS-12	A	3	45	3	45	The TS should capture the most important scientific aspects of the full assessment but it should also present a balanced view of all information presented. In some cases a more extreme view is given that may be based on limited data, one report (that may be weak) etc. Specific examples provided in indvidual comments. (Sharon Smith, Natural Resources Canada)	No response required.
E-TS-13	A	4	1	4	27	The definition of the terms used to characterize uncertainty do not include the qualitative terminology IPCC has also agreed to use, nor do they state that in most cases expert judgment is used in assigning uncertainty levels. The text needs to explain the process used to quantify expert judgment and to reference the guidance document developed on this topic. WG II should also consider use of the qualitative terminology IPCC has adopted. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Box TS-1 now explicitly references the Guidance Note.
E-TS-	A	4	31	4	31	I would urge including a definition for "resilience"	Included.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
14						(Michael MacCracken, Climate Institute)	
E-TS-15	A	4	37	4	39	Quotes in italics and throughout report? (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	No action – this is not the convention used her.
E-TS-16	A	4	47	4	49	This sentence is confusing. The two "its" refer to a System, not vulnerability, yet vulnerability is the subject of the sentence. Change first "its" to "the system's". (Pittock Barrie, CSIRO (retired))	Re-phrased to remove any confusion.
E-TS-17	A	4				Box TS-2. Include in the box the 'Emissions Scenarios' (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	This is not given as being more appropriate to WG3, but temperature change information is given in Fig. TS-4.
E-TS-18	A	4				Box TS-1. How quantitative is the description of confidence or liklihood? The numerical scale would appear to be rather precise for what often may be a qualitative assessment. (Sharon Smith, Natural Resources Canada)	This box is derived directly from the Guidance Note and we rely on the judgement of the Guidance Note authors.
E-TS-19	A	5	21	5	21	Change to say "to more completely incorporate the interests and expectations of decision makers and meet the needs of researchers" so it is clear that we want decision makers involved in effort as we are trying to be responsive to them. (Michael MacCracken, Climate Institute)	We have revised the text to better reflect the revised conclusions in the chapter. This stresses enhanced information exchange between the policy and research communities.
E-TS-20	A	5	23	5	23	The point needs to be clearly made that "Scenarios are not predictions of the future, but are plausible futures which allow alternative futures or policies to be evaluated for their consequences and desirability." (Pittock Barrie, CSIRO (retired))	We have added a one-line definition and referenced the Box in which a longer set of definitions is provided.
E-TS-21	A	5	26			…of the four SRES storylines with different socio-economic development trajectories. (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Not only socio-economic development, but also technological, land use changes etc. We don't need to specify this in the caption because it is described in the text.
E-TS-22	A	6	1	56		We have provided extensive comments on the SPM, and various chapters and their Executive Summaries of this SOD from whence the material in the TS is taken from. Therefore, we will not repeat them once again for the TS, but the next draft of the TS should consider those comments fully. We presume they will be passed on by the authors of the individual portions to the authors of the TS. By the same token, comments made here should be passed on to the authors of the relevant chapters. (Indur Goklany, US Department of the Interior)	Comments have been shared with TS and chapter authors.
E-TS-23	A	6	2	6	3	Replace "Since these may become more …" with "Whether or not they become more…" and append at the end of the sentence, the following: "to current climate, climate variability and climate change and, in any case, ." Rationale: First, this	We have inverted the sentence to emphaises the value of the studies in their own right, but stressing their added value if extremes become

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						general formulation is valid and more useful from a policy perspective. Second, its not clear that all exterme events will become more frequentand/or severe everywhere. (Indur Goklany, US Department of the Interior)	more frequent or severe.
E-TS-24	A	6	6	6	6	Change "to generate" to "to represent the complex interactions of the Earth system and to generate" to give an indication of what climate models do for us. (Michael MacCracken, Climate Institute)	We disagree with this formulation. While the reviewer is correct in identifying this as a major purpose of climate modelling, it is not the function required of models in the context of CCIAV. The function is to serve scenario development, and we don't need to report how complex the models are that provide this information. That is the job of WG I.
E-TS-25	A	6	28	6	30	The sentence commencing on line 28 should be pulled into the SPM. It's a critical finding from policy makers' perspective. See Goklany (2005c). (Indur Goklany, US Department of the Interior)	This is a decision for the SPM author team.
E-TS-26	A	6	28	6	30	The point should be made that many non-climate drivers, such as population growth in coastal areas, may interact with climate stresses, such as increased storm surge heights or frequency, so as to amplify the impacts of the climate changes. In other words, multiple stresses can act synergistically to cause greater impacts than either stress acting alone. (Pittock Barrie, CSIRO (retired))	We have added a line on multiple stressors.
TS -27	A	6	28			…different storylines and hence projected scenarios. 'I am not sure storyline captures what are in essence projected scenarios' (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	We have clarified the definitions of scenario and storyline in section A2.1, though there may not be sufficient space to retain these definitions.
E-TS-28	A	6	30			Add the following new sentence after the period (full stop) on line 30: "Further complicating matters is that impacts should consider that the segements of societies that would be impacted could implement autonomous (and automatic) adaptations based on their adaptive capacity, which itself depends on assumptions regarding economic and technological development embeded in the scenario storyline. However, there are relatively few impacts studies that fully consider changes in adaptive capacity over time that are consistent with the assumptions in the underlying scenarios regarding trends in economic and technological development ." For example, while Nicholls (2004) and Parry et al. (2004) make an effort at incorporating changes in adaptive capacity over time, they stil do not fully account for options that could be available in the future to a richer and more technologically advanced society. Other analyses either assume similar adaptive capacity as exists	Some of these points are raised in the chapter in relation to adaptation scenarios (section 2.4.6.7) and also now identified as a research gap in section A.2.1. We do not have sufficient space to include such a long paragraph here.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						today or, for practical purposes, ignore it altogether; see Goklany (2005c, 2006a). (Indur Goklany, US Department of the Interior)	
E-TS-29	A	6	33			An important class of scenarios has been neglected here and in Chapter 2. These are actual policy-driven scenarios such as that agreed to by the Asia Pacific Partnership on Clean Development and Climate (AP6) in January 2006. See two reports from the Australian Bureau of Agricutural and Resource Economics at www.abareconomics.com. The reports are ABARE Research Report 06.1 "Technological development and economic growth", and ABARE Research Report 06.6 "Technology: its role in economic development and climate change". These reports evaluate the climatic consequences of policies of greenhouse gas emissions reductions adopted in principle by the US, Australia, China, India, the Republic of Korea and Japan. The second report estimates that these policies, if the technology is adopted globally, will lead to a 50% chance of global mean temperatures increasing by 2.6 degrees centigrade or more by 2100 relative to 1990 levels, and a 100% probability of exceeding 1.7 degrees C at 2100. To my knowledge this is the only example of such a scenario being evaluated and it is very important as it is already the agreed policy of the world's major greenhouse gas emitting countries. I will forward pdf copies of these reports to the TSU. (Pittock Barrie, CSIRO (retired))	The scenarios in this report are strictly emissions mitigation scenarios and were not used for CCIAV assessment. They could be added as a general reference for mitigation scenarios, but otherwise are relevant to WG3, not to our chapter.
E-TS-30	A	6	35	6	38	I would think that mention needs to be made of whether it is being assumed that Kyoto Protocol, as now in force, is being assumed. Also, it would help to indicate that the scenarios do assume the ongoing pace of efficiency improvement that is being driven by other forces--so that the US President does not get to claim all of this for his emissions "reduction" program. (Michael MacCracken, Climate Institute)	This level of detail is well beyond anything reported in Chapter 2, where the main focus is on idealised stabilisation profiles such as WRE and how they might "draw down" impacts during the 21st century relative to unmitigated emissons. This type of discussion is more appropriate for Chapter 3, WG III.
E-TS-31	A	6	37	6	38	Replace "and the impacts of climate change" with "adaptation, and the residual costs of climate change impacts".. See, for instance, Goklany (2006a, 2005a) for how this can be done, and an example of an attempt to make such trade-offs. (Indur Goklany, US Department of the Interior)	We have revised the text to reflect what is reported in the latest (revised) version of Chapter 2.
E-TS-32	A	6	46	6	47	After the ppm- of what? Need to say what CO2 would help to give in relation to pre-industrial baseline levels (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	The text has been omitted, though new text does make this explicit.
E-TS-33	A	6	47	6	47	I would suggest changing this to say "surrogates yet exist" (Michael MacCracken, Climate Institute)	There are not going to be any changes to the SRES scenarios, so the existing statement seems valid. However, we have now omitted

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							most of this paragraph and added different text and a figure in its place.
E-TS-34	A	6	54	6	54	Change "and" to "or" as these are treated separately. (Michael MacCracken, Climate Institute)	Change made.
E-TS-35	A	6	56			Line 56: After "timing" add "and probability". (Indur Goklany, US Department of the Interior)	Likelihood has been added.
E-TS-36	A	7	3			Add the following new sentence after the period (full stop) on line 3: "However, the probability of such events is unknown, although for the North Atlantic meriodonal overturning circulation, if this occurs at all, it is unlikely to occur until at least 140 years hence." References: (1) Gregory, J. M., et al. 2005. A model intercomparison of changes in the Atlantic thermohaline circulation in response to increasing atmospheric CO2 concentration. Geophysical Research Letters 32: L12703, doi:10.1029/2005GL023209. (2) Seager, R., et al. 2002. Is the Gulf Stream responsible for Europe's mild winters?: Quarterly Journal of the Royal Meteorological Society 128: 2563-2586. (3) Weaver, A. J., and C. Hillaire-Marcel. 2004. Ice growth in the greenhouse: A seductive paradox but unrealistic scenario. Geoscience Canada 31: 77-85. (4) Wunsch, C. 2004. Gulf Stream safe if wind blows and Earth turns. Nature 428): 601. (Indur Goklany, US Department of the Interior)	A valid point but there is not discussion in Chapter 2 to support this, largely due to the page length limit. There is more extensive discussion in WG I.
E-TS-37	A	7	12	7	14	It's far from clear whether, how and how well, such (probabilistic) assessments of impacts take into consideration the uncertainties not only in climate scenarios, GCM results, downscaling (if appropriate), impacts modeling, adaptive capacity, and so forth, and how (and how well) they are reflected in the probabilistic assessment. (Indur Goklany, US Department of the Interior)	There is more detailed discussion in Chapter 2 on how different studies have constructed probabilistic futures representing different sources of uncertainties.
E-TS-38	A	7	14			…timing of any exceedance. (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Replaced by "such exceedance".
E-TS-39	A	7	28	7	28	Add after "opportunities", "in the context of inevitable uncertainties", since that is why risk management is necessary, and it is uncertainties that many decision makers are worried about. (Pittock Barrie, CSIRO (retired))	Text has been revised and uncertainties are already stressed.
TS -40	A	7	30	7	30	To stress the point further for those who do not understand the concept of risk, add "Risk is the product of probability times consequences, and thus large risks can arise from relatively low probability outcomes if those outcomes are severe." (Pittock Barrie, CSIRO (retired))	Details are given in the Chapter (Section 2.2.6, Figure 2.1).
E-TS-	A	8	1	8	1	replace "temperature change" by "temperature increase"	"Change" is more neutral and conventional.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
41						(Antje Schwalb, Institut für Umweltgeologie)	
E-TS-42	A	8	12			Explain location of small islands in legend. Everything else explicit. (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Reference made to a map in Chapter 2 for definitions of regions.
E-TS-43	A	9	0			Section B. This is a very important section. I have three overall comments aimed at improving the clarity and defensibility of its findings. Firstly, the current draft tends to blur the distinction attribution of observed effects to temperature changes per se and to temperature changes that are due to GHG emissions. It might be better to restructure this section to maintain this important distinction, e.g. by first describing all the effects that are attributed to temperature change per se, followed by a separate sub-section that describes the method for attributing changes to GHG emissions and listing the effects that can on that basis be attributed to GHG emissions. Secondly, the method for attribution used in the underlying chapter is significantly different from the method used by WG1 (not just in the AR4 but also in previous assessments). This does not invalidate the methodology employed here, but raises a question about suitable wording. As I see it, the chapter 1 methodology does not generally demonstrate that there is no alternative physically plausible explanation for the observed changes, because the studies used in this assessment don't check systematically for the role of regional climate patterns and decadal climate variability. Many more model runs, statistical and physical tests would be required to establish this, especially to assess the role of specific modes of oscillation and unforced variability at the relevant local scales. In addition, the methodology does not quantify the amount of variability that is explained by GHG forcing in the model runs, it simply shows that agreement is better with than without forcing in those model runs. Therefore, instead of referring to regional temperature changes as "attributed", it might be better to say that they are "consistent with the signal expected under global warming, and that they are not readily explicable through natural variability as simulated by GCMs". It would help consistency between reports if the word "attribution" were used only where a quantitative assessment is used as the basis for statements that can provide information on the amount of variability that is explained, including by unforced variability (as has been done by WG1 for changes in the physical climate system). My third overarching comment is that the language is sometimes ambiguous and open to mis (=over) intepretation. For example, stating that something has been attributed to GHG could be read to imply that GHGs are the dominant, if not sole, cause for the observed change. However, there is no evidence or analysis that would demonstrate that GHGs are the sole causes of any the observed effects. It	Text rewritten.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						would therefore improve robustness of these findings if suitable qualifiers were inserted in all major statements, along the lines of "GHGs are likely to have contributed to", or "part of the observed changes can be attributed to", "there is a discernible human influence on...". In contrast, the unqualified attribution statements are very open to scientific challenge. (Andy Reisinger, IPCC SYR TSU)	
E-TS-44	A	9	1			Section B. This section includes many changes as "impacts" which are also considered as "changes in the physical climate system (atmosphere, ocean, cryosphere)" by WG1. This does not mean that the WG2 TS should not refer to them again, but perhaps it would be useful to place more emphasis on impacts resulting from those changes rather than those changes themselves. (Andy Reisinger, IPCC SYR TSU)	We have tried to take this approach in this version of the TS.
E-TS-45	A	9	3	9	4	Since attribution thus far is a statistical statement, e.g. a judgement of likelihood of cause, it is not appropriate to state that something is or is not “attributed” or “caused” by emissions unless what is meant by this judgement is explained. Is something attributed if it is judged likely? This statement is assigned high confidence (8 out of 10 chance its correct) however what the “many” are is not specified and so it remains unclear what is the specific conclusion. Suggest that these statements on attribution be clarified by assigning judgements only to specific, testable conclusions. (Haroon Kheshgi, ExxonMobil Research and Engineering Company)	Test completely rewritten. No long relevant.
E-TS-46	A	9	3	9	4	I do not see how "climate-driven" can be used as an adjective here--how would one distinguish climate-driven from non-climate driven. The sentence is fine without this phrase, though one may want to say "attributed to the temperature increase and changes in other climatic variables caused by the increased concentrations of greenhouse gases" (better to say concentration than emission--think for example about methane). (Michael MacCracken, Climate Institute)	Test completely rewritten. No long relevant.
E-TS-47	A	9	3		4	High confidence is quite righly given to the attribution of changes in physical and biological systems to temperature increases caused by GHG emissions. But this is in stark contrast to the opening (p3, line 24) of the Summary for Policymakers which says that increases in temperatures are "likely" to be the result of GHG emissions. Consistency must be maintained. (James Curran, Scottish Environment Protection Agency)	Test completely rewritten. No long relevant.
E-TS-48	A	9	6	9	6	Change to read "recent changes in regional climatic conditions"--as is it sometimes seems as if the GHGs could change regional climates without changing the global climate.	Done.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Michael MacCracken, Climate Institute)	
E-TS-49	A	9	9	9	9	Change "major climate factors" to "most important changes in climate" or something similar as "factors" is not the right word. (Michael MacCracken, Climate Institute)	Done.
E-TS-50	A	9	21	9	21	Delete "Nevertheless" as it really does not make sense. (Michael MacCracken, Climate Institute)	Text rewritten. No longer relevant.
E-TS-51	A	9	22	9	24	The sentence says that "Observed responses..." have been attributed. This would mean that ALL observed responses have been attributed - which is clearly incorrect. Please choose an appropriate qualifying word or phrase, such as "Several large scale observed responses and statistical changes ..." (Andy Reisinger, IPCC SYR TSU)	Text rewritten. No longer relevant.
E-TS-52	A	9	22			is it worth making a point about different phase lags here? (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Text rewritten. No longer relevant.
E-TS-53	A	9	30	9	34	The text need to define Types 1, 2 and 3 observed responses. While these are explained in the caption of Figure TS-3, this is an obscure place to provide this information, which could easily be missed in an incomplete reading of the TS. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Text rewritten.
