WMO

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

UNEP

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

Government and Expert Review of Second Order Draft

Specific Comments

EXPERT REVIEW COMMENTS

Chapter 14

August 2006

Organization of the review comments file

Comments are organized as follows:

(a) First are the comments from the Co-Chairs and TSU. These:
  (i) track the development of the ZOD and FOD, and your responses to review comments on each of these drafts, and then
  (ii) present comments on the Second-Order Draft

(b) Second are the comments from the Expert Reviewers, organized in the same format as your FOD comments file.

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 14:

Comments from the Co-Chairs/TSU are laid out as follows: first we comment on whether the SOD addresses the comments we made on the ZOD; second we comment on whether the SOD addresses the comments we made on the FOD; our concluding comments on the Second-Order Draft are at the end

	Chapter 14 ZOD comments by Co-Chairs and TSU	Has this been addressed in the SOD?	Author response
14.Z1	LENGTH The draft is already substantially over-length. This is particularly worrying, as several important sub-sections are missing (e.g. 14.4.4 and 14.4.5, 14.5.2 and 14.5.3, 14.6.5 to 14.6.8 inclusive). We estimate that the chapter needs shortening by 28 text pages (see Blue Book Doc 3), i.e., it is already about 2 times the required length.	The chapter is still over length. There are 39 text pages and the target is 31 pages.	H - shorten
14.Z2	Some text space could be saved by use of tables to summarise, for example: a) bullet points for TAR conclusions in S1; b) tables of projected population, income etc. in S3.	a) Bullet points are now used. b) Section 3 is now very short – around 1 page (was 2 pages in ZOD) - tables wouldn't have much effect.	L - done
14.Z3	BALANCE The current balance between sections seems right. We agree that Section 14.4 should be the core of the chapter, taking up around half the pages, and that is what the authors have achieved here. So, we suggest you condense each section pro rata.	Section 4 runs from page 17 to 30 = 13.5 pages out of 39 = 35%. So should not reduce Section 4 further – reductions in page length should be achieved elsewhere to get the right balance.	H- discuss how to shorten other sections; government review suggested some areas
14.Z4	CONTENT Generally, the ZOD is well written, and nice to read.		Thanks
14.Z5	Is it possible to develop summary tables, similar to those in the TAR but maybe smaller, which update the numerical assessments from the TAR? Thus, there could be an update of TAR Table 15.3 on crop yields; and maybe also one on water.	There are no tables in Chapter 14.	H- discuss any text that could be put into tables Issue is that often the tables do not shorten text
14.Z6	The ZOD text is dense. It would help the reader to break up the flow with more tables and figures. Will the Case Studies have figures? It's regarded as important to make these, in particular, accessible to a wide audience.	There are 6 figures, compared to 2 in the ZOD. This chapter has never used tables. There are three case studies – 1 has a figure (same as ZOD). Authors could still do more to utilize figures and tables.	H – Figure removed from box 14.4, based on a government comment. Energy demand and supply impacts (14.4.8) now has one simple table.
14.Z7	Maybe the next step is to deliberate on the key emerging conclusions, and how these imply either a) confirmation of TAR conclusions; or b) revision of TAR; Then, draft these into conclusions and consider which of them deserve most space in the text (e.g. on basis of policy	ES now present. It has 12 headline statements (too many) and is handled very much on the basis of one sector one statement. Might be better to screw down on the most sensitive/vulnerable sectors. It doesn't give references back to main	ES rewritten to shorten and select key points from chapter. Provide reference back to source sections

	relevance, or newness of finding, etc); and thus prioritise the main messages and allocation of space in the text.	text. Conclusion and Key Uncertainties are now well handled.	
14.Z8	Can you identify key impacts/thresholds that can be drawn into Chapter 19?	This is now most effectively with energy demand/supply (14.4.8). Agriculture has few quantitative statements and little information on impacts under different scenarios/dates (it is generally rather weak compared to the rest of the chapter). Tables of impacts under different scenarios/at different dates would be useful to pull out this information from the text (where it is lost amongst all the words) and to show the authors where the gaps lie.	H added quantitative statements for ag, forestry. We still have not found useful ways to add tables. In addition, we are resisting the pressure to emphasize simplistic conclusions, even when they are in the literature.
14.Z9	Can you be more specific about timelines of impacts: e.g. 2020s, 2050s and 2080s?	Done intermittently – it would be nice to see it done on a more systematic basis through the use of tables, if only to see where the gaps lie.	H added timeslice info throughout 14.4
14.Z10	Is there any new knowledge which can be summarised concerning: a) impacts under stabilisation scenarios?; and b) impacts projected under different SRES scenarios?	See comment 14.Z9 – also applies here for SRES. Nothing on stabilization.	H We tried for a border with WG3 that gives them the mitigation/stabilization topic.
14.Z11	This ZOD is very thin on references. See, for example, Section 14.3 (Assumptions). Throughout, work is needed to substantiate statements with supporting data and provide references – the ZOD is somewhat anecdotal at present. The chapter badly needs more concrete examples and numbers about costs etc to make it really effective	This has been dealt with very effectively.	thanks
14.Z12	**Section 14.4**. Section 14.4 contains a considerable amount of material on current sensitivities and vulnerabilities, which should more properly be in Section 2 - there needs to be some sorting. It also contains many, many unsubstantiated statements; see for example section on wildlife on pages 21-22. Section 14.4.8 (Industry and Energy): this is far too long at 10 pages and 3 pages of this are on transportation alone. The Tourism section is very good (14.4.7), and the Energy section is excellent (14.4.8). There is material in here for some of the sectoral chapters such as 7. The separation between Section 14.4 (Impacts) and Section 14.5 (Adaptation) is well handled - could be an	This has been addressed Now 3 pages	OK

	example to other chapters. Table 1 is too general - inappropriate for a regional chapter - needs to focus on regional aspects.	Removed	
14.Z13	**Case Studies**: There are eight suggestions here - too many and some decisions have to be made. Three are worked up to some degree. The Great Lakes is rather disappointing. There's lots of sector-by-sector information, but no attempt to integrate. Authors could have used tables to good advantage but haven't. The case study on adaptation by insurers is weak.	Section 14.6 now has 3 case studies: Wildfire and disturbance; Colombia River; North American cities. Great Lakes water levels appears as a Box, but not in this section, and very short (much improved). Case study on insurers adaptation has gone.	OK
14.Z14	Sections on sustainability (14.7) and key uncertainties (14.8) are vague, saying all the right things but with little specificity. This is true for all regional chapters, and elsewhere, and needs to be addressed. Authors need guidance from Co-Chairs.	Now much better; tighter; well-focussed.	OK
14.Z15	We need to watch out for Americanisms in this chapter, for example use of pavement for tarmac. (p.39 line 22). What is our policy?	Very few Americanisms. We still need to edit out 'pavement' and replace by 'road' or 'road surface'	Change has been made
	Chapter 14 FOD comments by Co-Chairs and TSU	**Has this been addressed in the SOD?**	**Author response**
14.F1	**Comments14.F1 – 14.F4: Jean Palutikof** There is a huge amount of information in this chapter, and I complement the authors on putting it together.		Thanks
14.F2	There is still some organization to be done, and especially synthesising so that there is suitable material for the SPM and Technical Summary, and so that the key findings and new material since the TAR are emphasised for the readership (mainly non-specialist). Some summarizing/synthesising tables and figures could be added. Good examples are Ch 4 Table 4.5 (impacts for increments of global temperature change) and Ch 11 Table 11.11 (Impacts at future timeslices under different SRES scenarios). If Chapter 14 could do something like this, it would be great material for the SPM/TS, and would give the chapter much more punch. For examples of the kind of figures we are looking for, I refer you to Chapter 4 Fig. 4.9 (map of global impacts for three different temperature changes) and 4.10. Fig 4.10 is a sectoral burning embers diagram, but could be easily adapted for the regional case.	No tables at all in SOD. They would be worthwhile. A vulnerability map would also be useful – could be combined with Fig. 14.1?	H-Tables of what? No one has come up with a suggestion that shortens the chapter
14.F3	Amazingly, I could only find one table. But tables are exactly the tool you need to (i) radically shorten the text and (ii) really synthesise material and present it clearly and succinctly for your audience.	See 14.F2	A table of Energy, Industry, and Transportation Impacts was prepared. It did not "radically shorten the text, " which was already highly condensed. We achieved the reduction in this