E-TS-54	A	9	30	9	34	The numbers presented in this table do not agree with the numbers presented in Table 1-12 (Chapter 1, Pg. 69-70). This inconsistency need to be rectified. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Table redone.
E-TS-55	A	9	30			Table TS-1. line 2 re types needs explanation. This is given in Figure TS-3, but needs to be in caption here also. (Pittock Barrie, CSIRO (retired))	No longer relevant.
E-TS-56	A	9	31			Need to explain types, type 2, type 3 in legend. (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	No longer relevant.
E-TS-57	A	9	32	9	32	The Table needs some better explanations. First, what is meant by "type" is not explained here, but in Figure TS-3, which is a bit confusing. Second, is there some sort of statistical test implied by saying "consistent and not consistent"--and if so what (is a very high standard being used or a relative likelihood standard)? It also seems to me essential to say that there is not data for most cells or that most cells are unchanged, for having, for example, only 83 out of 2560 cells be consistent with warming, which is one way to read this, seems almost less than would be expected by chance--and almost same problem for types 2 and 3. I just do not think the table is convincing of very much. (Michael MacCracken, Climate Institute)	No longer relevant.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-58	A	9				Footnote 5, line 1. Should read "… is linked to anthropogenic climate change …" (Pittock Barrie, CSIRO (retired))	Footnote no longer present.
E-TS-59	A	10	0			Figure TS-3: caption: It would be helpful to use another word than "attributable" regional warming. The approach taken by chapter 1 is significantly different (employs much weaker criteria) to the approach by WG1, and it is not helpful if we use one word in the IPCC based on two different approaches that lead to considerably different findings. This does not mean that the approach employed by chapter 1 and summarised in the TS is invalid, but it might be better if it didn't use the same word as has been used for the last several assessments, which implies a much more systematic testing of hypotheses and model performances including finger printing techniques, and not least a quantification of the amount of variability that is explained by GHG forcing. For example, it has been clearly demonstrated that the warming over the Antarctic Peninsula is largely due to dynamic changes caused by ozone depletion, not by GHG emissions. Nonetheless, the Figure TS-3 would suggest (as a result of the less strict tests carried out by chapter 1) that it can be attributed to GHG emissions. This would represent a significant error. In general, "attributable" without any further qualifiers would mean "entirely due to" - which seems to overstate the case. The phrases "not reproduced by GCMs forced only with natural climate drivers", or perhaps "not readily(!) explainable by natural climate variability", would be correct; "attributable [to GHG emissions]" is not correct. (Andy Reisinger, IPCC SYR TSU)	Attributable no longer used.
E-TS-60	A	11	1			A figure like TS-3 should also be done for Oceans if at all possible. (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Addressed, though lack of specific long term stations within the ocean makes this more difficult.
E-TS-61	A	11	4	11	7	While this is an important statement it is silent on an equally important issue that policy makers would be concerned about, namely, whether these changes are outside of the bounds of natural variability, and the extent to which available information allows such a judgement to be made for the diffrent kinds of processes. Accordingly, modify this statement and the subsequent text to provide this information. (Indur Goklany, US Department of the Interior)	Addressed in section 1.4.
E-TS-62	A	11	4	11	7	This would read more easily as two sentences rather than (i) and (ii). (Pittock Barrie, CSIRO (retired))	Disagree.
E-TS-63	A	11	5	11	5	It is simply not clear what is meant by the phrase "managed systems in the cryosphere"? Why not simply delete "affecting natural and managed systems in". Or maybe the word "the cryosphere" needs to be changed to "the Arctic" or "polar	Disagree.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						regions". (Michael MacCracken, Climate Institute)	
E-TS-64	A	11	9	11	12	There is limited evidence of climate change impacts on permafrost-based infrastructure. As stated in Ch. 15 WG2, often damage to infrastructure caused by permafrost thaw is wrongly attributed to climate warming. This thawing and associated damage is frequently related to the effects of disturbance of the ground surface and the ground thermal regime related to construction and operation of infrastructure and also failure to incorporate this into the engineering design. The statements in this section of the TS are based on Ch. 1 rather than Ch. 15 which presents a more thorough assessment of the literature. The statements in Ch. 1 are based on limited publications and perhaps not particularly strong references and also some misinterpretation of the information in the publications. Further details provided in Ch. 1 comments. (Sharon Smith, Natural Resources Canada)	Addressed, permafrost-based infrastructure deleted.
E-TS-65	A	11	10			Shouldn't 'changes in Artic mammals and Antarctic Peninsula fauna' be in B.2? (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	No. Agreed in Plenary that these changes should be addressed in the this section.
E-TS-66	A	11	12	11	15	The authors might wish to reconsider the wording regarding which of those impacts can be formally "attributed" to GHG emissions (which is what most readers would take the phrase "undergoing changes in response to ..." would mean). In most instances, global warming caused by GHG emissions may have contributed to changes, but is not the only driver for the observed changes. The phrase "have contributed to the observed changes", or "have produced a discernible human influence" (useful language from the SAR) will be more correct in most instances than "changes in response to global warming", which implies attribution of the entire change to this particular cause. Where possible, it would help to quantify the fraction of the observed change that can be attributed (by phrase such as "most of", or "more than half"). Where a robust quantification of the attributable fraction is not possible, some qualifiers such as "some of the observed change can be attributed" would be important to use. Note that WG1 only finds a "discernible human influence" on changes other than temperature (eg on sea-ice), but it does not "attribute" changes in sea-ice etc to anthropogenic forcing because this would imply that all of the observed change is entirely due to anthropogenic forcing. The latter statement would be highly challengeable - current models and observational constraints don't allow such a quantification to be made. We also need to be careful about other confounding factors; eg the collapse of ice shelves, as a general statement, cannot be attributed because at least for the Antarctic Peninsula we know	Addressed.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						that ozone depletion and related circulation changes significantly contributed to the warming. Neither is it clear that the retreat of parts of the Antarctic ice sheet can be attributed, given that Antarctica is projected to grow over the 21st century; we don't sufficiently understand the source of the current dynamic imbalance in the WAIS. (Andy Reisinger, IPCC SYR TSU)	
E-TS-67	A	11	17	11	17	recent evidence shows there is more evidence? (Mark Baird, University of NSW)	Changed.
E-TS-68	A	11	20	11	22	The observed and modelled strengthening of the Annular Modes in both hemispheres is consistent with great aridity in Mediterranean-type climates as the westerlies associated with rain systems move further polewards. This is observed and projected in southern Europe, southern Australia and southern Africa and in other regions. See the relevant chapters, and my EOS paper in press July 2006 for recent references. (Pittock Barrie, CSIRO (retired))	Section rewritten. No longer relevant.
E-TS-69	A	11	22		22	In wetter areas there is no consistent pattern of trends - I don't know what this means. In my experience, the changes in rainfall are consistent with model predictions which is what matters and which is what should be addressed here. (James Curran, Scottish Environment Protection Agency)	Text rewritten.
E-TS-70	A	11	27	11	27	As 0.1 units looks very small, some idea of the error bars would be useful to evaluate its significance. (Pittock Barrie, CSIRO (retired))	Text rewritten.
E-TS-71	A	11	27		27	Impacts of ocean acidification may to a degree still be "uncertain" but there is also good evidence beginning to accumulate of potentially very damaging effects. This would be a good place to introduce the precautionary principle - which suggests that lack of full and complete evidence should not prevent us from taking avoiding action. (James Curran, Scottish Environment Protection Agency)	Done. Text rewritten.
E-TS-72	A	11	32		32	The effects are not just restricted to coastlines "distant" from human modification. This is strange wording. There are numerous impacts on coastlines very close to human settlements and also heavily modified by human action. (James Curran, Scottish Environment Protection Agency)	Please provide specific references for these.
E-TS-73	A	11	36	11	37	The 1.7 mm/yr rate is average for the century--the recent rate is 3 mm/yr and this should be used. And the sentence is phrased wrong, as the reasons for the global rate being exceeded include the reasons the global rate is rising. And be careful of saying "many regions" because there are also "many regions" where this is not the case--as much goes up as down, roughly. (Michael MacCracken, Climate Institute)	No longer present.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-74	A	11	41	11	45	The previous comment applies to this portion as well. (Indur Goklany, US Department of the Interior)	Addressed in Section 1.4
E-TS-75	A	11	50	11	50	10 degrees latitude (Pittock Barrie, CSIRO (retired))	Corrected.
E-TS-76	A	11	51	11	51	Change to "than for any" (Michael MacCracken, Climate Institute)	Text rewritten.
E-TS-77	A	11	51			…terrestrial study reflecting the high connectivity of ocean systems. These have also been marked changes in phenology (Edwards M & Richardson A. NATURE 430 (7002): 881-884 AUG 19 2004). Similar changes have occurred on rocky shores. (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Range changes and species abundances are the stronger evidence as judged by the Authors.
E-TS-78	A	12	3		3	Flora and fauna are not "expanding", they are being translocated - which actually means a diminishing area of suitable habitat as they are pushed up mountains or towards the poles. (James Curran, Scottish Environment Protection Agency)	Text rewritten.
E-TS-79	A	12	5	12	7	The claim in this sentence that the disappearance of a few butterfly species has been attributed to climate change is stronger than can be justified from the underlying chapter. Chapter 1, Pg 46, lines 13-15, states that climate change has had a "significant impact" on the extinction of two butterfly species. Change the end of the sentence to: "and has had a significant impact on the extinction of two butterfly species." (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Addressed. Changed to “limited evidence”.
E-TS-80	A	12	6	12	6	Please be clearer when you use the phrase "climate change": is this climate change in the IPCC definition, ie any change in climate regardless of cause, or is this in the sense of the more common perception and interpretation, ie in response to GHG emissions? This is a critical issue and it would be helpful if the text were explicit, otherwise there is too much room for misinterpretation and misquotation. (Andy Reisinger, IPCC SYR TSU)	Done.
E-TS-81	A	12	7	12	7	including a few key examples of butterfly disappearance (Mark Baird, University of NSW)	Text rewritten.
E-TS-82	A	12	7			…disappearance. Changes in the cryosphere have resulted in changes in Arctic mammals and Antarctic Peninsula fauna. (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Disagree. Already addressed earlier in Cryosphere section.
E-TS-83	A	12	20	12	20	Is this "documented improvement" really occurring everywhere, or just in some regions. As stated, this seems like an overly broad conclusion.	Wine removed from TS.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Michael MacCracken, Climate Institute)	
E-TS-84	A	12	21	12	22	Add fire. (Pittock Barrie, CSIRO (retired))	Done.
E-TS-85	A	12	24	12	24	Please be clearer when you use the phrase "climate change": is this climate change in the IPCC definition, ie any change in climate regardless of cause, or is this in the sense of the more common perception and interpretation, ie in response to GHG emissions? This is a critical issue and it would be helpful if the text were explicit, otherwise there is too much room for misinterpretation and misquotation. (Andy Reisinger, IPCC SYR TSU)	Done
E-TS-86	A	13	2	13	2	Change "main" to "most" (Michael MacCracken, Climate Institute)	'main' removed.
E-TS-87	A	13	2			Section C. It would be very useful if each sub-section paid systematic attention to impacts relative to certain global warming temperature bands, so that those findings can robustly and defensibly be lifted from the TS into the SPM, and also that they can be robustly brought forward into the Synthesis Report. If the TS does not make systematic reference to impacts for temperature bands, it could be read to imply that the authors believe that no such robust statements can be made. This may of course be the case, at least for some sectors or regions - in which case this should be stated clearly, too. Along a similar line, it would also be helpful if each sector or region paid systematic attention to time scales (ie impacts before 2050, by 2100, and in the long term), and made a comment about the relevance of the rate of change compared to absolute amount of change. These criteria are important to policy makers but are very hard to find in the current draft of the TS. Lack of relevant statements in the TS could be interpreted to mean that in the authors' judgement, no such robust statements can be made (which, again, may be true in some sectors and regions, but should be stated explicitly where it is true). These issues are highly relevant and where robust statements can be made they should not be kept hidden and buried in the underlying chapters. (Andy Reisinger, IPCC SYR TSU)	This is now done in Tables TS-3 and TS-4
E-TS-88	A	13	2			Section C. It is somewhat confusing to have two large boxes, and equally long text, which mostly (but not always) duplicate each other. At least to me it was not clear what the purpose and focus of the box is compared to the text; it is mainly confusing and risks diluting key messages. (Andy Reisinger, IPCC SYR TSU)	We have decided to keep this structure, and try to improve the separation – the main text should set out the genral headline statements and the bullets in the boxes should contain the detail and specificity.
E-TS-89	A	13	3			It isn't clear to us whether the studies that are used in this document to project future impacts of climate change were subjected to any quality control. In our reading of Chapter 4, for instance, we see very little evidence of a critical	The reveiwer is vague as to why he/she reaches thisconclusion with respect to Chapter 4 – more evidence would be useful.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						evaluation of models used to project future impacts. That Chapter seems to be, for the most part, content to report results as laid out in the underlying papers, but without a critical evaluation of the assumptions and methodologies used in the papers themselves, it is impossible to know how much confidence, if any, can be placed on those results. There should be, accordingly, a short paragraph at the beginning of Section C detailing the general methodology used to assure that the results reported here were subjected to quality control; also, within the chapters themselves, there should be evidence furnished that this methodology (or a variant) was indeed applied. We would like to see this only because in our reading of Chapter 4, for instance, little or no quality control seems to have been exercised. (Indur Goklany, US Department of the Interior)	To take this action would be a new departure for the IPCC – there is no precedent; nor is it necessary. Authors have carefully evaluated the literature they assess, and only carried forward reliable nd robust results. No action.
E-TS-90	A	13	3			At the beginning of this section there should be a piece addressing the ability of impacts assesments to make future projections, their robustness, how much certainty can be attached to their results, and why. It should be noted that currently available impacts assessments are plagued with uncertainties, therefore the ability to make estimates does not necessarily mean that much confidence can be placed in them. Among the reasons why these estimates are suspect are, first, most impacts estimates have necessarily got to be made at local or – for water related impacts, watershed – scales. But at these scales results of these climate change models are suspect for a variety of reasons, including the fact that frequently they do not consider the effect of off land use/land cover changes. Thus, it is hardly surprising that precipitation results may vary for any given locality from model to model. Second, impacts models are themselves riddled with problems. They model some processes, but not others. Third, most impacts assessments do a relatively poor job of factoring in adaptive capacity – and changes in this capacity as a function of the economic and technological development consistent witth the assumptions that are used to drive the emissions (and climate change) scenarios,. or how secular technological change is accounted for (see Goklany 2005c, 2006a). There should also be information provided as to whether -- and how rigorously -- the spatial and temporal results from impacts models are validated and verified. (Indur Goklany, US Department of the Interior)	This is asking for too much information from a Technical Summary. The reader who is concerned with this level of detail must go to the underlying chapters. However, we have done the following: 1. We have now placed confidence estimates on <u>all</u> headline statements, and where relevant in the supporting text. In the boxed information (Boxes TS-5 and TS-6), <u>all</u> statements have a confidence statement and an evaluation of whether this is a new finding since the TAR. 2. We are now clear about the level of adaptation assumed – see page 18 lines 3-9, and the captions of Tables TS-3 and TS-4. For precipitation, it is well-known that the estimates are of lower reliability than those for temperature.
E-TS-91	A	13	11	13	13	In first sentence, change to say "significant increases in winter runoff" and then sentence needs to say this is occurring due to earlier mountain snowmelt. Then, second sentence needs to be redone, perhaps saying "in some regions, reduced springtime snowpack has led to water supply reductions in summer, or something similar to differentiate from first sentence. On line 13, change to say "last few decades has necessitated large investments"--this is not just a prompting, but a	Text deleted.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						requirement. (Michael MacCracken, Climate Institute)	
E-TS-92	A	13	15	13	16	Are you saying we have high confidence that temperature and sea level rise will affect freshwater, or that we have high confidence of all the climate change impacts the most certain are temperature and sea level rise. It reads as the later, although I am sure it is the former you mean. It doesn't matter where temperature and sea level rise rank in their certainity, but it is their actual importance which you then want to ascribe a certainty to. Ascribing of certainity should be removed from the statement, and be found only in the brackets. i.e. Water temperature and sea level rise associated with climate change are likely/very likely/virtually certain to have significant impacts on freshwater and its management (high confidence). (Mark Baird, University of NSW)	This section on Water Resources completely rewritten.
E-TS-93	A	13	18	13	19	I would think mention should also be made that saltwater intrusion will also be affecting estuaries. (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-94	A	13	22	13	23	"are expect to" ascribes a poorly defined level of certainity and should be removed from the statement, and be found only in the brackets. And a likelihood should be given. i.e. The risk of floods and hydrological droughts are likely/very likely/virtually certain to increase due to increases in precipitation variability (high confidence). (Mark Baird, University of NSW)	This section on Water Resources completely rewritten. A substantial effort hs been made to be more rigorous in the use of uncertainty language and to not words such as ‘may’, ‘might’ etc.