			section mainly by rewriting to drop content.
14.F4	The authors have not followed the Plenary-agreed headings as carefully as they should have done. They have separated out Section 15.1 Introduction and Section 15.2 Summary of Knowledge Assessed in the TAR so that all folowing headings are +1 compared to the other core chapters. This wil be confusing for readers trying to read across chapters, and should be modified to bring this chapter into line with the others. Section 14.5 should be 'Key future impacts and vulnerabilities' but includes sensitivities and adaptation. And so on - headings should agree with the list of Reduced-form subheadings which are available from the authors closed web site	This is still a problem – the authors haven't paid attention to this comment at all. Please follow the PAO subheadings. Other chapters do and this help the reader move easily between chapters.	Fixed: 14.1 Introduction;14.2 is now current sensitivity/vulnerability; 14.4 Key future impacts and vulnerabilities; 14.5 Adaptation: practices, options and constraints; 14.7Conclusions: implications for sustainable development, 14.8 Key uncertainties and research priorities
14.F5	**Comments 14.F5-14.F8: Carla Encinas** General comments		
14.F6	Length: The chapter is currently too long, needs to be shortened in about 18.5 pages.	See 14.Z1	Shortened – and removed figure as per gov't comments
14.F7	The number of contributing authors is not the ideal could ask for more CA.	There are now 12, compared to 7 in FOD.	OK
14.F8	Headings: the introduction is missing	See 14.F4	Edited to use approved section headings
	Chapter 14 SOD comments by Co-Chairs and TSU		**Author response**
14.S1	**LENGTH:**	See 14.Z1. Text needs to lose ~8 pages	
14.S2	**ARE PAO HEADINGS PRESENT?**	See 14.F4. Section 14.4 heading is misleading – it includes 'adaptation options' which are not discussed in text, implying there aren't any.	Edited to use approved section headings
14.S3	**HAVE MOST GENERAL COMMENTS OF ERs FROM ZOD AND FOD BEEN COVERED?**	Yes	
14.S4	**ARE REFERENCES BROADLY COMPLETE?**	Pretty good.	
14.S5	**IS THERE LINE-OF-SIGHT TEXT → ES AND TEXT+ES → TS+SPM?**	Yes	We tried hard to do this comprehensively.
14.S6	This chapter is in good shape. Everything that is needed is here, except assessment of literature on impacts under stabilisation (if none exists, then say so). It lacks contrast and definition – there isn't a strong sense of which sectors will really be hurt or most benefited by climate change. This would be helped by a table, perhaps, where sectors could be ranked by their vulnerability to climate change. What about regions? Which regions of North America are most vulnerable to climate change?		H We feel that the section on interactive impacts tried to pull things together. We also emphasize the point that there are vulnerable people and places for every sector. This is not table friendly.
14.S7	Tables on impacts under different scenarios of climate change/at different time periods are still needed and would save space by removing material from main body text. Good examples come towards the end of Chapter 5.		H All of the tables we tried were either overly simplistic or were larger than the text they replaced.
14.S5	**IS THERE LINE-OF-SIGHT TEXT → ES AND TEXT+ES → TS+SPM?**	Yes	

14.S6	This chapter is in good shape. Everything that is needed is here, except assessment of literature on impacts under stabilisation (if none exists, then say so). It lacks contrast and definition – there isn't a strong sense of which sectors will really be hurt or most benefited by climate change. This would be helped by a table, perhaps, where sectors could be ranked by their vulnerability to climate change. What about regions? Which regions of North America are most vulnerable to climate change?	H
14.S7	Tables on impacts under different scenarios of climate change/at different time periods are still needed and would save space by removing material from main body text. Good examples come towards the end of Chapter 5.	H
14.S8	Chapter needs to link to other chapters, for example Chapter 6 has two boxes on Hurricane Katrina which should be referred to from Chapter 14. Only Chapter 15 is referenced from WG2 (there are more references to WG1).	H References to other chapters in WG2 have been inserted as appropriate.
14.S9	Introduction is redundant. Page 5 lines 3-7 could head up ES, lines 7-11 are redundant since they are dealt with in the WG2 volume Introduction.	M Re lines 7-11 – Many readers will not read the volume introduction and **will** need to be told the scope or terms of reference for this chapter in the chapter intro
14.S10	The chapter is sometimes trying to do the work of the sectoral chapters. This contributes to excess length. For example Section 14.2.3 contains definition of coastal squeeze but this is in the Glossary and discussed at some length by Chapter 6. CLAs need to go through, especially the early sections, and rigorously prune this out – there really isn't room given the length over-run.	H-Significant cross referencing now in 14.2.6 14.2.8 14.4.6 14.4.8 to Chapters 6,7,15, WG 1 Ch 3,10, and 11 and other sections of Ch 14 The specific example from 14.2.3 (re coastal squeeze) has been removed.
14.S11	**IN SUMMARY WE RECOMMEND THAT THE AUTHORS SHOULD:**: • Shorten the chapter by around 8 text pages They can consider, for example: o Removing the general information which might be more appropriate to a sectoral chapter, for examples definitions of coastal squeeze in 14.2.3 should be left to Coastal chapter and cross-referenced. o Giving the chapter a better feel of what is important and what is not – which are the important sectors for North America. This would improve the chapter anyway. And would mean you could lose text related to less-important sectors. o Consider using tables to summarize information. • Improve the Executive Summary: o Give references back to sources in main text, in the form [14.x] o Reduce number of headline statements to improve emphasis • Where possible relate impacts to SRES scenarios, time horizons and increments of warming. This can be done in main text or through tables. • If any information on impacts avoided by stabilization/mitigation is available, be sure to mention it. • Follow PAO headings exactly. • Include cross-references to other WG2 chapters.	As note above, we have done this ES rewritten, headline statements reduced and references to main text Links to scenarios and time lines are difficult because there are few publications that use them. Done Done

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-14-1	A	0	0	0	0	The authors of Chapter 14 are to be congratulated for the significant improvements they made in the Chapter since the ZOD. The chapter is much clearer. There still needs to be some work to make the sections consistent (such as only some sections of 14.4 including confidence statements). (Kristie Ebi, ESS, LLC)	H –
E-14-2	A	0				Tourism is substantially dealt with in CH 1,4,6,7,91112,13,14,16 . This is a significant change compared to TAR. Overall this is done in a satisfactory manner , in particular since the regional chapters do focus on regional issues without losing space on general aspects. What is missing though, is a critical assessment of the literature quoted (even though this literature is peer reviewed), not an individual assessment of papers but a critical overview of the mainstreams of methods that have been used these last years (though it must be recognised that these works have shed some light on what is a very important issue). This concerns both qualitative and speculative approaches and quantitative research. As regards the former, these confront current tourism behaviour and requirements regarding climate to the futures envisaged by scenarios. What is the degree of reliability of this kind of work knowing that the expectations of tourists regarding climates can evolve significantly, as they already have done in the past? There is at least a need for research to explore the range of possible evolutions in behaviours and introduce that into the analyses. Also, to what extent are econometric analyses concerning modifications in tourist flows (the more seducing as they yield figures…) robust and reliable? Is it, for example, acceptable to use a unique climate for the US as it is done in a paper quoted in several chapters? If it is, the coarseness of the results should be mentioned. In short, I believe that there should be in some place in the report, a caveat on the difficulties research on this topic encounters (uncertainties on future behaviours, shortcomings regarding statistics etc.) and their consequences on the results. (Jean-Paul Ceron, CRIDEAU (Université de Limoges-CNRS-INRA))	M – Dan Scott I agree, but there is no way an adequate critique of this type of research can be included in IPCC documents. One critique and a reply are due to be published soon, but will not likely meet the IPCC cut off date. Results that support the reviewers position are also available, but not yet published.
E-14-3	A	0				This Chapter now is well done because a fair balance has been achieved between continental scale trends and impacts and regional trends and impacts. The case studies also add an important new dimension compared to the zero order draft. (Edward Miles, College of Ocean and Fishery Sciences)	thanks
E-14-4	A	0				There is inconsistent use of the confidence level terms throughout the chapter. Some sections faithfully put these terms after the various statements; others leave them out. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	H – confidence statements
E-14-5	A	0				The use of the qualifiers "high-low confidence" is inconsistent in this chapter,	H – confidence statements

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						appearing in 14.4.2. on Ecosystems for the first time (except in the Ex. Summary) (Ellen Wall, University of Guelph)	
E-14-6	A	0				The review paper of Dessai and Hulme "Does climate adaptation policy need probabilities?" and the paper Dessai, S., Lu, X. and Risbey, S. (2005). On the role of climate scenarios for adaptation planning. Global Environmental Change 15(2), 87-97 does highlight the challenge between R&D, operationnal use, capacity and uncertainty... and paper like this last one does suggest that ptobabilities should be useful! Barnett, D. N., S. J. Brown, et al. (2006). "Quantifying uncertainty in changes in extreme event frequency in response to doubled CO2 using a large ensemble of GCM simulations." Climate Dynamics 26(5): 489 - 511. (Alain Bourque, Ouranos)	M – review references
E-14-7	A	0				second order draft much less cluttered with details and easier to absorb the messages- well written -I have only minor edits -some bibliographic information would be difficult to track down with the information provided (Robert Taylor, Bedford Insitute of Oceanography)	Thanks- bibliography still needs final checking and formatting
E-14-8	A	0				Relevant reference for health section, adaptation strategies and many comments w.r.t. health, perceptions and behavior indicated above: Menne B, Ebi K (eds.) Climate Change and Adaptation Strategies for Human Health. Steinkopff Verlag, Darmstadt, Heidelburg, 449p. and also Haines A, McMichael AJ, Epstein PR. Environment and health: 2. Global climate change and health. JAMC 2000;163(6):729-34. Accessible on Web at http://www.cmaj.ca/cgi/content/full/163/6/729#R24-17 (Alain Bourque, Ouranos)	M – review references
E-14-9	A	0				Reference of interest for ground water resources and climate change over regions of earsten Canada: Rivard, C., J. Marion, Y. Michaud, S. Benhammane, A. Morin, R. Lefebvre et A. Rivera, 2003. Étude de l'impact potentiel des changements climatiques sur les ressources eneau souterraine dans l'Est du Canada. Open File n° 1577 Geological Survey of Canada, Natural Resources Canada, 39 pp and appendixes (Alain Bourque, Ouranos)	M – review references – not future climate change modelling but sensitivity and trends
E-14-10	A	0				Reference highlighting potential surprising impacts on animal behaviors! Amstrup, S. C., I. Stirling, et al. (2006). "Recent observations of intraspecific predation and cannibalism among polar bears in the southern Beaufort Sea." Polar biology. (Alain Bourque, Ouranos)	M – review references . more appropriate to chapter 15 - polar
E-14-11	A	0				Overall I found the Chapter much improved over the previous draft. I had commented during the review of the previous draft that the time delay between when information had been generated and put into general distribution and when	thanks