E-TS-95	A	13	24	13	24	replace "water" with "the hydrological cycle" (Mark Baird, University of NSW)	This section on Water Resources completely rewritten
E-TS-96	A	13	24	13	25	Rephrase to read "Since the TAR, new understanding has been gained about the potential for changes in the frequency and intensity of climatic extremes affecting water resources and the occurrence of floods and droughts." (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-97	A	13	25	13	27	Change to say "Increases in the number and intensity of heavy precipitation events are projected …" Basically, I think one has to be careful not to equate climate extremes with precipitation extremes--need to be more specific as there are many types of climate extremes and not all create heavy precipitation. (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-98	A	13	30	13	32	The phrase "especially beyond 2020" is quite problematic here--can one do anything before then either? It is also quite bizarre to have "high confidence" that something is "uncertain"--I would think one would have low confidence in some sort of finding, especially as the sentence on line 32 seems to say that uncertainties are being "improved" (and if this means "reduced" please do say that.	This section on Water Resources completely rewritten

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Michael MacCracken, Climate Institute)	
E-TS-99	A	13	34	13	37	It is really not clear what is meant here--what are "precipitation inputs"? Are these the outputs of models? If it is intended to say that the main uncertainty is a result of the lack of agreement among models on projections of climate change rather than on uncertainties due to emissions scenario, climate sensitivity, or hydrologic model, then clearer wording is needed--and care needs to be taken in distinguishing the inherent variability of the climate from the model uncertainties in causing the uncertainty in precipitation amounts (or percentage changes). Are the problems due to systematic problems with the models (e.g., in not having sufficient resolution to treat orographic features) or in the models generating different changes from their flawed baselines, etc. Please do be clearer on all of this as it will determine what is done to address the problem. (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-100	A	13	36	13	36	"precipitation inputs" does not explain the problem. Suggest: "regional and local patterns of precipitation changes" (Pittock Barrie, CSIRO (retired))	This section on Water Resources completely rewritten; this phrase removed.
E-TS-101	A	13	39	13	39	Change "impacts" to "adverse impacts" (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-102	A	13	41	13	43	These statements really say very little--in what way are these quantities "affected" and are the changes important? And the second sentence is really useless information unless something is said about the likely direction and importance of impacts. (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-103	A	13	41	13	43	Add algal blooms and eutrophication, which are the main symptoms, both in rivers and in estuarine environments. (Pittock Barrie, CSIRO (retired))	This section on Water Resources completely rewritten. Symptoms are excluded to save length.
E-TS-104	A	13	46	13	46	"shortage" to "short" (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten
E-TS-105	A	13	47		47	It is virtually certain that anthropogenic pressures "can" be the most decisive factor in freshwater resource constraints but, on average, how true is this in the face of climate change? Probably it will be a minor factor in the future. (James Curran, Scottish Environment Protection Agency)	This section on Water Resources completely rewritten.
E-TS-106	A	13	51	13	51	Rephrase to "Incorporation of the projected impacts of climate change is likely to improve management of and planning for water resources." Don't tell them what to do--tell them the result of doing it. (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-	A	13	51	13	51	"should incorporate" seems an inappropriate phrase, and does not quantify a	This section on Water Resources completely

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
107						likelihood. My suggestion: Future management of water resources are likely/very likely/virtually certain to deliver better outcomes when the impacts of climate change are included in decision making (high confidence). (Mark Baird, University of NSW)	rewritten.
E-TS-108	A	13	55	13	55	Change to "to account for the projected changes and their uncertainties." (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-109	A	14	1	14	26	Figure TS-4 and the text describing it should be deleted in light of the conclusion in Chapter 3 (Pg3, lines 30-31) "Quantitative projection of changes in river flow and water levels at the basin scale, especially beyond 2020, remain uncertain (high confidence)." Given this uncertainty it is highly misleading to present projections for 2100. If WG II persists in presenting this information, then a full description of the uncertainties involved in the projections must accompany the figure and the figure should be lablled "low confidence." (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Caption of table has been amended to make it clear that the figure is illustrative, and that the background map is based on an ensemble of model runs for just one scenario.
E-TS-110	A	14	2	14	2	Change to "will be decreased very strongly by changes in temperature and precipitation characteristics."--Be more specific if you can. (Michael MacCracken, Climate Institute)	This section on Water Resources completely rewritten.
E-TS-111	A	14	6	14	22	Regarding Figure TS-4: (a) what do the footnotes refer to? (b) Why is the freshwater lens issue limited to just the Indian Ocean region and just that time interval? (c) The statement for western North America is likely far too strong, and too generally applied--does it not apply to a very particular region? A more general statement for the western US regarding snowpack should be generated. (d) The Bangladesh estimates of 23-29% give a false sense of precision--perhaps say about 25%. (e) Is the groundwater issue for Brazil really critical--should not the statement for this part of the world deal with the Amazon River? (f) It might be useful to add a statement for the southeastern US, where runoff is likely to become more intermittent given more intense droughts and more intense summer rains/hurricanes. (Michael MacCracken, Climate Institute)	Caption of table has been amended to make it clear that the figure is illustrative. Obviously there are many examples which could be given – these are just a few where the literature makes it possible for us to say something quntitative.
E-TS-112	A	14	24	14	25	It is not really clear what is meant by suggesting that these changes pose a risk to sustainable development. Is this occurring really anywhere right now? Might it be better to replace that phrase with something like "present and projected needs for water"? (Michael MacCracken, Climate Institute)	'Sustainable development' reference removed from caption.
E-TS-113	A	14	24			Figure TS-4. There are numbers to footnotes on the Figure but no footnotes are provided. Moreover, the changes shown are just a selected sample, and this should be made clear in the caption. There are projected changes and impacts in many	Footnote references have been removed. Caption has been altered to make it clear that impacts shown are illustrative.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						other locations. (Pittock Barrie, CSIRO (retired))	
E-TS-114	A	14	39			changes in processes such as diversity… (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	A
E-TS-115	A	14	42		42	The statement that "some of these effects may be considered beneficial" is unacceptable. Firstly - beneficial to whom - humans maybe, but certainly not to ecosystems. This statement must be modified and a degree of certainty attached. (James Curran, Scottish Environment Protection Agency)	A
E-TS-116	A	14	47	14	48	I would move the "with few exceptions" to the front of the sentence. (Michael MacCracken, Climate Institute)	A
E-TS-117	A	14	48	14	49	I am confused by this sentence in that climate change is resulting from human drivers (and I don't really like the word "drivers"). Perhaps say that "In some locations and for several more decades, logging and other changes in land cover, for example, will continue to be a more important human-induced impact that climate change; thereafter, human-induced climate change is likely to dominate in most regions." (Michael MacCracken, Climate Institute)	A/R – Text improved. It seems the word driver is commonly used in particular scientific literature, including MEA (e.g. Nelson, G.C., 2005. Drivers of ecosystem change: summary chapter. In: Hassan, R., Scholes, R. & Ash, N. (eds.), Ecosystems and human well-being - volume 1: current state & trends. Island Press, Washington, DC, pp. 73-76).
E-TS-118	A	14	48	14	48	"several" is not appropriate. There are many examples, but "several" implies only a handful. Suggest "some"? I would add on line 49-50 "but such multiple drivers will exacerbate the impacts, and climate change may well dominate for large global warmings." (Pittock Barrie, CSIRO (retired))	A
E-TS-119	A	14	48		49	This staement should not be included in a section on climate change impacts, it is addressing other impacts. But if it stays - then a confidence level should be placed on it. It should perhaps be turned around: "in many, if not most cases, imapcts from climate change will surpass those from other human drivers". (James Curran, Scottish Environment Protection Agency)	A/R – TR. While it is true that our focus is on climate change, we have to discuss also other aspects beside climate change. This is not only part of our mandate, but was also explicitly requested by many, many reviewers (and we believe for very good reasons, see e.g. MEA, Reid et al., 2005. MEA - Synthesis).
E-TS-120	A	14	51	14	54	I read this statement as we have high confidence that we have a better understanding (you would hope so) and we have high confidence in significant uncertainities (sound like we know there are unknown unknowns!) I would have a short statement in bold like "Ecosystem and species-specific responses to climate change are likely/very likely/virtually certain to confront human uses of ecosystem	A – TR and thanks for the useful suggestion.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						resources and lead to irreversible changes such as an increased risk of species extinctions. (xxxx confidence)." Then mention that this is something we have learnt since TAR and is based on paleo data etc, and that the projections of individual systems is difficult. (Mark Baird, University of NSW)	
E-TS-121	A	14	55	14	55	This first sentence is not complete--that is, species-specific as opposed to what other type of response (ecosystem specific)? This should be said in such a way that it is clear that loss of some keystone species, even if species specific, can lead to degradation of whole ecosystem--so there are some thresholds and some key species. (Michael MacCracken, Climate Institute)	A
E-TS-122	A	14	56	15	1	This sentence really does not provide much information--of course there are uncertainties--but what are they and what are they due to? (Michael MacCracken, Climate Institute)	A – TR
E-TS-123	A	15	6	15	6	I would think a bit greater care needs to be taken in statements in the tables, and some ranges need to be given to give sense of uncertainty. For example, putting Amazon collapse on one line at about 2.6 C seems much too precise. Regarding Australian butterflies, it is presumably extinction of about one third of the various types of butterflies, not of all butterflies. Saying 77% loss of tundra at a given value is much too precise--must be from one study. I would think this chart should be redone and somewhat more general statements made--and going up to 8C for one specific item makes little sense--I am amazed any ecosystem is really so resilient. (Michael MacCracken, Climate Institute)	A
E-TS-124	A	15	8			Figure TS-5: I could find no evidence in the underlying chapter that warming of 1 deg C would lead to a systematic reduction in penguin populations (which is what the text in the figure would imply). There are regional shifts in populations, and shifts in population between species, but no evidence of a systematic overall reduction. Please either delete this statement, or replace it with "changes in penguin populations". (Andy Reisinger, IPCC SYR TSU)	R – The new figure with the new caption makes it now clear that we are not making any such statements. It is global average temperature changes, which may mean regionally much larger changes, especially at the poles. Moreover, due to page limitations the underlying chapter can not explain every phenomenon in detail, but the here mentioned impact on penguins was referenced in the underlying chapter's text (e.g. last sentence of Box 4.4) citing the study on penguins (Barbraud and Weimerskirch, 2001. Nature, 411, 183-186 on CC impacts on emperor penguins) as well as T4.1#3 (Forcada et al.,

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							2006. Global Change Biol., 12(3): 411-423).
E-TS-125	A	15	11	15	12	What does it mean to say we have high confidence in the significance and key relevance of a phenomena. For this bold statement to fit in with earlier, well written ones, I guess you want a statement like "Climate-driven changes in biodiversity will change the functioning of a range of ecosystems (high confidence). (Mark Baird, University of NSW)	A – Thanks for the suggestion.
E-TS-126	A	15	11	15	12	Suggest changing to "are particularly significant because global losses in biodiversity are irreversible and because of the dependence of societal well-being on ecosystem services". (Michael MacCracken, Climate Institute)	A – Thanks for the suggestion.
E-TS-127	A	15	13	15	13	Change to "smooth functioning" as one can have quite a variety of outcomes. (Michael MacCracken, Climate Institute)	LA – Thanks for the suggestion.
E-TS-128	A	15	15		15	Add that "and the natural mechanisms for sequestering CO2 from the atmosphere will be irreparably damaged". (James Curran, Scottish Environment Protection Agency)	LA – Thanks for the suggestion.
E-TS-129	A	15	17	15	18	The first sentence is too limiting--some ranges are shrinking now and 2050 is too specific and yet too far off. I would start the paragraph by saying that "The ranges of plant and animal species are already being affected by global warming." And then on line 18 change 'by that time" to "by mid-century" (Michael MacCracken, Climate Institute)	A/R – Text changed. Here we discuss issues where future impacts are the focus, not recent changes (cf. chapter 1).
E-TS-130	A	15	17	15	17	if terrestial productivity increases for the first have of the century, not all species ranges will shrink.Perhaps many will, and some will fill the niche left behind. In any case, the statement "species ranges are likely to shrink by 2050" is incorrect by omission of the species whose range will expand to fill voids. (Mark Baird, University of NSW)	R/LA – Increased terrestrial productivity and changes in species' geographic ranges are not that closely linked but text improved to avoid the problems mentioned.
E-TS-131	A	15	17	15	22	Delete "About one-fifth to one-third of the species may be committed to extinction by that time ..." Projections of high rates of species extinction are not supported by the evidence presented in this report and elsewhere. There has been 0.7 C global average temperature rise in the last century, but climate change has been implicated in only a handful of extinctions, the two butterfly species mentioned in Chapter 1 and one species of frog. Until a more compelling case can be made that observed climate change is leading to extinctions, projections of large rates of extinction should be viewed with scepticism. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	R – First, we do present and review the evidence for those statements. Secondly, the argument that 0.7°C increase in mean global T has lead to only a "handful of extinctions" is not inconsistent with our statement, since precisely those projections matching the observed small changes in climate lead to the extinctions discussed here and in the underlying chapter for the cases of future, higher increases in global average T. Many of the reviewed studies use commonly accepted criteria to define extinction risks (e.g.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							Akçakaya et al., 2006. Global Change Biol., 12(11): 2037-2043.). Our synthesis effort is fully aware of these issues and has observed criteria as commonly used within science.
E-TS-133	A	15	17	15	17	Change "the" to "all" (Pittock Barrie, CSIRO (retired))	A
E-TS-134	A	15	19	15	19	It is regional species or ecosystems that are vulnerable, not mountains or polar regions per se. (Pittock Barrie, CSIRO (retired))	A
E-TS-135	A	15	20			coral reefs and the coastal zone (Helmuth et al. SCIENCE 298 (5595): 1015-1017 NOV 1 2002) It could be argued that the coastal zone is vulnerable (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	A/R – That can be argued, but here we discuss more what is tracable to chapter 4, not to chapter 6.
E-TS-136	A	15	24	15	24	Change "mobile wild species" to "wild species that can relocate or become reestablished"-not all species can independently move (e.g., seeds). (Michael MacCracken, Climate Institute)	LA
E-TS-137	A	15	27	15	27	Change "or" to "and" as this applies to both. (Michael MacCracken, Climate Institute)	A
E-TS-138	A	15	29	16	10	High confidence in progress? This section is not structured like previous sections. The statement of knowledge appears last not in bold, with the caveats first, some in bold. The Section should be led in with a statement in bold like "The biosphere is likely/very likely to continue as a sink for approximately one quarter of anthropogenic emmisions before declining in the second half of the century to become a net source by 2100 (xxxx confidence).". then put in the biogeochemical details not in bold. (Mark Baird, University of NSW)	A - Thanks
E-TS-139	A	16	1	16	5	The '2' in CO2 should be subscript. (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	A
E-TS-140	A	16	7	16	10	This sentence needs reworking. Perhaps say "Over the next two decades, CO2 fertilization of the biosphere is expected to continue to lead to absorption of about a quarter of global fossil fuel emissions. The amount of C uptake is projected to peak near mid-century and then decline, with the biosphere becoming a net source of carbon towards the end of the century." In the clarification, something also needs to be said about how net deforestation rate plays into this. I would also note that in the 19th century, with so much deforestation, was not the biosphere a source of carbon-	A – Thanks for the suggested text and indeed the point about deforestation is an important one.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						-and is the deforestation amount now included here? (Michael MacCracken, Climate Institute)	
E-TS-141	A	16	7	16	10	This seems to me to now be too optimistic. There are a number of recent papers documenting regional biomass turning from a sink to as source in globally significant amounts due to drought and fire. See references in my forum article in press in EOS (July 2006). (Pittock Barrie, CSIRO (retired))	LA
E-TS-142	A	16	7		7	Use of the word "offset" suggests it is a complete or major contribution. It should say "..will continue to absorb some of…" (James Curran, Scottish Environment Protection Agency)	A – Yet, ~25% is a major contribution, which is incidentally ~50% of what does not remain in the atmosphere.
E-TS-143	A	16	10			…of this century leading to positive feebacks. (This is a crucial point that needs to be made explicit) (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	A
E-TS-144	A	16	12	16	17	we have high confidence in significant uncertainities (sound like we know there are unknown unknowns!). The points in this section are virtually a repeat of those on p14 line 51 onwards. I would place the lines 14-17 there, and remove lines 12-13 altogether. (Mark Baird, University of NSW)	A
E-TS-145	A	16	12	16	12	Change "human drivers" to "non-climatic influences" (Michael MacCracken, Climate Institute)	TR
E-TS-146	A	16	17	16	17	Add: "functioning, as is the role of increasing drought and fire frequency." (Pittock Barrie, CSIRO (retired))	A – Text improved and thanks for the suggested text.