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						the final report was released would likely result in the document being considerably .out of date and therefor seen by many readers as being less relevant. I was pleased to see that the text not only now incorporated mention of both new sceintific information and related information and documents on events that had occured in 2005 that had relevance to the sceince but even more so to the resulting impacts and adaptive strategies peoples had either put in play and or any short comings. I also noted an entry relating to information that came early in 2006. This effort to be current will only strengthen the credibility readers will place on this topic which is now being regualrly reported on in the popular media. I know it is idfficult but congratulations to the authors. (Ian Church, Yukon Government)	
E-14-12	A	0				Note a few additionnal relevant publications at http://adaptation.nrcan.gc.ca/new_e.asp and http://www.ouranos.ca/doc/produit_e.html and http://www.parc.ca/ (Alain Bourque, Ouranos)	M – reviewed web sites
E-14-13	A	0				Needs more balance. Both Mendelsohn (2001) and my own research have found a net benefit from climate change for the US. My study can be found in Climate of Fear, Cato Institute, 1998. (Thomas Gale Moore, Stanford University)	M – reviewed references. Mendelsohn was included. Moore is before TAR and appears to be reinterpretation of other work. It did not contain work that was useful for either energy or human settlements. Transportation was given a more positive interpretation by moving favorable impact material to the front of the subsection.
E-14-14	A	0				Mostly curiosity: some financial values seem to be in US$ while others in Canadian$: is it fine or will there be some consistencies. (Liette Vasseur, Laurentian University)	M – costs in CAD or USD as reported in sources
E-14-15	A	0				I reviewed Chapter 14and found the chapter to be in better shape (although I am somewhat concerned that in terms of impacts the comments made appear to be not balanced, highlighting the negative impacts). I do not feel that it is necessary to send further, more detailed, comments at this time. (Stanley Changnon, Illinois State Water Survey)	OK Transportation was given a more positive interpretation by moving favorable impact material to the fron of the subsection.. Energy was given more balance.
E-14-16	A	0				General comments: I approached this review from the viewpoint of an “expert reviewer” (or somewhat expert, anyway!) and from the viewpoint of an “informed reader” with a strong general science background but unfamiliar with the climate change literature. In the later capacity, I attempted to identify sections, phrases, terms, etc. whose meaning might not be immediately obvious and could not be simply looked up in a dictionary. I also looked for inconsistent and confusing	OK

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						statements, and whether I agreed with interpretation of the articles cited. At this late date in the process, I did not suggest any other references to include. There are many, many additional articles that could have been included, but I am cognizant of the space limitations. (Julie Winkler, Michigan State University)	
E-14-17	A	0				For forest/forestry issues, especially fires: Although climate change coherent signals seem to be detected, some work link this to climate variability features (PDO, NAO, AO), human managment, etc. Included in my mail delivery will be a few references from Girardin et al., Bergeron et al with some references stating that even 2 or 3XCO2 changes in fire frequency could remain within historical natural variability…. Some of those references also discusses adaptive managment of forests, taking into account forest fires frequency to limit climate change impacts. This concept could be mention either in the future forestry or in the adaptation section. There is little adaptation discussed in the forestry section although managment will likely play a significant role (allocation, forest managment...) (Alain Bourque, Ouranos)	M – review references – sent by CD by A. Bourque and provided to writing team on ftp site. M- Adaptation?
E-14-18	A	0				Authors will have to ensure that conclusions are consistent with what is portrayed in Fig. SPM-5 for North America. There is no reference to marine ecosystems in this chapter, yet SPM-5 depicts them as experiencing strongly negative impacts (based on chapters 4 and 5). The relatively high impacts on birds, amphibians and terrestrial mammals depicted in SPM-5 is not well reflected in text. There are several other examples not clearly supported - including grassland ecosystems and transport. Requires thorough consideration. Use of confidence terminology is inconsistent with respect to where it is used after the Executive Summary. At many places in the chapter reference is made to ACIA (2004). All of these references should be updated to refer to the specific appropriate chapters of the ACIA technical report (2005). (Donald Lemmen, Natural Resources Canada)	H – cross-checked ES, SPM, TS and Chapter conclusions to ensure reflected in text and clearly supported Some of the conclusions for North America in the SPM are drawn from systems and sectoral chapters H M- Searched and Replaced with ACIA 2005. Reference in Ref list was also changed.
E-14-19	A	0				Although we prefer peer-reviewed litterature than workshop reports, this reference provides a very nice scientific sythesis of the science of climate change and forests in north eastern north america per sub-sectors: Bernier, P.Y. et D. Houle (2006). « Les changements climatiques et la productivité forestière. » Actes du colloque Changements climatiques et foresterie : impacts et adaptation tenu à Baie-Comeau les 20 et 21 avril 2005. (Alain Bourque, Ouranos)	M – review references – available on chapter ftp site

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E-14-20	A	1	35	1	37	Fisheries u/c line 37 should read Human Health not coastal regions (Robert Taylor, Bedford Insitute of Oceanography)	Formatting glitch – will be corrected in final
E-14-21	A	1	37			Editorial - section 14.2.5 is "Human Health" (Donald Lemmen, Natural Resources Canada)	Formatting glitch
E-14-22	A	3	1	4	36	The rationale behind the assignation of the different confidence levels to the statements in the Executive Summary is not obvious. It is not clear from the following text why one statement was assigned "moderate confidence", another "high confidence", and yet another "very high confidence". Somewhere there needs to be a statement on how the confidence measures were assigned (i.e., what are the measures based on, what were the procedures used to assign the specific levels, etc.) Perhaps this discussion is in one of the introductory chapters to the Working Group II document (I didn't check), but I suspect that the chapters in this document will be selectively read and important concepts (such as the assignation of confidence measures) need to be repeated in the individual chapters (or at least there needs to be a reference to the chapter in which they are discussed). (Julie Winkler, Michigan State University)	H – Confidence limits – assigned based on literature – making a note in introduction on confidence statements
E-14-23	A	3	1	4	36	Not all the sectors that are discussed in the following text appear in the Executive Summary. Tourism is an example of a sector that is omitted. (Julie Winkler, Michigan State University)	Required to select key sectors and provide short ES
E-14-24	A	3	1	4		In general, note that comments on the Executive Summary also apply to the supporting text in the chapter. (Indur Goklany, US Department of the Interior)	OK
E-14-25	A	3	1	4	36	I don't think the executive summary sufficiently emphasizes the spatial variability in impacts that is likely. (Julie Winkler, Michigan State University)	M Revised and condensed ES.
E-14-26	A	3	1	4	36	Another concern regarding the Executive Summary is that some of the statements that are assigned a confidence measure are compound sentences, with the first part of the statement referring to the past and the second part referring to the future. Which part does the confidence measure apply to? An example is on lines 35-37. Here very high confidence is given to the statement "Sea level is rising along much of the coast, and the rate will increase in the future, exacerbating the impacts …" Is the very high confidence referring to the "sea level is rising along much of the coast" part of the sentence? To "the rate will increase in the future" part of the sentence? Or to the "exacerbating the impacts" part of the sentence? (Julie Winkler, Michigan State University)	H – compound sentences and assigning of confidence statements
E-14-27	A	3	1	41		Following are citations for references in the foregoing, which were not provided within the comment. Most of these are available at	M – review references. Goklany, IM. 2006. Death and Death Rates Due to Extreme

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						http://members.cox.net/igoklany/: Goklany, IM. 1996. "Factors Affecting Environmental Impacts: The Effects of Technology on Long Term Trends in Cropland, Air Pollution and Water-related Diseases." Ambio 25: 497-503.. Goklany, IM. 2000a. Potential Consequences of Increasing Atmospheric CO2 Concentration Compared to Other Environmental Problems. Technology 7S: 189-213. Goklany, IM. 2001a. Economic Growth and the State of Humanity. Political Economy Research Center, Policy Study 21. March 2001. Goklany, IM. 2001b. The Precautionary Principle: A Critical Appraisal of Environmental Risk Assessment (Cato Institute, Washington, DC, 2001).. Goklany, IM, and Straja, SR. 2000. U.S. Death Rates due to Extreme Heat and Cold Ascribed to Weather, 1979-1997. Technology 7S (2000): 165-173. Goklany, IM. 2005a. A Climate Policy for the Short and Medium Term: Stabilization or Adaptation? Energy & Environment 16: 667-680. Goklany, IM. 2006a. Integrated Strategies to Reduce Vulnerability and Advance Adaptation, Mitigation, and Sustainable Development. Mitigation and Adaptation Response Strategies for Global Change, forthcoming. Goklany, IM. 2006b. Death and Death Rates Due to Extreme Weather Events: Global and U.S. Trends, 1900-2004, Climate Change and Disaster Losses Workshop, 25-26 May 2006, Hohenkammer, Germany. (Indur Goklany, US Department of the Interior)	Weather Events: Global and U.S. Trends, 1900-2004, Climate Change and Disaster Losses Workshop, 25-26 May 2006, Hohenkammer, Germany. was added to section 14.2.6.
E-14-28	A	3	1			COMMENT EXECUTIVE SUMMARY: Insufficient space is given to the implication of ecosystem changes and implications for biodiversity conservation and species extinction. (William Hare, Potsdam Institute for Climate Impact Research (PIK))	Focused nature of the ES required that only key issues presented
E-14-29	A	3	1			COMMENT EXECUTIVE SUMMARY: Regional differentiation within the Executive Summmary would add value and significance to this part of the chapter. (William Hare, Potsdam Institute for Climate Impact Research (PIK))	Focused nature of the ES required omission
E-14-30	A	3	3	3	5	Add drought to possible disruptions related to global warming (Gregory McCabe, U.S. Geological Survey)	added
E-14-31	A	3	4	3	5	Another concern is that the statements in the Executive Summary are not always structured so that the assigned confidence level makes sense. An example is "Experience with recent hurricanes, wildfires, and other extreme events highlights the vulnerabilities within North America (high confidence)". Is this sentence saying that we have high confidence in our "experience" (note that "experience" is the noun of the sentence) or that we have high confidence in the "vulnerabilities". I	H – assigning of confidence to statements