E-TS-147	A	16	21	16	29	Overall, this is a very well phrased statement--it should be a model for others. Just a couple of notes: (a) on line 23, make clear if this is referring to summer or average temperature; (b) on line 27 change "include" to "consider" and "show" to "project" and "than for changes" to "than studies done considering changes"; and (c) on line 29 add in that the effect also applied to "small-holder and niche crop farmers" (Michael MacCracken, Climate Institute)	This statement has been modified to concentrate on average temperature change vs. yield only. The statement on extremes has been moved to a new statement.
E-TS-148	A	16	21		29	This pargraph is pretty redundant. First of all any predictions of crop yield MUST involve accounting for extreme events - so the first half the paragraph should be cut. (James Curran, Scottish Environment Protection Agency)	The removal of extremes to make a new statement on that topic resolves redundancy.
E-TS-149	A	16	23	16	23	preponderance is not a good word here. (Mark Baird, University of NSW)	We disagree.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-150	A	16	31	16	34	Needs clarification. "New field experiments on CO2 … than earlier laboratory experimental results ....… include CO2 fertilisation estimates …" (Pittock Barrie, CSIRO (retired))	This section has been rewritten for clarity and repositioned.
E-TS-151	A	16	31	16	33	Change "smaller effects on" to "smaller enhancements of" in order to give sign of influence--also, is this statement consistent with the ones on page 16, lines 7-10? On line 32, I would suggest rephrasing to "Present crop models include CO2 fertilization effects close to ...". On line 33, change "models may" to "model results currently available are likely to" (Michael MacCracken, Climate Institute)	The term "CO_2 effects" is in common usage. We do not know nor do we see the need for p. 16 lines 7-10 to be consistent with this statement.
E-TS-152	A	16	32	16	32	I am sure you can see if models use CO2 fertilization parameterisation that are at the upper range of new research. The question is, do crop models overestimate CO2 fertilization effects? You answer this clearly (with moderate confidence) in the second part of the statement for forests. But do crop models overestimate CO2 fertilization effects? (Mark Baird, University of NSW)	This is now answered explicitly.
E-TS-153	A	16	35		39	Remove this - it doesn't take account of extremes (see comment immediately above) or precipitation changes. It is just misleading. (James Curran, Scottish Environment Protection Agency)	We do not understand the nature of this comment. FACE studies confront a range of extremes and the parameterizations in models are meant to allow limited extension of current climate- CO_2 interactions to climate change conditions.
E-TS-154	A	16	41	16	45	Is this finding consistent with the pace of deforestation that is underway, or is it referring only to the output from existing tree farmed land? Some sort of mention of the pace of deforestation should be mentioned. (Michael MacCracken, Climate Institute)	This statement refers only to forestry production on currently forested land. We do discuss deforestation under current multiple stresses in the chapter, but there is not much that we can say from the literature on interactions of deforestation and forestry production under climate change.
E-TS-155	A	16	43	16	45	The effects of increased fire is a major uncertainty. There is considerable observational and modelling evidence for increases in fire frequency and extent in the US, Canada, Europe and Australia. This may well threaten future forest production. I think the paragraph is too optimistic. (Pittock Barrie, CSIRO (retired))	The literature is quite thin on the effects of fire on forestry production under climate change, although it is a contributing factor to the medium confidence of the statement.
E-TS-156	A	16	47	16	52	On line 47, this should likely say "freshwater fish species". And why is this point made in the section under Food, Fiber and Forest products rather than under Ecosystems section--where it would seem most appropriate to casual reader. (Michael MacCracken, Climate Institute)	We disagree because diadomous species are salt water at times. We try to stick to species that are commercially harvested, which keeps them in the food rather than ecosystem

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							chapter.
E-TS-157	A	16	47	16	52	A major source of changes in fish is changes in ocean circulation generally, not just in relation to the MOC. Such changes are already observed and projected in the major oceans where the gyres are strengthening and extending fiurther polewards. See references by Cai, Fyfe, Gillett and Marshall, all in my EOS paper (in press, July 2006) (Pittock Barrie, CSIRO (retired))	We recognize this, but in terms of identifying major new knowledge on large potential impacts, it seems that the meridianal overturing issue dwarfs everything else related to ocean currents.
E-TS-158	A	16	50			…sturgeon). Interactions between climate change and fishing will adversely affect some marine species particularly at range edges (e.g. Cod in N.Sea - Beaugrand et al. SCIENCE 296 (5573): 1692-1694 MAY 31 2002; Beaugrand et al. NATURE 426 (6967): 661-664 DEC 11 2003) (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	We will consider.
E-TS-159	A	16	51	16	51	which fisheries? (small pelagics, large pelagics, coastal and shelf fisheries or ocean fisheries) (Mark Baird, University of NSW)	The statement is so speculative that it is not wise to imply the precise knowledge of specific fisheries.
E-TS-160	A	16	54	16	55	For clarity, change phrase to "with an increased dependence on food imports by most …" (Michael MacCracken, Climate Institute)	This is starndard FAO terminology—we are trying to conserve space.
E-TS-161	A	17	1	16	2	Rewrite to say "While climate change is likely to exert an influence toward declining real prices for food for the first half of the century, its influence over the second half of the century is likely to be an accelerating one toward higher prices." Need to indicate that climate is only one influence on prices--not the dominating factor. (Michael MacCracken, Climate Institute)	What is recommended here changes the intended meaning of the original statement and leaves off an important piece of information (purchasing power). We recognize that climate is not the only influence on prices and make that very clear in the chapter—to bring it in here would be to make the statement very clumsy.
E-TS-162	A	17	1		5	This is a tasteless paragraph. The issue is not trade - it is starvation of potentially millions on the planet. (James Curran, Scottish Environment Protection Agency)	We disagree.
E-TS-163	A	17	2	17	3	The sentence is a bit awkward--perhaps change "challenged" to "problematic"; better yet would be to expand on what is meant by "food security", listing key influences. (Michael MacCracken, Climate Institute)	This has been completely rewritten.
E-TS-	A	17	4	17	5	Change "will rise" to "are very likely to rise" as it is not really certain. Also change	Has been rewritten.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
164						"may" to "is likely" and "in forestry" to "for forest products" (Michael MacCracken, Climate Institute)	
E-TS-165	A	17	4	17	4	Change "foreseen" to "projected" (Michael MacCracken, Climate Institute)	Has been rewritten.
E-TS-166	A	17	7	17	45	Several key points are missing. The benefits of adaptation will depend largely on their cost and economic growth in poorer countries affecting adaptive capacity. This is likely to be negatively affected by the increasing frequency and severity of extreme events such as tropical cyclones, floods and droughts which already hold back economic development in countries such as Mozambique, Bangladesh, Costa Rica and Honduras. In Figure TS-6, the caption needs to explain what is assumed regarding changes in precipitation and CO2 concentrations, and whether adaptation has taken account of limits to irrigation as water supply decreases, declines in fertiliser applications as oil prices go up (a fact of life irrespective of climate change), and the effects of growing limits on energy inputs due to mitigation restraints on energy demand and increasing energy prices. In line 7, "relative" to what? (Pittock Barrie, CSIRO (retired))	We don't disagree with the first point and it is considered as such in the chapter. There simply isn't the literature to make strong statements about the interactions of extreme events, development, and adaptation. We have redrafted the figure caption to clarify the points raised about it. Relative is with respect to without adaptation yields at a given amount of climate change.
E-TS-167	A	17	7	17	9	Only 20% confidence in the predicted impact. Is it worth making a statement that has only a 1 in 5 chance of being right. (Mark Baird, University of NSW)	There is greater than 20% percent confidence in the first half of the statement. But even if it is all low confidence, we feel that sharing such information on such a highly important issue is better than remaining silent on the issue.
E-TS-168	A	17	7	17	7	Need to indicate "relative" to what? (Michael MacCracken, Climate Institute)	See above.
E-TS-169	A	17	10	17	10	Rephrase to something like "There is a wide range of potential adaptation options that vary greatly in cost, (Michael MacCracken, Climate Institute)	Will consider in the final version.
E-TS-170	A	17	13	17	14	Perhaps rephrase to "For cereal cropping systems, adaptation measures such as changing varieties and planting times enable avoidance, on average of reductions in yield of 10-15%." Then say "The benefits from adaptation tend to …" (Michael MacCracken, Climate Institute)	We are trying to keep the statement compact.
E-TS-171	A	17	15	17	15	Change to "However, pressure" (Michael MacCracken, Climate Institute)	Will consider at next revision.
E-TS-172	A	17	16	17	17	Change "may increase" to "is likely to increase" and say "further endanger" and "Climate change will increase" (Michael MacCracken, Climate Institute)	Done.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-173	A	17	49	17	49	does highly vulnerable mean likely, very likely or virtual certain to be vulnerable? (Mark Baird, University of NSW)	Agree – text edited to confirm with standard terminology.
E-TS-174	A	17	51	17	53	Rephrase to say "are already experiencing multiple stresses as a result of natural processes and human presence, and it is virtually certain that, among other challenges, significant population growth and urbanisation will intensify during the 21st century. (Michael MacCracken, Climate Institute)	Agree – new text in the spirit of suggestion.
E-TS-175	A	17	53	17	53	Change "these" to "coastal and low-lying" (Michael MacCracken, Climate Institute)	Text deleted – but general text has been strengthened in this regard.
E-TS-176	A	18	2	18	2	Change to "Thus, climate change is very likely to be a major challenge for all coastal nations. (Michael MacCracken, Climate Institute)	Text deleted
E-TS-177	A	18	4	18	14	very high confidence that there is more to climate change than one effect. This is virtually a tautology, and tarnishes the appropriate use of statement (confidence of statement) structure in other statements. If you remove lines 4 and 5, then lines 6-13 logically lead on from lines 1 and 2. (Mark Baird, University of NSW)	Agree – text reworded
E-TS-178	A	18	4	18	4	Change to "Changes in climate experienced by coastal systems and low lying areas will cause changes in addition to the impacts of sea level rise." (Michael MacCracken, Climate Institute)	Disagree – one of the main thrusts of this assessment is the compounding effects of climate change.
E-TS-179	A	18	6	18	13	Mention should be made of riverine and estuarine flooding and sediment loadings. (Pittock Barrie, CSIRO (retired))	These are important points, but there is insufficient space to develop these points.
E-TS-180	A	18	6	18	6	Change "climate change effects" to "changes in climate" (Michael MacCracken, Climate Institute)	Text deleted, but disagree – effects are distinct from changes in climate.
E-TS-181	A	18	9	18	9	rising atmospheric CO2 (as a cause of climate change) seems out of place among the rest of the list which are impacts of climate change (Mark Baird, University of NSW)	Agree – rephrased as ocean acidification.
E-TS-182	A	18	10			…and precipitation. Introduction of non-native species made worse by climate change will impact coastal ecosystems. (Non-native species as a big threat) (Stachowicz JJ et al. PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 99 (24): 15497-15500 NOV 26 2002) (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Agree with the point, but the chapter team did not see this of sufficient importance to be distinguished in the TS.
E-TS-183	A	18	11	18	11	Change "concerning" to "concerning the effects of" and "The other change" to "Impacts resulting from other" (Michael MacCracken, Climate Institute)	Text signifcantly changed.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-184	A	18	15	18	15	overwhelmingly - does that mean virtually certain to be ? (Mark Baird, University of NSW)	Agree – confidence has been added .
E-TS-185	A	18	15	18	20	It seems to me this paragraph should be moved ahead of the preceding one. (Michael MacCracken, Climate Institute)	We have signiifcantly modified TS structure.
E-TS-186	A	18	22	18	23	no likelihood (Mark Baird, University of NSW)	Have discussed with TSU – in this case likelihood does not seem necessary.
E-TS-187	A	18	26	18	27	I would encourage deleting "some models still suggest" as really unnecessary--and not just models suggest this outcome. (Michael MacCracken, Climate Institute)	Agree – text changed.
E-TS-188	A	18	27		27	Should read "..suggest many millions..". This figure is played down at several points in the document although at p24, line 56, it is recognised that up to 50 million people could be affected (even assuming adaptation). (James Curran, Scottish Environment Protection Agency)	Agree – text now correctly state hundreds of millions.
E-TS-189	A	18	30	18	30	high confidence in concern? It is likely/very likely/virtual cetain that the combined impacts of …. will be greater than the largest single impact alone (high confidence) (Mark Baird, University of NSW)	Text deleted.
E-TS-190	A	18	30	18	31	Change to read: "… countries, the combined impacts of flooding, saltwater intrusion on freshwater resources, health problems, and food insecurity pose additional threats." (Michael MacCracken, Climate Institute)	Text signifcantly changed.
E-TS-191	A	18	33		33	Foul water drainage will also be severely impacted by flooding. Again this issue is absent or downplayed throughout the document. (James Curran, Scottish Environment Protection Agency)	Agree, but the chapter team did not think it a key issue for TS.
E-TS-192	A	18	35	18	36	Change to "… flooding are likely to increase water borne pathogens …" and change "relate" to "are likely to arise due" (Michael MacCracken, Climate Institute)	Text signifcantly changed.
E-TS-193	A	18	40	18	40	does "produces" mean virtually certain ? (Mark Baird, University of NSW)	Text deleted.
E-TS-194	A	18	41	18	47	Mention should be made of the adverse effects of some adaptation measures, especially of sea walls on amenity and attractiveness. (Pittock Barrie, CSIRO (retired))	Agree – but not a main message in this assessment, so not included in TS.
E-TS-195	A	18	49	18	49	often? What does often mean? Do you mean (1) Global responses to climate-related coastal hazards are likely / very likely / virtually certain to be inadequate relative to the growing levels of risk? (Mark Baird, University of NSW)	Text deleted.
E-TS-196	A	18	51	18	51	Change "this is" to "adaptation is likely to be" (Michael MacCracken, Climate Institute)	Text deleted.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-197	A	19	1	19	1	Change "management" to "preparedness"--needs to happen before the disaster. (Michael MacCracken, Climate Institute)	Text deleted.
E-TS-198	A	19	3	19	4	Add: "However, climate change and sea-level rise are likely to soon exceed the limits of present climate variability, and thus require further adaptation measures." (Pittock Barrie, CSIRO (retired))	Agree – but no space in TS.
E-TS-199	A	19	6	19	6	Greatest inertia? This seems a meaningless phase. If I understand where you are going with this statement, I would say biodiversity loss is less reversible, and may take longer to reach its steady-state than sea level rise. Is this the grounds for a comparison of greatness of inertia? Also, given the exactness of the science behind thermal expansion of seawater, I would say it is not 'likely", but virtually certain that sea level change will require on-going adaptation. So I would re-word the statement: Sea-level rise is virtually certain to continue for centuries and with a significant ongoing demand for adaptation (high confidence). (Mark Baird, University of NSW)	Disagree –have developed the point that sea-level rise has inertia and so does settlement patterns.
E-TS-200	A	19	6	19	7	Add: "… which will increase costs." (Pittock Barrie, CSIRO (retired))	Text changed to the point that "Adaptation costs for vulnerable coasts are much less than the costs of inaction".
E-TS-201	A	19	8	19	9	Change to "The long-term implications of sea rise require consideration in coastal planning, especially regarding siting of …" and then change last part to read "Selection of flexible adaptation measures that can be upgraded as required is likely to be the best strategy. (Michael MacCracken, Climate Institute)	Text changed – new bullet identifies the problem – more work is required for responses.
E-TS-202	A	19	10	19	10	Additional areas that are vulnerable include: Sacramento-San Joaquin delta, Chesapeake Bay, Thames, etc. (Michael MacCracken, Climate Institute)	Agree, but no space for examples.
E-TS-203	A	19	10		11	These population figures are far too small - see comment above and below. (James Curran, Scottish Environment Protection Agency)	Numbers are correct – impacts WITHOUT climate change – improved caption.
E-TS-204	A	19	12			Fig. TS-7 extreme > 1 m, medium < 5000. High = 500,000. But 500,000 > 5000, so high is medium. Usually a figure like this would be labelled something like: extreme > 1 m, 100,000 < high < 1 m, 5000 < medium < 100,000. Otherwise it doesn't make sense. (Mark Baird, University of NSW)	Agree – figure has been relabelled.
E-TS-205	A	19	21	19	21	Change "trends in human systems" to "societal choices"--we are making decisions, these are not somehow independent trends forced on us. (Michael MacCracken, Climate Institute)	We prefer to talk in terms of system trend rather than societal choices.
E-TS-	A	19	22	19	22	"these other systems" is not clear. Suggest add: "Abrupt climate change would	Language changed.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
206						prove to be very costly and difficult to adapt to due to the need to prematurely write off existing infrastructure." (Pittock Barrie, CSIRO (retired))	
E-TS-207	A	19	24	19	27	This sentence is confusing. On lines 25 and 26 I think, but am not sure, that it should read "…the potential to distinguish future …. from prospects involving …" (Pittock Barrie, CSIRO (retired))	Statement simplified.
E-TS-208	A	19	25	19	25	replace predict with distinguish? (Mark Baird, University of NSW)	Changed to "project".
E-TS-209	A	19	25	19	25	Change "to predict" to "to project" (Michael MacCracken, Climate Institute)	Ditto.
E-TS-210	A	19	27	19	28	This is common to most sectors, so why put it here particularly? The reason of course is that there are a wide range of scenarios and uncertainty about actual impacts. (Pittock Barrie, CSIRO (retired))	Particularly important to ISS.
E-TS-211	A	19	32	19	32	Change "limited access to" to "limited access to or commitment of" (Michael MacCracken, Climate Institute)	Sentence edited.
E-TS-212	A	20	2	20	2	Aside from major extreme events, climate change is secondary. Does that mean including extreme events climate change is tertiary? What is often? This doesn't seem a statement that confidence should be attributed to. (Mark Baird, University of NSW)	Sentence edited to clarify.
E-TS-213	A	20	3	20	3	Change "stresses" to "impacts", and to what does "Its" apply--climate change? (Michael MacCracken, Climate Institute)	Sentence edited.
E-TS-214	A	20	6	20	6	depend considerably? Shouldn't you say are likely/very likely/virtually certain to depend (Mark Baird, University of NSW)	Language changed.
E-TS-215	A	20	7	20	8	Very true, but nonetheless most of the economic analyses about climate change do aggregate calculations. Is this point going to be carried forward and made to WG III? (Michael MacCracken, Climate Institute)	We hope so – in the Sythesis process.
E-TS-216	A	20	9	20	9	spread? Impacts are likely/very likely/virtually certain to spread … (Mark Baird, University of NSW)	Edited.
E-TS-217	A	20	13			Table TS-2. Why are there cross-references to chapters only in column 2? And in entries re major storms and riverine floods they say much the same, so why not combine in a single entry and save space? Similarly for entries on saline intrusion and sea-level rise, where the cause of saline intrusion is SLR. In the heat and cold waves entry, col.3, what is "internal temperature control"? and in col.4, why not spell out "energy requirements" which I take to mean increased energy costs for air	Table totally redone.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						conditioning? In the entries on precipitation and saline intrusion, why use "infrastructures" when "supply" is much plainer?, and under precipitation, last col. I would add "urban populations in increasingly arid regions such as in Mediterranean-type climates". Under abrupt climate change the point must surely be made that the rapidity and size of potential impacts would make adaptation much more difficult and costly. (Pittock Barrie, CSIRO (retired))	
E-TS-218	A	20	14			In Table TS-2, the column on "Other processes/Strreses" should be removed. It has no relevance here. In column 2, environmental mibgration should alos appear in rows 1 and 3, "major storms" and "riverine flooding". (James Curran, Scottish Environment Protection Agency)	Table totally redone.
E-TS-219	A	21	4	21	19	high confidence in more knowledge? Lines 4-7 should not have a confidence attached to them. Lines 4-18 are a lead into the statements that come below, and I don't think should be in bold. The segregation of empirical, spatial, temporal is artifical. I imagine many would be a combination of these factors. Nonetheless, the range of studies undertaken is certainly worth mentioning. (Mark Baird, University of NSW)	Table totally redone.
E-TS-220	A	21	4	21	4	Change "population health" to "human health and well-being" (Michael MacCracken, Climate Institute)	Not addressed – had been decided by the team.
E-TS-221	A	21	5	21	7	The sentence/statement in these lines should be rewritten. Also, are the 'early effects' referred to in line 5 what was covered in the previous section (B) on 'Impacts observable now'? If so, then don't mention here (section C is on 'future effects'). Insert 'the' before 'national'. (Paul Beggs, Macquarie University)	Addressed.
E-TS-222	A	21	13	21	15	The last bit of this point ('in the context of detecting the early effects of climate change') may not be required. (Paul Beggs, Macquarie University)	Addressed.
E-TS-223	A	21	20	21	20	This statement has no likelihood? Only 20-50 percent chance of being correct? (Mark Baird, University of NSW)	Addressed.
E-TS-224	A	21	20	21	25	This material should be moved to section B.3. (Paul Beggs, Macquarie University)	Addressed.
E-TS-225	A	21	20	21	20	Change to: Climate change already may be affecting human health." It is inconsistent to make a definitive statement and then assess it as having only low to medium confidence (2 to 5 chances out of 10 of being correct). (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Addressed.
E-TS-226	A	21	27	21	39	For this list of bullet points to be a brief balanced summary, it needs to include the positive impact of higher winter temperatures on cold-related illness and morbidity.	Addressed.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						Otherwise, the chapeau should explicitly state that it focuses only on the negative impacts. (Andy Reisinger, IPCC SYR TSU)	
E-TS-227	A	21	27	21	39	An addition point should be inserted along the lines of: 'Changes in aeroallergens such as pollens could increase diseases such as asthma and hay fever'. (Paul Beggs, Macquarie University)	Not addressed – is in chapter but not carried forward to TS as too tentative.
E-TS-228	A	21	37	21	38	Surely there is a need to mention potential adaptation measures such as improved health and quarantine services. (Pittock Barrie, CSIRO (retired))	Not addressed.
E-TS-229	A	21	37		37	Stress levels are very high in flooded communities - creating significant negative health impacts. (James Curran, Scottish Environment Protection Agency)	Not addressed – is in the chapter but too specific for TS.
E-TS-230	A	21	41	21	45	This paragraph is a mix of an overview paragraph about the changing balance between positive and negative impacts, and a statement about specific positive impacts. If the specific positive impacts were to be included in the bullet point list above (lines 29 to 39), then this para could focus excusively on the balance between positives and negatives. Suggested rephrase: "Projected climate changes will produce a mix of positive and negative impacts (high confidence). The degree of positive and negative health impacts will vary from one location to another, and will alter over time as temperatures continue to rise. It is also likely that different population groups within countries will experience positive and negative aspects of climate change in different ways, depending on their socio-economic status and access to health services (medium/high confidence)." (Andy Reisinger, IPCC SYR TSU)	Addressed now.
E-TS-231	A	21	41	21	41	"will probably" do you mean "are likely/very likely/virtually certain". All likelihoods have a probability. (Mark Baird, University of NSW)	Addressed.
E-TS-232	A	21	43	21	43	Is 'degree' the correct word to use here? Would something like 'The balance between positive and negative ...' be better? (Paul Beggs, Macquarie University)	Addressed.
E-TS-233	A	21	43	21	43	Change "degree" to "magnitude and balance" (Michael MacCracken, Climate Institute)	Addressed.
E-TS-234	A	21	47	21	53	This section may need some attention. For line 47 (the title) would it be better to say: 'Some populations are particularly vulnerable to health impacts of climate change'? In the first point, I think the words 'the consequences of' should be deleted. In the second point, is it really dependence on 'natural resources' that may make some populations particularly vulnerable to health impacts of climate	Addressed.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						change? (Paul Beggs, Macquarie University)	
E-TS-235	A	22				Fig. TS-8. Aeroallergens should be explicitly included in this figure. The middle level of confidence used in the figure (Medium High) seems a little odd. 'Medium High' is not defined in section D.1 of the Introduction chapter. Should it be Medium to High? There is no need for the title of the figure to appear above it and in the figure caption. (Paul Beggs, Macquarie University)	Addressed – Not addressed, because there were no studies addressing future pollen and distributions etc – and health effects.
E-TS-236	A	23	1	25		Couldn't the material in this box be move to the preceding discussion for each section? It seems clumsy and confusing to do each section/sector twice. (Paul Beggs, Macquarie University)	We have decided to keep this structure, and try to improve the separation – the main text should set out the genral headline statements and the bullets in the boxes should contain the detail and specificity.
E-TS-237	A	23	1			The contents of this box are very repetitive of the accompanying main text re sectors, such that it is superfluous, and also more selective and incomplete and thus potentially misleading. As suggested in a general comment, I would seriously consider dropping this and the next Box completely. I have not been through this Box in detail, but did do so with Box TS-4 and noted there many deficiencies in the briefer version of results in the Box.. (Pittock Barrie, CSIRO (retired))	We have decided to keep this structure, and try to improve the separation – the main text should set out the genral headline statements and the bullets in the boxes should contain the detail and specificity.
E-TS-238	A	23	3		29	Add in the problem that reduced flows in rivers will provide less dilution to pollution and result in ecological damage. Also wetting/drying of soils may result in structural damage and oxidation - causing erosion and relesae of CO2 to the atmosphere. (James Curran, Scottish Environment Protection Agency)	Point on pollution made in new TS page 29 lines 23-25. Soils point not added – due to space constraints.
E-TS-239	A	23	8	23	9	Change to "the period of spring discharge moves toward" (and this point is duplicated on lines 26 and 27). (Michael MacCracken, Climate Institute)	Boxed text on Water Resources entirely rewritten.
E-TS-240	A	23	26	23	27	repeated sentence. (Mark Baird, University of NSW)	Deleted.
E-TS-241	A	23	28	23	29	This point should be rewritten to be more generic as clearly applies outside Indian Ocean. (Michael MacCracken, Climate Institute)	Boxed text on Water Resources entirely rewritten.
E-TS-242	A	23	37	23	37	Saying 77% implies too much precision--say about three quarters or something similar (Michael MacCracken, Climate Institute)	A
E-TS-	A	23	39	23	39	Change to "wildfires will increase" so have a lexicon word being used.	A

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
243						(Michael MacCracken, Climate Institute)	
E-TS-244	A	23	41	23	42	This conclusion of forest expansion in North America is highly dependent on what happens to precipitation/evaporation and soil moisture. While there is some potential, there is also, for a number of model simulations, potential for conversion of the southeastern forest area to savanna and grassland, etc. It is also not clear how the word "other" fits in this point. And saying "some" biodiversity loss is too nebulous. (Michael MacCracken, Climate Institute)	A
E-TS-245	A	23	47	23	48	The phrase "low-productivity permanently stratified subtropical gyre biome" is much too complex--rephrase to an understandable level. Also "9.4%" is far too precise. And there is no time period given here. (Michael MacCracken, Climate Institute)	A
E-TS-246	A	23	50	23	50	The numbers 42% and 17% are too precise, giving false sense of certainty. (Michael MacCracken, Climate Institute)	A
E-TS-247	A	23		25		What does main mean? Does "likely" impacts mean only those between 66-90 % likelihood? And any confidence? Can I suggest: Box TS-3. Summary of Future Impacts and Adaptations for Sectors. Impacts and adaptations listed have a likelihood of likely, very likely or virtually certain, a confidence of high or very high, and are considered to be key impacts in the Sector. (Mark Baird, University of NSW)	The standard terminology is used, as set out in the IPCC Guidance Note – see Box TS-14.
E-TS-248	A	24	5	24	5	Change "may" to "are likely to" (Michael MacCracken, Climate Institute)	Text extensively rewritten and have tried throughout to remove imprecise langauge such as ‘may’ ‘could’ etc.
E-TS-249	A	24	17		17	It is wrong and misleading to include a prediction that does not take account of associated precipitation changes. It must be removed. (James Curran, Scottish Environment Protection Agency)	Removed.
E-TS-250	A	24	31	24	32	To avoid the false sense of precision, change to say "and, in the absence of breakthroughs on controls, these losses are projected to rise by about 30% by the 2030s and over 300% by the end of the century." (Michael MacCracken, Climate Institute)	Removed.
E-TS-251	A	24	46	24	36	Change to say ".. vulnerable to sea level rise and changes in climate, including …" (Michael MacCracken, Climate Institute)	Text completely redrafted.
E-TS-252	A	24	52	24	54	Change to read "Sea level rise of 40 cm, which is likely to occur by the end of the century, is projected to inundate up about 20% of the world's coastal wetlands, with over 40% inundated by the middle of the 22nd century in the absence of emissions mitigation measures." No real need to give a US value here as it is about in line with the overall projection (note that present text is giving the US value for 21oo	Text completely redrafted.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						while first sentence said 2080s--all quite confusing). (Michael MacCracken, Climate Institute)	
E-TS-253	A	25	4		4	The potentail for mass forced migration must be included here. (James Curran, Scottish Environment Protection Agency)	Lack research literature to support such a point.
E-TS-254	A	25	25	25	36	Delete “with larger increases beginning mid-century” because this conclusion cannot be drawn from Chapter 8 Subsection 8.4.1. (Changke Wang, National Cliamte Center, CMA)	Edited.
E-TS-255	A	25	30	25	32	Delete this statement. While there is no doubt that it is true, it is independent of climate change. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Addressed.
E-TS-256	A	25	33	25	34	It would help here to give an indication of where this is all likely--the diseases given are typical of developing countries, and so presumably there, but it could be added that heat stress is a likely reason for low income populations in developed nations to succumb. (Michael MacCracken, Climate Institute)	Addressed.
E-TS-257	A	25	46			Delete “all other considerations unchanged”. It seems uncertain that all other considerations are unchanged. (Changke Wang, National Cliamte Center, CMA)	Addressed.
E-TS-258	A	26	1	29		Why separate impacts on and adaptations of regions into box (TS-4) and text (C.2)? Move the content of this box to the following section. It is possible that some duplication of material will be easier to identify and remove as a result. (Paul Beggs, Macquarie University)	In structuring the TS, we have followed the Plenary-agreed Outline for the WG2 AR4, and this has the support of government reviewers. .
E-TS-259	A	26	1			As for Box TS-3, this is superfluous as regards the later text on regions, too brief and misleading. Drop it. Some detailed queries follow, which illustrate my argument. (Pittock Barrie, CSIRO (retired))	We have decided to keep this structure, and try to improve the separation – the main text should set out the genral headline statements and the bullets in the boxes should contain the detail and specificity.
E-TS-260	A	26	10	26	10	Change to say ""models project an increase" and delete the "are estimated" at end of line. (Michael MacCracken, Climate Institute)	Bullet rephrased.
E-TS-261	A	26	14	26	15	Change to "likely to experience" and what does "drainage density" mean? (Michael MacCracken, Climate Institute)	Bullet rewritten.
E-TS-262	A	26	17	26	17	Can delete opening "the South-western Cape" as location is also given later. Also, change "predicted" to "projected" (Michael MacCracken, Climate Institute)	Bullet removed.
E-TS-263	A	26	19	26	21	On line 19, change to say "Changes in the primary production of large lakes are likely to have …". On lines 20-21, delete "it is expected that" and change "may" to	Done.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						"is likely to" and change "an estimated" to "roughly" (Michael MacCracken, Climate Institute)	
E-TS-264	A	26	23	26	32	The words "could" and "may" need to be converted to the IPCC lexicon--so generally use "are likely to" for each of them--at least 8 instances) (Michael MacCracken, Climate Institute)	Done.
E-TS-265	A	26	33	26	33	An important conclusion is missing: Sea-level rise threatens major delta regions with large populations, as indicated in some cases in Figure TS-7, in this case the Nile and Niger deltas as well as other in Africa. If the box stays this extra point should be added. (Pittock Barrie, CSIRO (retired))	Done.
E-TS-266	A	26	36	26	38	It would help to give percentages to indicate significance. And is "sea product culturing" the same as "aquaculture"? (Michael MacCracken, Climate Institute)	No baseline available from underlying chapter, but still considered to be worthwhile statistics. Changed to aquaculture.
E-TS-267	A	26	38	26	38	Use same units--either hectares or square kilometers--not both. (Michael MacCracken, Climate Institute)	Done.
E-TS-268	A	26	38	26	39	Other major deltas in Asia should be included, as indicated in Figure TS-7 if this box is to stay, preferably with some indications of the size of the populations involved.. (Pittock Barrie, CSIRO (retired))	Two examples are considered enough. There is more detail in the underlying chapter. No action.
E-TS-269	A	26	40	26	41	The point made on line 40-41 should be combined with point pane on lines 47-48--have a single more explanatory point. (Michael MacCracken, Climate Institute)	The two points have been put next to one another, but not combined.
E-TS-270	A	26	42	26	43	Can delete "under IS92a" as out at 2030 all scenarios give virtually the same result. Also, is this not the case because of lower latitude range of Asian corals than other corals? (Michael MacCracken, Climate Institute)	The imporatnt thing is not the cause, but the extent. IS92a retained because it would be seen as a gap by other reviewers. No action.