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						assume the latter, but that is not how the sentence reads. Another similar sentence is found on lines 8-10. Is the very high confidence referring to "economic damage from severe weather has increased dramatically" or to the "due largely to an increase in the value of infrastructure at risk" portion of the sentence? (Julie Winkler, Michigan State University)	
E-14-32	A	3	7			Insert a new para at line 7 that deals exclusively with deaths and death rates due to extreme weather events, which would read as follows: "Despite the hurricanes of 2004 and 2005, aggregate mortality and mortality rates due to extreme weather events for the United States are generally lower today than they used to be in earlier decades. Current mortality and mortality rates due to extreme temperatures, tornados, lightning, floods and hurricanes are below their peak levels of a few decades ago (based on 10-year moving averages). The declines for the last four categories range from 55 to 95 percent (Goklany 2000a, 2006b)." (Indur Goklany, US Department of the Interior)	Too long for ES – were directed to shorten and focus on key issues
E-14-33	A	3	10	3	12	This sentence says nothing about the sensitivity to projected changes in climate and extreme events (storm surges, extreme precipitation, tropical cyclone intensity etc). There is a significant literature on this and it need to be summarized here eg Choi, O., and A. Fisher (2003). "The impacts of socioeconomic development and climate change on severe weather catastrophe losses: Mid-Atlantic Region (MAR) and the US." Climatic Change 58(1-2): 149-170 is reviewed in 14.4.6 (William Hare, Potsdam Institute for Climate Impact Research (PIK))	M included
E-14-34	A	3	14	3	14	Need a comma after "temperature" (Gregory McCabe, U.S. Geological Survey)	Ok
E-14-35	A	3	14	3	18	Interannual variability, including droughts, should also be included in the list of vulnerabilities--time scales between individual storms and decadal or longer averages. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M Droughts added
E-14-36	A	3	14	3	14	insert a comma between "temperature" and "precipitation" (David Sauchyn, University of Regina)	L, reworded
E-14-37	A	3	14			. Rather than "temperature, precipitation, water balance" do the authors mean "temperature and precipitation extremes, surpluses and deficits of the water balance"? (Julie Winkler, Michigan State University)	L, reworded
E-14-38	A	3	20	3	22	Is the very high confidence for "North America has considerable adaptive capacity"? Or for "this capacity has not always protected its populations from adverse impacts of climate variability…"? (Julie Winkler, Michigan State University)	M, both

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E-14-39	A	3	20			When you refer to "adaptive capacity" are you also referring to "preventing problems" (line 25), or what some distinguish as mitigation? (Julie Winkler, Michigan State University)	M no
E-14-40	A	3	22	3	23	Re "climate is not a central concern", perhaps this generalization is applicable to North America in general, but the ecosystems and economic activities in certain regions, specifically the north and the interior plains, are climatically sensitive and thus weather and climate (e.g. storms and drought on the plains) have cultural significance and there are institutions dedicated to adaptation to climate (e.g. soil and water conservation services) and don't exist in other regions. (David Sauchyn, University of Regina)	M – good point ; may be can provide some regional differentiation as per another comment
E-14-41	A	3	22	3	23	"decentralized response framework". I think that this has to be spelled out more in the Executive Summary, especially as this is not discussed in the following text. (Julie Winkler, Michigan State University)	M We kept the phrase but added explanation.
E-14-42	A	3	22			yielded is maybe not a good word -unclear to me -do you mean produced (Robert Taylor, Bedford Insitute of Oceanography)	L changed word
E-14-43	A	3	26			Should more likely read "…mainstreaming climate change issues..." or "…better mainstream climate change and variability issues..."since #1) 14.5 and 14.7 mainly discuss about mainstreaming climate change and #2) one could argue that North America has done a decent job to mainstream past climate to support socio-economic activities for an ever growing population and that mainstreaming is becoming increasingly critical to successfully limit/optimize impacts of changes. (Alain Bourque, Ouranos)	M replaced mainstreaming with clearer terms
E-14-44	A	3	28	3	30	It would be good to state that the urban heat island effect is a real climate change, but stands apart from global warming both in its cause and its geographic scope. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M Too much detail for ES
E-14-45	A	3	28			"human well-being" sounds a bit to soft and the expression used should include health and especially safety: Climate change should amplify safety issues/concerns, especially over a continent where past adaptations have helped to bring death tolls to an all time low in late 20th century (Alain Bourque, Ouranos)	Considered
E-14-46	A	3	29	3	31	Why wouldn't there be very high confidence in the statement beginning "Climate impacts …"? (Julie Winkler, Michigan State University)	M Section edited and reworded
E-14-47	A	3	31			I suggest to add "risk perceptions and behaviors" to the list (or the lack of). This component could be included at page 4, line 3 also (or one or the other). (Alain Bourque, Ouranos)	M consider
E-14-	A	3	37	3	38	Eliminate the sentence stating with "Increased intensity…". Rationale: (1) We	M-Reword.