E-TS-271	A	26	44	26	46	Here no attempt is made to distinguish between population growth and climate change as causes. They are synergistic, but both should be mentioned. (Pittock Barrie, CSIRO (retired))	Both are now mentioned.
E-TS-272	A	26	49	26	50	Change "suggested in" to "projected for"--and can the most vulnerable parts of Asia be identified here? (Michael MacCracken, Climate Institute)	It is undesirable to change 'suggested' to 'projected', given the variety of methods used in 10.4.1. It is not possible to provide information on regions given space constraints – readers need to go to underlying chapter.
E-TS-273	A	26	49	26	49	By when? What scenarios? (Pittock Barrie, CSIRO (retired))	This summarises a wealth of information in Section 10.4.1 – it is not possible to be more specific.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-274	A	26	51	26	51	Change to say "for each increase" as there will likely be larger warmings than indicated. (Michael MacCracken, Climate Institute)	No change – this language is considered to be Ok.
E-TS-275	A	26	54		54	This is not a "large" contribution. Could be something like 0.1%. (James Curran, Scottish Environment Protection Agency)	This statement removed.
E-TS-276	A	27	13	27	15	Extended drought and crop losses are already evident in southern Australia and are tentatively attributable to climate change. It in part relates to a strengthening of the Southern Annular Mode. (Pittock Barrie, CSIRO (retired))	Noted, but there has been no atttribution study that links human activities (increasing greenhouse gases) to Australian drought. The report by IOCI (2002) found a possible human contribution to the decline in rainfall in southwestern Australia, but this didn't extend to the whole of southern Australia. The paper by Burke et al (2006) attributes human activites to drought severity at the global scale, but not at the regional scale. Does IPCC WG1 attribute human activities to the strengthening of the SAM?
E-TS-277	A	27	23	27	23	What are "capital cities" and why is the effect only there. Can the word "capital" simply be eliminated? (Michael MacCracken, Climate Institute)	Agree: We have deleted "capital cities".
E-TS-278	A	27	23	27	24	This is a mixture of climate change and population growth and aging. Clarify. (Pittock Barrie, CSIRO (retired))	Noted. The details are in the report by McMichael et al (2003), cited in 11.4.11. This is not the place to cite those details.
E-TS-279	A	27	26	27	26	Change "loss" to "degradation"--we do not lose the land, we lose the value of what it can produce or be used for. (Michael MacCracken, Climate Institute)	Agree. Replace "loss" with degradation".
E-TS-280	A	27	33	27	34	It is not clear to me whether this refers to changes in variability and extremes or to changes in seasonal averages relative to the present. Clarify meaning. As the next dot point refers to averages, this one is probably about extremes, but that is guesswork. (Pittock Barrie, CSIRO (retired))	Language changed for clarity.
E-TS-281	A	27	35	27	43	Are these points really for the 2080s, or for the end of the century--typically, are not the calculations for the period 2080-2099 or something. It would be better in all the cases to really say by the end of the century. (Michael MacCracken, Climate Institute)	Language changed to make clear the date (which is not the end of the century).
E-TS-282	A	27	48	27	48	The text in paragraph 12.4.7.1 refers to energy crops and not crops in general. (Yannis Sarafidis, National Observatory of Athens)	FGD of Chapter 12 includes maize in this statement about northward expansion.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-283	A	27	58	61		This is quite inadequate as the impacts will depend on timing. If the THC breaks down in the next few decades it may lead to regional cooling relative to present, but if not until the 21st century it may lead to less warming but still some warming. (Pittock Barrie, CSIRO (retired))	Statement somewhat rephrased but please note that major reference to THC is on page 60 lines 40-47 of new draft.
E-TS-284	A	27				need to indicate time scale (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	In the new draft we have worked to be more rigorous about timescales.
E-TS-285	A	28	5	28	29	The occurrence of the first tropical cyclone recorded in the South Atlantic has been attributed to climate change related to the strengthening of the Southern Annular Mode. See: Pezza, A.B. and I. Simmonds, 2005: The first South Atlantic hurricane: Unprecedented blocking, low shear and climate change. Geophysical Research Letters, 32, L15712, doi:10.1029/2005GL023390. If borne out, this has serious implications for Brazil. (Pittock Barrie, CSIRO (retired))	The issue of Catariana as "produced" by climate change is not addresed in Chapter 13. The suggested references will be revised and considered for the next stage.
E-TS-286	A	28	9	28	9	For 2055, there is little difference between scenarios, so why not just delete "depending on the SRES scenario considered"? Is that really the cause of the uncertainty? (Michael MacCracken, Climate Institute)	Sorry, I cannot find it in the text.
TS - 287	A	28	37	28	39	This greatly underplays the situation by neglecting to mention many other locations such as Chesapeake Bay area, San Francisco Bay area and Florida. (Pittock Barrie, CSIRO (retired))	Added list of affected coastal areas e.g., gulf, atlantic and northern coasts. Inditcated that New York example is a case study.
E-TS-288	A	28	40	28	60	The words "may", "should", and "could" need to be replaced with lexicon words, such as "is likely to"--in at least 6 places. Also, the years mentioned here need to be generalized a bit--saying "by 2090" and "In 2050" are simply too precise--could be before or later. (Michael MacCracken, Climate Institute)	Changed dates where appropriate and wording to lexicon words.
E-TS-289	A	28	45	26	45	Change "will probably' to "is very likely to" (Michael MacCracken, Climate Institute)	Changed to suggested wording.
E-TS-290	A	28	45	28	45	Reduced snowpack is a trend now, observed data. (Pittock Barrie, CSIRO (retired))	Agreed but focusing on future impacts.
E-TS-291	A	28	54	28		Again xls program does not allow lines past 54. Increased fire occurrence has already been observed in Canada and parts of the western US. This is not a problem for 2100 but for now. (Pittock Barrie, CSIRO (retired))	Point that is being made is that disturbances will be the greatest impact on forests; yes it is a current issue but the point is that it will become the most important.
E-TS-292	A	28	59	60		Again, program does not allow line numbers, but they are 59-60. Should add that rapid or abrupt climate change will add greatly to costs of adaptation or make it too late to save damages. Infrastructure will have to be written off before its economic	Added sentence on long lead times of infrastructure development and that it would benefit from adaptation.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						lifetime. (Pittock Barrie, CSIRO (retired))	No text in chapter to support rapid or abrupt climate change point.
E-TS-293	A	29	3	29	5	Should relate this to impacts on wildlife, coastal erosion and communities. Also should note that it is already well under way, not some distant threat. (Pittock Barrie, CSIRO (retired))	This is given in nore details further in the text, section C.2.
E-TS-294	A	29	3	29	4	In two spots, change "predictions" to "projections". On line 4, can it be said why the Antarctic estimates vary so much. (Michael MacCracken, Climate Institute)	“Predictions” was changed to “projections”. More studies are needed to narrow the uncertainties in the Antarctic.
E-TS-295	A	29	6	29	6	What is meant by "Northern Hemisphere permafrost is projected to reduce by 20-35% by 2050" - the areal extent? its thickness? Clarification is required. Section 15.3.4 presents no values regarding reduction of permafrost and only mentions that the areal extent of permafrost will decrease in the 21st century. The statement should be revised to reflect those made in Ch. 15. (Sharon Smith, Natural Resources Canada)	The word “are” was added to the TS text. Projected reduction of permafrost area by 20%-35% by 2050 were added to section 15.3.4.
E-TS-296	A	29	6	29	6	Change "reduce" to "decrease" (Michael MacCracken, Climate Institute)	Changed.
E-TS-297	A	29	11	29	12	The 14-23% seems to me false precision. Also, change so both points giving result for end of century (not 2080 and 2100). (Michael MacCracken, Climate Institute)	Changed as suggested.
E-TS-298	A	29	21	29	23	Should note that there are likely to be more widespread wildfires in boreal forest due to higher temperatures and occasional droughts. Already observed in Canada and Alaska. (Pittock Barrie, CSIRO (retired))	New item was added to the box.
E-TS-299	A	29	33			Section Small Islands: Please delete the bullet point on renewable energy in lines 57-59. This is a mitigation issue and not within the scope of WG2. Unless it can be explicitly linked to changes in climate, and the direct impacts of those changes on the energy systems of small islands (eg disruption of fossil fuel supplies during and after major storms), this material does not belong in WG2. (Andy Reisinger, IPCC SYR TSU)	We delted this bullet.
E-TS-300	A	29	33			Section Small Islands: I'm somewhat surprised that this section does not mention the impacts of long-term sea-level rise, which is virtually certain to continue for centuries to come. Depending on scenario, this on-going SLR could extinguish some low-lying countries entirely. I would have thought that this would be a highly relevant and defensible statement (check with WG1 on revised long-term sea-level projections) to make. (Andy Reisinger, IPCC SYR TSU)	While were are aware of media, anecdotal and some agency reports and government statements that 'on- going sea-level rise could extinguish some low-lying countries entirely' we are not aware of any substantive scientific research that justifies the comment. On atoll islands such as those in

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							Tuvalu, Kiribati, Marshall Islands and the Maldives the source of island sediments is from the adjacent coral reef. With sea-level rise it is most lkely that reefs will grow up and expand laterally and thus provide more sediment for additional island building. If however reefs are subject to coral bleaching and degradation, the degraded products will be transferred to island depocenters thus adding to reef islands, at least in the first instance. (And what are bleached corals replaced with? Coralline algae and other sediment producers) Moreover, with rising sea levels, storm waves, rough seas and tides will reach higher, thus having the capability of building island ridges up to greater elevations than under present sea level and wave conditions. These are some of many arguments that can be put forward to counter the view that atoll and reef islands will be "extinguished" with rising sea level. However such arguments are not as catchy (or it would seem politically correct) as the destruction of islands and what to do with the resulting environmental refugees. We refer you also to the comments in our chapter especially the second and fourth paragraphs in 16.4.2 and 16.5.4.4.
E-TS-301	A	29	35	29	38	These are only a few examples amongst many - misleading as is. (Pittock Barrie, CSIRO (retired))	We took these becausethere are few case studies with quantitative assessment results, though damage of port facilities is certainly an important impact. In addition, we deleted the

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							cases for St.Lucia and Grenada fore they are past events not future impacts.
E-TS-302	A	29	39	29	41	Adverse effects of adaptation, such as sea walls, should be mentioned. (No view of sea from Apia, Samoa or Male in the Maldives.) (Pittock Barrie, CSIRO (retired))	The comment seems to refer to different bullet, because walls are not used for adaptation to rainfall change. Regarding the coastal adaptation, seawall is not a single measure, and there are many other options ranging from hard structures to soft planning. Even though seawall has some disadvantages like no view, we do not think to focus on this point in a narrow space like TS. not used for adaptation.
E-TS-303	A	29	40	29	41	Change sentence to read "Lens reductions due to decreases in precipitation are likely to be significantly exacerbated by sea level rise." (Michael MacCracken, Climate Institute)	We strengthened the text in the wat the meaning of the comment is expressed.
E-TS-304	A	29	47	29	50	What about the future? (Pittock Barrie, CSIRO (retired))	We deleted the bullet because it did nor look at the future.
E-TS-305	A	30	1	43	6	The discussion of adaptation is inconsistent across the geographic areas discussed in this section. There is no discussion of adaptation for Africa, Asia, Europe and Latin America. The topic is discussed in the sections on Australia/New Zealand and North America, and at least mentioned in the sections on Polar Regions and Small Islands. All sections should have a full discussion of adaptation, as it is an important theme for this report. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	The intention was that chapters would restrict themselves to impacts in this section, and not deal with adaptation. Some have folowed this line, while others have not. We have tried to persuade chapters to exclude information on adaptation in this section in the FGD, and I think tehre is some improvement, but regretfully we haven't been 100% successful.
E-TS-306	A	30	5			Africa section should discuss sea-level rise and major deltas as shown in Figure TS-7, with an idea of number of people affected. (Pittock Barrie, CSIRO (retired))	A new bullet has been added in Box 5.
E-TS-307	A	30	12	30	13	These numbers seem so small as to be in the noise--is this correct, or are the really going to be noticed? (Michael MacCracken, Climate Institute)	Removed from text.
E-TS-308	A	30	15	30	31	Replace the "may", "could", and "might" by IPCC lexicon words--such as "are likely to"--at least 6 instances. (Michael MacCracken, Climate Institute)	Done.
E-TS-309	A	30	25	30	35	The bullet is based on incorrect information. The images don't show glacier retretat but different snow cover. Snow cover usullay lasts only very few days on tropical Kilimajaro and each of the two pictureas could have been taken anythime in the last	Interacting factors now specified.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						50 years, even in an inverse order. A product advertising web site cannot be used as a source for scientific results unless they are referemced respectively. For correct information see WG1 Ch 4.5. The entire bullet needs either to be rewritten or to be removed. (Georg Kaser, Geo and Atmospheric Sciences)	
E-TS-310	A	30	27	30	28	The statement that glaciers on Kilimanjaro are retreating is correct, but incomplete. Add: "However, the shrinkage of glaciers on Kilimanjaro's slopes is constantly decelerating." This finding is report in WG I's SOD (Chapter 4, Pg. 19, lines 42-43), and is necessary to put Kilimanjaro's glacier loss in context. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	This hasn't been incorporated due to space limitations.
E-TS-311	A	30	28	30	29	Add the following phrase: "for which solar radiation has been identified as the main driver" to the statement "By 2020, indication are that the ice cap (on Kilimanjaro) could disappear for the first time in 11,000 years." Without that clarification, readers could assume that human induced temperature rise is the cause of the loss of Kilimanjaro's ice cap. However, this is not the case. WG I's SOD (Chapter 4, Pg. 19, lines 36-39) finds: "Glaciers on Kilimanjaro behave exceptionally. Even though the thickness of tabular ice on the summit plateau has not changed dramatically over the 20th century, the ice has shown incessant retreat of the vertical ice walls at the margin, for which solar radiation has been identified as the main driver." WG I's finding indicates that the loss of Kilimanjaro's ice cap is driven mainly by natural events, not human activities. Given the iconic status of the "snows of Kilimanjaro" it is important that the reason for their disappearance be made clear to readers. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Solar radiation now included.
E-TS-312	A	30	34	30	35	Simply presenting photos of Kilimanjaro's summit in 1993 and 2000 in Figure TS-9 without an explanation that the loss of the summit ice cap is mainly driven by solar radiation (WG I SOD, Chapter 4, Pg. 19, lines 36-39) is highly misleading. The solar radiation effect is natural, not related to human induced climate change. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Solar radiation now included.
E-TS-313	A	31	7	31	18	This discussion of malaria transmission is important and should be retained in the final draft. Past IPCC assessments have incorrectly argued that increased risk of malaria would be one of the main impacts of climate change on human health. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Text has been shortened but discussion of malaria remains.
E-TS-314	A	31	26	31	38	Replace the "may" and "could" by IPCC lexicon words--at least 4 instances. (Michael MacCracken, Climate Institute)	Done.
E-TS-315	A	31	40			Asia section should discuss increased forest fires, especially in boreal forests, and also in tropical areas such as Borneo where major fire losses occurred in El Nino years (Aldhous, P., 2004: Borneo is burning. Nature, 432, 144-146).	Reference to forest fire on page 35 lines 25-27 of new draft are considered adequate for TS – for more detail readers will have to go to

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Pittock Barrie, CSIRO (retired))	underlying chapter.
E-TS-316	A	32	4	32	28	Replace the words "could", "can" and "should" by IPCC lexicon words--is likely to take some rephrasing. At least 8 instances. (Michael MacCracken, Climate Institute)	We have worked hard in new draft to standardize use of language to express uncertainty, and delete such words.
E-TS-317	A	32	9	32	14	The change in seasonality of runoff due to reduced snow and ice storage is critical for irrigation in summer and should be explicit here.. (Pittock Barrie, CSIRO (retired))	This is not particular to Asia, and the point is made elsewhere in the TS for example in the Water Resources section.
E-TS-318	A	32	16	32	21	The bullet needs to be cross checked for consistency with WG1 Ch 4.5 (Georg Kaser, Geo and Atmospheric Sciences)	This is based on reading of the literature, and so should be consistent with WG1 Chapter 4.
E-TS-319	A	33	53	33	53	Replace "loss of" by "damage to" (Michael MacCracken, Climate Institute)	Noted. “loss” replaced by “degradation”, consistent with comment TS-279.
E-TS-320	A	34	28	34	29	Figure TS-11 is very good--should be done for all IPCC regions. (Michael MacCracken, Climate Institute)	Noted. Thanks!
E-TS-321	A	34	28		29	The map of Australia highlights some significant adverse effects due to climate change but this is NOT replicated in the text on p27 (see my general coment at the head of this response). (James Curran, Scottish Environment Protection Agency)	Noted. Box TS-4 now includes dot points that mention all of the *regions* in Figure TS-11. Box TS-4 doesn’t have enough space to duplicate the detailed *text* in Figure TS-11.
E-TS-322	A	35	13	35	20	The relative contribution of climate change and population growth should be mentioned. These are synergistic effects especially as demand will increase with warming. (Pittock Barrie, CSIRO (retired))	This headline statement has been rewritten and the supporting text revised – it is not, however, starightforward to allocate the relative contributions of tehse two – we have really only made it clear that both contribute (and see page 71 line 3 to 27 on new draft TS).
E-TS-323	A	35	39	35	54	Replace "may" and "could" per IPCC lexicon--at least 5 instances. (Michael MacCracken, Climate Institute)	We have worked hard in new draft to standardize use of language to express uncertainty, and delete such words.
TS - 324	A	36	21	36	21	Replace "in 2080s" by "by the end of the century". And the table having 3-figure precision is simply overdone--this is one study and there is surely greater uncertainty. (Michael MacCracken, Climate Institute)	Table has been removed. 2080s not replaced by end of century – if the literature says by 2080s, that’s what we need to reflect.
TS - 325	A	36	43	36	48	The bullet needs to be cross checked for consistency with WG1 Ch 4.5 (Georg Kaser, Geo and Atmospheric Sciences)	This is based on reading of the literature, and so should be consistent with WG1 Chapter 4.
E-TS-326	A	37	5	37	5	In second bullet, why is this a problem only for low-lying coastlines--will it not be more general? (Michael MacCracken, Climate Institute)	Not only, but specially for low-lying coast lines, because of se-level rise.
E-TS-	A	37	28	37	28	SLR should be defined.	OK.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
327						(Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	
E-TS-328	A	37	30	37	32	The various "i.e."s should be "e.g."s. (Pittock Barrie, CSIRO (retired))	Ok.
TS - 329	A	38	19	38	38	"especially the poor and indigenous …" - especially in the light of New Orleans. (Pittock Barrie, CSIRO (retired))	Added poor.
E-TS-330	A	38	52	38	54	The link between adaptation and elevated CO2 is not clear. Better examples might be irrigation infrastructure and plant breeding. (Pittock Barrie, CSIRO (retired))	Removed section.
E-TS-331	A	39	10	39	11	It is really species that are directly affected by various climatic factors not all of which change the same way, and as species change location or phenology this affects ecosystems via mutual dependencies, and so ecosystems either change or die out. Ecosystems do not get moved around, they change or die out. (Pittock Barrie, CSIRO (retired))	Reworded.
E-TS-332	A	40	9	40	9	"… been rapid, and further dramatic changes are expected." (Pittock Barrie, CSIRO (retired))	Language will be fixed during the final editing.
E-TS-333	A	40	28	40	28	replace last character in line "0" by ")" (Antje Schwalb, Institut für Umweltgeologie)	Fixed.
E-TS-334	A	40	33	40	39	Positive feedbacks of retreat of sea ice on climate should be mentioned. (Pittock Barrie, CSIRO (retired))	Note was added to the last point on global feedbacks.
E-TS-335	A	41	4	41	8	Loss of permafrost and its adverse effects on infrastructure and coastal erosion should be mentioned. (Pittock Barrie, CSIRO (retired))	This point is addressed in Box TS-4.
E-TS-336	A	41	12	41	12	"loss of land-based ice" (Pittock Barrie, CSIRO (retired))	Text changed.
E-TS-337	A	41	14	41	15	This is already evident (Labat, D., Y. Godderis, J.L. Probst and J.L. Guyot, 2004: Evidence for global runoff increase related to global warming. Advances in Water Research, 27, 631-642). (Pittock Barrie, CSIRO (retired))	We do not understand this comment, what action is expected?
E-TS-338	A	41	16	41	19	This is complex. Thawed permafrost will give off methane if it is wet, but CO2 if it is dry, so drainage is important. Methane hydrates are another complication and perhaps should be explicity mentioned as they could be a large contributor. Plant growth will of course take up some CO2 unless it gets burned. As for albedo, the loss of seasonal snow cover and permfrost and reduced sea ice, not just increased plant cover, will all reduce albedo, and these effects are clearly happening already, not lagged due to slow plant growth. So the positive feedbacks are kicking in already. For refs. see my EOS article in press July 2006. (Pittock Barrie, CSIRO (retired))	We agree, however there is obviously no space in TS for such a complex discussion. The text has been changed in the spirit of reviewer's comment.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-TS-339	A	41	46	43	6	Section Small Islands: I'm somewhat surprised that this section does not mention the impacts of long-term sea-level rise, which is virtually certain to continue for centuries to come. Depending on scenario, this on-going SLR could extinguish some countries entirely. I would have thought that this would be a highly relevant and defensible statement (check with WG1 on revised long-term sea-level projections) to make. This would have to come from the underlying chapter of course, so this comment is just to flag that if the statement is made in the underlying chapter, it would appear highly relevant to take it up in the TS as a limit to adaptive capacity. (Andy Reisinger, IPCC SYR TSU)	While were are aware of media, anecdotal and some agency reports and government statements that 'on- going sea-level rise could extinguish some low-lying countries entirely' we are not aware of any substantive scientific research that justifies the comment. On atoll islands such as those in Tuvalu, Kiribati, Marshall Islands and the Maldives the source of island sediments is from the adjacent coral reef. With sea-level rise it is most lkely that reefs will grow up and expand laterally and thus provide more sediment for additional island building. If however reefs are subject to coral bleaching and degradation, the degraded products will be transferred to island depocenters thus adding to reef islands, at least in the first instance. (And what are bleached corals replaced with? Coralline algae and other sediment producers) Moreover, with rising sea levels, storm waves, rough seas and tides will reach higher, thus having the capability of building island ridges up to greater elevations than under present sea level and wave conditions. These are some of many arguments that can be put forward to counter the view that atoll and reef islands will be "extinguished" with rising sea level. However such arguments are not as catchy (or it would seem politically correct) as the destruction of islands and what to do with the resulting

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
							environmental refugees. We refer you also to the comments in our chapter especially the second and fourth paragraphs in 16.4.2 and 16.5.4.4.
E-TS-340	A	42	39	42	39	Change "may" and "could" to "are likely to" (Michael MacCracken, Climate Institute)	We have changed where it is appropriate.
E-TS-341	A	42	44	42	45	Delete the statement: "Climate change is likely to result in increases in climate-sensitive vector-borne diseases such as dengue fever and malaria." It is not consistent with the more carefully balanced and well supported statement about the effects of climate change on malaria that appear on Pg. 31, lines 7-18 of the TS, or with the more detailed discussion of the topic in section 8.2.8.2. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	We have changed the text.
E-TS-342	A	43	1	43	6	Migration has always been one possible adaptation to environmental stress. Pressure to migrate will increase and this will pose policy concerns for potential receiving countries. (Pittock Barrie, CSIRO (retired))	We have added a new section (16.5.4.4.) on 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.
E-TS-343	A	44	7			…that include migration crop diversification… (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	Addressed in complete rewrite of section.
E-TS-344	A	44	27	44	28	Are you sure? Not just responses? (Stephen John Hawkins, The Marine Biological Association of the United Kingdom)	This text now removed.
E-TS-345	A	44	39	44	40	It is not clear what this statement regarding response to permafrost thaw by Inuit is based on. There is nothing in section 17.2.3 that specifically comments on adaptation to permafrost thaw in Nunavut. An example is provided in Table 17.1 but does not specifically mention adapatation to permafrost thaw. (Sharon Smith, Natural Resources Canada)	Addressed in complete rewrite of section.
E-TS-346	A	44	41	44	41	Add Australia to the list where artificial snow-making is increasing. (Pittock Barrie, CSIRO (retired))	Addressed in complete rewrite of section.
E-TS-347	A	45	25	45	42	It would be very helpful to have some clearer statements about limits to adaptation relative to specific degrees of global warming, even if only at a regional scale. The	Addressed in complete rewrite of section.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						current list of examples is useful, but it gives no guidance as to how those limits are related to amount of warming. It also gives little guidance to the reader as to how widespread those limits are, and how much they can be extrapolated across the globe or at least regions to form a coherent picture of limits to adaptation. If no more generic quantitative information is possible, then this should be stated clearly, too. Limits to adaptation and adaptive capacity are highly policy relevant that should not be left, if at all possible, at a list of isolated and qualitative examples only from which readers draw their own conclusions. (Andy Reisinger, IPCC SYR TSU)	
E-TS-348	A	45	29	45	29	Change "to" to "of" (Pittock Barrie, CSIRO (retired))	Addressed in complete rewrite of section.
E-TS-349	A	45	35	45	35	Delete "it" (Pittock Barrie, CSIRO (retired))	Addressed in complete rewrite of section.
E-TS-350	A	45	37	45	37	Add: "…for social sectors, reduce economic growth and reduce adaptive capacity." (Pittock Barrie, CSIRO (retired))	Addressed in complete rewrite of section.
E-TS-351	A	45	40	45	40	Change "may" to "is likely to" (Michael MacCracken, Climate Institute)	Addressed in complete rewrite of section.
E-TS-352	A	45	40	45	40	Add: "…to implement, and will be costly." (Pittock Barrie, CSIRO (retired))	Addressed in complete rewrite of section.
E-TS-353	A	45	43	45	43	Add new point (f): Adaptation has to compete with other funding priorities and will often be too late (as in the case of New Orleans in 2005). (Pittock Barrie, CSIRO (retired))	Addressed in complete rewrite of section.
E-TS-354	A	46	24			Box TS-15. The caption is not adequate to explain the Figure. (Pittock Barrie, CSIRO (retired))	Addressed in complete rewrite of section.
E-TS-355	A	47	1			This section fails to mention one of the biggest issues: that the long time lags re mitigation reducing climate change means that action must be taken soon to avoid increasing damages many decades hence. Thus if we are to avoid global warming of 2 to 3dC by 2100 relative to preindustrial we need to reduce emission by some 50% by 2050. This poses a severe problem, discussed at some length in papers in Schellnhuber et al. 2006 ("Avoiding Dangerous Climate Change", Cambridge UP, available at www.defra.gov.uk.). See especially the paper by Edmonds and Smith (Chapter 41, p.385-), which raises the question as to whether it will be possible to avoid a 2dC warming by 2100.. The time lag means that it will not be possible if significant absolute reductions are not made in the next few decades. (Pittock Barrie, CSIRO (retired))	This is now dealt with in Section D.
E-TS-356	A	47	4	47	14	Innovations from the chemical industry are the key to greater energy efficiency and sustainable climate protection. In our research strategy we are concentrating major	TSU to respond in consultation with Chapter 18 authors.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						technology-driven issues of particular relevance to the future in the five growth clusters: energy management, raw material change, nanotechnology, plant biotechnology and white (industrial) biotechnology. (James Bero, BASF)	
E-TS-357	A	47	4	47	14	BASF is developing and marketing products that contribute to energy savings and CO2 reductions. Examples are insulating materials for the construction industry, plastics to make cars lighter and additives to enhance fuel efficiency. (James Bero, BASF)	Rewritten.
E-TS-358	A	47	5	47	6	There will not only be lag times in the climate system but also lag times for the impacts themselves due to feedbacks, system inertia etc. One example would be impacts on the cryosphere were the impacts may lag behind the changes in climate due to the time required for heat transfer, latent heat effects etc. We must consider that benefits of mitgation may not be noticeable in terms of the impacts related to climate change for a longer period of time. (Sharon Smith, Natural Resources Canada)	Not included.
E-TS-359	A	47	5	47	6	Are noticeable benefits in 2040 the best case scenario? One assumes that these benefits related to mitigation will only occur in this time period if all emission targets are met and all countries participate in Kyoto etc. (Sharon Smith, Natural Resources Canada)	Rewritten.
E-TS-360	A	47	6	47	6	Change "until 2040" to "mid-century" (Michael MacCracken, Climate Institute)	Done.
E-TS-361	A	47	8	47	14	It is important to also mention that there may be lags in the response of biophysical systems (see earlier comment) and impacts may continue to occur well after mitigation employed and climate stabilized - adaptation may be required for long periods. Impacts in many cases will not be reversible (or systems may be slow to recover) so adaptation may be required over the longer term. (Sharon Smith, Natural Resources Canada)	Accepted.
E-TS-362	A	47	12	47	14	This statement sounds intuitively plausible, but I don't think it is fully supported by the underlying chapter. The discussion in section 18.4.3 leaves a much more open and ambiguous picture as to what or where limits to cost effective adaptation might be. This is an extremely important statement that needs full, extensive and explicit support in the underlying chapter if it is to be brought forward into the TS. (Andy Reisinger, IPCC SYR TSU)	Rewritten.
E-TS-363	A	47	30	47	32	The wording "while its costs and ancillary benefits arise locally" is incorrect. There are many instances of adaptation costs and benefits accruing on regional and global scales, of which three examples follow. Research on heat-/drought-tolerant crop varieties is funded and im+K4plemented on a global scale through CGIAR. An	Rewritten.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						increase in electricity use due to more air conditioning in hot summers will have regional costs through increased electricity prices throughout the grid area. Benefits of coastal protection that avoid displacement of population include lower migratory pressure on industrialized countries. (Axel Michaelowa, Hamburg Institute of International Economics)	
E-TS-364	A	47	32	47	34	Sentence should be modified to reflect that mitigation can also happen due to private action (voluntary activities such as offsetting air travel emissions or other private activities are happening in many industrialised countries, see Ch. 13 of WG III). While currently adaptation may be dominated by private action, this could change in the future due to the risk that private investment in adaptation may be below the social optimum and thus government investment is done to ensure reaching of the social optimum. (Axel Michaelowa, Hamburg Institute of International Economics)	Rewritten.
E-TS-365	A	47	47	47	52	Change "may" to "are likely to on lines 47 and 52. (Michael MacCracken, Climate Institute)	Accepted.
E-TS-366	A	47	52	47	53	Delete sentence as it is not substantiated by the literature. Synergies will always be one of many decision criteria, not the overriding one. (Axel Michaelowa, Hamburg Institute of International Economics)	Rewritten.
E-TS-367	A	48	4	48	17	This paragraph contains two very important separate statement and findings that almost contradict each other. It would be better if they were separated to limit the contradition and bring out their importance more clearly. The first one is the need to have costs and benefit information over long time scales to assist decision-making; it might also be worth adding the emerging concept of declining discount rates over time. This first thought ends at line 13. The second statement, from line 14 to 17, which is very relevant and important, is that even with very good cost information, one cannot necessarily add it all up and get a balanced cost-benefit analysis because it isn't necessarily a null-sum game. I think this would be worth lifting out into a separate paragraph. (Andy Reisinger, IPCC SYR TSU)	Rewritten.
E-TS-368	A	48	14	48	17	Change phrase into: "It is challenging to identify an optimal mix of adaptation and mitigation due to the well-known problems of quantifying welfare impacts on stakeholders living at different points in time and having widely differing political influence." Budgets for action are always limited in an economy and thus the assumption of no budget constraint underlying the wording should be deleted. (Axel Michaelowa, Hamburg Institute of International Economics)	Rewritten.
E-TS-369	A	48	31			Table TS-4. This has several unexplained acronyms, viz., CDM, MEA, ENGO. Cannot assume readers know these.	Accepted.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Pittock Barrie, CSIRO (retired))	
E-TS-370	A	49	1			Section E. This section, and the underlying chapter, employ an inconsistent definition (or rather lack of a definition) of "key vulnerabilities". According to WG2 definitions, "vulnerability" means "susceptibility to harm". Therefore, it is not the actual harm (ie impact) but the susceptibility to sustain harm that should be described as a "key vulnerability". However, Section E and chapter 19 use "key vulnerability" interchangeably with vulnerability, impact, or something akin to coping limits. This makes this section unnecessarily weak. It would be much more robust to clearly separate "suceptibility to significant harm" (=key vulnerability), and the likelihood that the change that would cause such harm would actually occur (which would have to, and could, rely much more explicitly on supporting information and assessments by WG1; and the key vulnerability would to a first degree be independent of changes in knowledge about the actual likelihood of events, and hence be of longer lasting relevance). To give a practical example, "not wearing a seatbelt" is a key vulnerability to motorists. It can be discussed on its own. But to say that a car crash or speeding somehow "trigger" the key vulnerability sounds odd. A car driver cannot argue that because he or she drives slowly, he/she won't "trigger" the key vulnerability (police DO NOT argue about the speed of the driver when handing out a ticket for not wearing a seat belt). Not wearing a seat belt is a key vulnerability, full stop, because car crashes do happen, can be deadly, and one cannot rule out a crash no matter how careful the driver is. The same line of argument would make a lot of sense for the key vulnerabilities discussed in this chapter. (Andy Reisinger, IPCC SYR TSU)	Chapter 19 authors have worked to achieve a robust definition of 'key vulnerability', and this section is much more successful in the FGD. See E-TS-372.
E-TS-371	A	49	1			Section E. I believe that the phrase of "triggering key vulnerabilities" is misleading because it implies that there are "triggers", which implies a rapid, non-linear change. There is not always good evidence for this where the phrase is used in this section. It also confuses (see my other general comment on this section) the issue of "susceptibility to harm", which is what vulnerability is meant to signify, and the actual occurrence of the event, which is a question of chance and probability, not susceptibility. (Andy Reisinger, IPCC SYR TSU)	'Trigger' does not occur in the FGD of (old) Section E. 'Susceptibility' does not occur in the FGD of the TS.
E-TS-372	A	49	3	49	4	The idea of key vulnerabilities in geophysical (or physical) systems does not make sense. According to the definition of vulnerability it refers to the degree to which a system is susceptible to or unable to cope with adverse effects of climate change and an important factor is the adaptive capacity. It would seem that physical systems (or the physical environment) can adapt to changes in climate. This	Agreed, rewritten extensively.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						response or adaptation may be for example changes in the landscape such as landslides, erosion or changes in storm patterns etc. The system will adapt and change, the problem might be that it is not to our liking. It would seem that the vulnerability label is attached because it is the human (or biological) system that can not cope with the changes in the physical system and it is the human or biological system that is vulnerable rather than the physical system. (Sharon Smith, Natural Resources Canada)	
E-TS-373	A	49	21	49	22	"...some illustrative examples…" (Pittock Barrie, CSIRO (retired))	Rewritten.
E-TS-374	A	49	25	49	30	Another important group of thesholds are those associated with avoiding positive feedbacks from making changes rapid and irreversible, such as the melting of the GIS or WAIS. We may already have passed at least one of these thresholds. (Pittock Barrie, CSIRO (retired))	Included in rewrite.
E-TS-375	A	49	32	50	2	Another point that should be made is that uncertainties, highlighted by some recent observations of rapid climate-related changes, mean that there is a risk that key thresholds could well be lower than present best estimates (again, refer to my EOS forum article in press). (Pittock Barrie, CSIRO (retired))	Included in rewrite.
E-TS-376	A	50	14	50	14	Change "may" to "it is possible that" or some other choice from the IPCC lexicon. (Michael MacCracken, Climate Institute)	Entire uncertainty descriptions changed to eliminate imprecise language.
E-TS-377	A	50	28	50	31	Please ensure that this para is consistent with the detailed assessment of extremes, including their attribution and projections, as contained in Table SPM-1 in WG1 (also check for updates to this table). The authors might also wish to consider an explicit reference to this table (in which case the wording has to be identical). (Andy Reisinger, IPCC SYR TSU)	Rewritten to eliminate inconsistencies with WG1.
E-TS-378	A	50	37	50	42	I would now add "global warming, but high confidence that aggregate impacts will be negative at larger warmings." (Pittock Barrie, CSIRO (retired))	Concept explained in rewritten tables.
E-TS-379	A	50	38	50	45	Change "may" and "could" to "are likely to" or something similar--3 instances. (Michael MacCracken, Climate Institute)	Entire uncertainty descriptions changed to eliminate imprecise language.
E-TS-380	A	50	43	50	47	Note that this para is inconsistent with the detailed assessment of ice sheet changes and projections in WG1. In fact, the global temperature level at which complete deglaciation of Greenland would occur has been raised from 2.7 to 3.1 deg C based on recent literature. This does not mean that you cannot qualify such findings further, ie with reference to incomplete modelling of base lubrication. But the generic statement that thresholds may be lower than in the TAR appears inconsistent with the literature on projected ice sheet changes. Either change the	Rewritten to eliminate inconsistencies with WG1.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						wording, or provide a clear and robust reference that justifies this rather significant statement. (Andy Reisinger, IPCC SYR TSU)	
E-TS-381	A	50	47	50	47	Add: Acceleration of outlet glaciers has already been observed on Greenland and in Antarctica. Refs. in my EOS article, in press July 2006. (Pittock Barrie, CSIRO (retired))	Language rewritten to avoid inconsistencies with WG1.
E-TS-382	A	51	0			Table TS-5. Ice sheet changes. The phrase "triggering" partial deglaciation is misleading because it implies a trigger, ie a non-linear threshold. I'm not aware of such a threshold and have not found reference to a threshold in the underlying chapter, WG1, or the literature. Also, please be more careful with time frames. According to the WG1 assessment based on palaeo data and modelling, the upper limit for expected SLR is 0.4m per century from Greeland. Even if you assume that we could get up to 1m per century from a rapid disintgration of WAIS, it would take not "several centuries" (which is perhaps 200 to 500 years in my books) but at least a millennium to have 10m SLR. Even thousand years would appear to be an upper bound estimate, and "millennia" would appear more appropriate. The phrase of "several centuries" is of course still relevant, but not if you want to point to a 10m rise. I found no literature assessed in either the WG1 or WG2 report that would suggest a 10m rise over several (2 to 5) centuries. (Andy Reisinger, IPCC SYR TSU)	Language rewritten to avoid inconsistencies with WG1.
E-TS-383	A	51	1			Table TS-5. Under Regional systems, col.2, this bit re increasing drought needs to be generalised to Mediterranean-type climates such as southern Europe, southern Africa and Australia, and part of the western US, all affected by a more positive trend in the Annular Modes (see my EOS article in press). (Pittock Barrie, CSIRO (retired))	Point addressed in revision.
E-TS-384	A	51	1			Table TS-5. Coastal communities, col.3. We need to add some numbers related to population or area affected by SLR of order 1m and/or 5m in the light of the fears re disintegration of the GIS and WAIS. (Pittock Barrie, CSIRO (retired))	More information given in revised table.
E-TS-385	A	51	1			Table TS-5, last entry, col.3. Add that acceleration of outlet glaciers on the GIS and parts of Antarctica are already observed. (Pittock Barrie, CSIRO (retired))	Language rewritten to avoid inconsistencies with WG1.
E-TS-386	A	51				Table TS-5. The statement "Many Arctic systems vulnerable to permafrost melting" needs to be clarified. What systems? Human (including communities, infrastructure), biological? (see earlier statement regarding vulnerability of physical systems). Techniques for adaptation with respect to infrastructure already exist as infrastructure needs to be designed to withstand a certain amount of permafrost	Point addressed in revision.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						thaw regardless of climate warming. (Sharon Smith, Natural Resources Canada)	
E-TS-387	A	52	7	52	17	Given the importance of these figures to compare impacts costs against mitigation costs (even if only crudely), it might be helpful to have a slightly longer discussion of those figures. For example, it might be useful to state whether most of those studies include very long-term impacts (such as melting of Greenland), whether there are non-linearities (eg ecosystems flip, or when certain regions reach their adaptive capacity limits), and finally a reference to the fact that damage costs not only increase at the margin, but also accumulate. (Andy Reisinger, IPCC SYR TSU)	Done.
E-TS-388	A	52	8	52	9	Explain 'social cost of carbon." (Pittock Barrie, CSIRO (retired))	Done.
E-TS-389	A	52	19	52	25	These two paragraphs need to be in reverse order, as the first illustrates the second. Moreover, it needs to be explicitly said that the estimated numbers affected are for a combination of climate change and other stresses including population change, and whether adaptation is taken into account. (Pittock Barrie, CSIRO (retired))	Revised and done.
E-TS-390	A	52	21		21	The figures of 2 to 50 million are presented on p24, line 56. Consistency is needed here. (James Curran, Scottish Environment Protection Agency)	Done.
E-TS-391	A	52	23	52	40	The chapeau heading is in contradiction with the para lines 34 to 36: The chapeau says that climate change will impede (which is a pretty strong word) achievement of Millennium SD targets, while the first para says in line 34 that climate change per se will NOT be a serious impediment to 2015. Please qualify the wording of the chapeau to be consistent with the very clear and specific line 34. Also, the word "erode" in line 35 in my books means "make impossible" - I'm not sure this statement is justified without any further qualification (regarding other development trends, emission scenarios, climate sensitivity, uncertainties etc). (Andy Reisinger, IPCC SYR TSU)	Clarified Targets versus Goals.
E-TS-392	A	52	34	52	36	Damages from extreme climate events such as tropical cyclones, floods and droughts already inhibit economic growth in countries such as Mozambique, Bangladesh, Honduras and Costa Rica. So I am dubious about the statements here. (Pittock Barrie, CSIRO (retired))	Clarified.
E-TS-393	A	52	36	52	36	Change be "by 2050" to "by mid-century". Also on line 46. (Michael MacCracken, Climate Institute)	Ok
E-TS-394	A	52	39	52	39	Many development activities exacerbate climate-related vulnerabilities, such as increasing population and investment in lowlying coastal and riverine areas and	Clarified.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						cities, clearing of forests, poor design of infrastructure and housing, draining swamps, building flood levees, etc. It depends I suppose how one defines "sustainable development", but "development" as commonly interpreted can be counter-productive for reducing vulnerability. If such unwise developments are defined out, then this should be said explicitly. (Pittock Barrie, CSIRO (retired))	
E-TS-395	A	52	42	53	9	Based on my reading of the underlying chapter, the authors are lifting findings from one single paper by Yohe et al (2006) into the TS. This should be made clear. These findings currently read as if they were a summary of climate change impacts, based on our sum of knowledge as assessed in the WG2 report as a whole. I don't think the sum of the other chapters support the strength of findings as described in this paragraph. It is not good practice in the IPCC to lift individual studies and present them as generic findings. According to the underlying chapter, the Yohe et al paper uses a very basic and also subjective metric (delta T plus expert judgement of national capacity). These paras should therefore be qualified by stating very clearly that this is based on one study, and also what metric it used to come to its conclusions. (Andy Reisinger, IPCC SYR TSU)	Revised and shortened.
E-TS-396	A	52	48	52	48	Change "may" to "are likely to" (Michael MacCracken, Climate Institute)	Revised.
E-TS-397	A	53	4	53	6	The first sentence, which states that up to 2050 mitigation would benefit developing countries, appears to be in contradiction with the statement in TS page 47 lines 5-6, which says that up to 2040 mitigation would hardly be noticeable. If mitigation hardly matters up to 2040, then the benefit of mitigation up to 2050 would surely be rather small, too. Somehow the authors need to reconcile these two sentences. (Andy Reisinger, IPCC SYR TSU)	Revised and clarified.
E-TS-398	A	53	6	53	9	I don't understand the result that mitigation benefits industrialised countries MORE than developing countries. Perhaps the same, but why more? Please explain. Also, this statement is not actually contained in the underlying chapter (unless I missed it); the TS should be a summary and not come up with a new finding unless clear evidence is provided within the TS of how this finding is derived from the underlying chapters. (Andy Reisinger, IPCC SYR TSU)	Revised and clarified.
E-TS-399	A	53	14	53	14	Add: "…with climate change, especially if it is large (greater than 2 or 3dC by 2100), and …" (Pittock Barrie, CSIRO (retired))	Ok, but thoroughly revised text.
E-TS-	A	53	20	53	23	I strongly query this claim. In my experience and reading I would have thought	Revised and clarified, but the point was that

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
400						most development people focussed on adaptation, often not understanding that climate change will exceed the capacity to adapt, especially in poorer countries but also in rich countries, all too soon. (Pittock Barrie, CSIRO (retired))	mitigation will not be enough to help in developing countries given their vulnerabilities.
E-TS-401	A	53	30	53	30	Change "could" to "are likely to be able to"--or rewrite sentence a bit to make it consistent with use of IPCC lexicon. (Michael MacCracken, Climate Institute)	Ok
E-TS-402	A	54	3	54	3	I don't think Figure TS-16 comes across very well because treatment of large nations is hard to do--there are lots of parts of the major nations that are vulnerable (e.g., Alaska, US western mountain regions, etc.) and it is really not helpful to show this diagram based on national scale summaries--or really guesstimates. (Michael MacCracken, Climate Institute)	Emphasis on maps reduced; role as illustrative emphasized.
E-TS-403	A	55	12	55	12	Changes in key variables are monitored but we only observe effects of climate change if we can attribute the changes to that cause (may be other causes) (Sharon Smith, Natural Resources Canada)	True – no response required.
E-TS-404	A	55	12	55	12	Add: "… and recognition that climate change impacts are already occurring over wide geographical areas and many sectors." (Pittock Barrie, CSIRO (retired))	Inserted, but using 'discernible impact' term.
E-TS-405	A	55	17	55	22	This list of critical information needs on which little progress has been made since the TAR is important information which should be retained in the final draft and also presented in the SPM. (Lenny Bernstein, L.S. Bernstein & Associate, L.L.C.)	Retained, but not put in SPM due to space considerations.
E-TS-406	A	55	18	55	22	This list should be lengthened by adding: proximity to thresholds and tipping points, likelihood and distribution of extreme events, etc. (Michael MacCracken, Climate Institute)	Thresholds and tipping points added. Extreme events are a concern of WG1.
E-TS-407	A	55	28	55	28	Add: "Critical issues regarding costing concern changes in extreme effects and large-scale singularities, which may lead to very large costs." (Pittock Barrie, CSIRO (retired))	Other reviewers say too much text on costs – not done.
E-TS-408	A	56	3	56	4	In some cases impacts will still occur even if emissions are reduced or stabilitzed - it may just take longer for the changes to occur. (Might be more a question of pay now vs pay later) (Sharon Smith, Natural Resources Canada)	Added 'or the impacts postponed'.
E-TS-409	A	56	10		20	Research is also urgently required on all the global carbon cycle positive feedback mechanims - Amazonian die-bak, soil oxidation, methane release from tundra. These could create a tipping point of irreversibility in the very near future. (James Curran, Scottish Environment Protection Agency)	A sentence on tipping points and thresholds has ben added.
E-TS-	A	56	13	56	16	The key uncertainty is about the climate sensitivity and the effect of positive	WG1 point – no action.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
410						feedbacks which appear to be kicking in already, such as decreasing sea ice, melting permafrost, biomass sources rather than sinks, etc. (Pittock Barrie, CSIRO (retired))	
E-TS-411	A	56	17	56	20	Too much emphasis on the THC, the effects of which are highly uncertain. Better understanding of possible accelerated melting of the Greenland Ice Sheet and Antarctica are equally or more critical as they will have certainly disastrous effects. Mechanisms for these involving the effects of surface meltwater are now identified but not yet incorporated in cryospheric modelling. Regarding Antarctica, the implications of a strengthening of the ocean gyres on heat transport into the Antarctic Circumpolar Current and its effect on disintegration of major floating ice shelves is critical. See references in my EOS article in press, July 2006, especially Cai, W. J., 2006: Antarctic ozone depletion causes an intensification of the Southern Ocean super-gyre circulation. Geophysical Research Letters, 33 (3): L03712, 10.1029/2005GL024911. Cai, W.J., G. Shi, T. Cowan, D. Bi and J. Ribbe, 2005: The response of the southern annular mode, the East Australian Current, and the southern mid-latitude ocean circulation to global warming. Geophysical Research Letters, 32, L23706, doi: 10.1029/2005GL024701.Carril, A.F., C.G. Menedez and A. Navarra, 2005: Climate response associated with the Southern Annular mode in the surroundings of Antarctic Peninsula: A multimodel ensemble analysis. Geophysical Research Letters, 32, L16713, doi: 10.1029/2005GL023581. (Pittock Barrie, CSIRO (retired))	The MOC is just an example. Ice sheet melting has been added.
E-TS-412	A	56	22	56	27	Changes in key variables for various systems need to be monitored to better understand how they will respond to various stresses including climate change. High quality observations are required to attribute changes to systems to various causes (human or natural) not just climate change - we need to do this to mitigate and/or adapt to various impacts no matter what causes them. The last sentence in this section concerning the requirement of high quality observations for unequivocal attribution of trends to climate change is somewhat limiting and implies we don't need to deal with changes that may be attributable to other causes. (Sharon Smith, Natural Resources Canada)	Text added on 'full understanding of causes'.
E-TS-413	A	56	27	56	27	Add: Critical areas already identified, some of which may lead to accelerated climate change and sea-level rise, are: sea ice retreat; permafrost melting; biospheric feedbacks; acceleration of outlet glaciers from major ice sheets; changes in ocean circulations. These need special monitoring efforts to provide early warning of potentially dangerous developments. (Pittock Barrie, CSIRO (retired))	This is too specialized and detailed, and would give undue weight to research neds of observed changes – no action.
E-TS-	A	56	34	56	34	Inset after "for example" "increased population and investment in vulnerable areas	Added 'and settlement of low-lying coasts'.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
414						such as lowlying coasts and flood plains, " (Pittock Barrie, CSIRO (retired))	