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48						don't know with any confidence that all types of storms will become more frequent and more intense to the point that they would add to the severity of impacts. (2) Even if storms become more frequent and intense, it does not follow that damages will necessarily increase because of adaptations that might be undertaken. As noted in the previous comments deaths and death rates for various categories of events have declined over the decades for the U.S., and part of that decline can be attributed to adaptation. (Indur Goklany, US Department of the Interior)	
E-14-49	A	3	42	3	42	This states that rising value of infrastructure and increased population increase vulnerability with "high confidence." This seems to contradict a similar statement on the same page, line 10, with "very high confidence." (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M-The two statements are very similar, but the one here is prospective, and presumably less reliable than the retrospective statement online 10.
E-14-50	A	3	44			Add the following new sentence at the end of this para that would read as follows: "Additional complications arise from the relatively easy availability of disaster aid and insurance from public agencies which allow individuals to pass off a portion of their risks to others." (Indur Goklany, US Department of the Interior)	M – The point has some validity, but worded it differently in revised text.
E-14-51	A	3	46	3	48	Why does there need to be a confidence measure assigned to this sentence? Isn't this a statement? (Julie Winkler, Michigan State University)	M- I think the point is correct. The statement is correct, but isn't as good as a summary prospective sentence.
E-14-52	A	3	46	4	3	Replace this para with the following, which provides context and is more accurate: "ALTHOUGH warm temperatures and extreme weather events affect human health via heat-related mortality, pollution, storm-related fatalities and infectious diseases, LONG TERM TRENDS FOR THE U.S. INDICATE THAT DEATHS AND DEATH RATES DUE TO MOST OF THESE PHENOMENA ARE LOWER TODAY THAN THEY HAVE BEEN IN THE PAST DESPITE SOME RECENT INCREASES DUE TO THE 2005 HURRICANE SEASON AND EMERGING NEW DISEASES (GOKLANY 1996, 2000a, 2006b). THESE IMPROVEMENTS ARE LARGELY DUE TO TECHNOLOGICAL CHANGE, BETTER PUBLIC HEALTH SERVICES, IMPROVEMENTS IN EMERGENCY PREPAREDNESS, BUILDING CODES, DISASTER MANAGEMENT, AND GREATER UNDERSTANDING OF THE ROOT CAUSES OF THESE DISEASES. HOWEVER, IF ADAPTATION DOES NOT KEEP PACE WITH INCREASED RISKS, THEN MORTALITY COULD INCREASE IN THE FUTURE." [New text is in UPPER CASE, deletions are not shown. NOTE: The same convention will be used in many of the following comments.] (Indur Goklany, US Department of the Interior)	M –Suggested replacement by commenter is too wordy. Also, needs a better take on adaptation. Is glass half empty or half full? Reduced “””deaths and death Deaths and death rates are a success story (short-term mobiity in response to warning, , but property losses are not

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E-14-53	A	3	47			Eliminate the sentence that commences with "Heat waves…" This is not necessarily true because of possible adaptations and acclimitizations (see p. 13, lines 18-23 of thi chapter; and page 12, lines 1-7, Chapter 8). Moreover, what is the trend in heat wave related death rates? They haven't gone up. See, e.g., Goklany and Straja 2000, Goklany 2006b. I would place greater trust in empirical trends than in model results or intuitive thinking. (Indur Goklany, US Department of the Interior)	M edited
E-14-54	A	3	49	3	49	This doesn't state that greater rainfall runoff will actually occur, but seems to indirectly imply it. Either state this explicitly and back it up with a citation, perhaps from WG I, or make it more explicit that you mean "if there is greater runoff." (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M This is the ES no reference required
E-14-55	A	3	49	3	49	Degraded water quality has been cited as a consequence of reduced rainfall and surface water quantities and therefore higher concentrations of waterborne pollutants. This is contrary to the conclusion here of degraded water quality from greater rainfall runoff. (David Sauchyn, University of Regina)	M – both causes of water pollution can occur
E-14-56	A	3	49			Whether or not there will be “greater rainfall runoff” in the future is highly debatable given the contradictory scenarios for most of North American from different GCMs on whether precipitation will increase or decrease in the future. I don’t think high confidence can be assigned to this. (Julie Winkler, Michigan State University)	M – changed
E-14-57	A	3	51	3	52	What is the link between drought and vector borne diseases? The more plausible impacts of drought on human health are the affects of dust and stress caused by failure of agriculture. (David Sauchyn, University of Regina)	M ES – not treated here
E-14-58	A	3	51	4	1	There is evidence that precipitation may be more important for Lyme disease occureence than is temperature (see (1) Subak, S., 2003. Effects of climate on variability in Lyme disease incidence in the northeastern United States, American Journal of Epidemeology, 157:531-538., (2) McCabe, G.M., and J. Bunnel 2004. Precipitation and the Occurrence of Lyme Disease in the Northeastern United States, Vector Borne and Zoonotic Diseases, v. 4, n. 2, 129-134., and (3) Estrada-Pena, A., 2001. Forecasting habitat suitability for ticks and prevention of tick-borne diseases. Vet. Parasitol., 1994:91-132). At the least precipitation should be mentioned here. (Gregory McCabe, U.S. Geological Survey)	M – JP
E-14-	A	3		4		The only break from negative consequences on these two pages is possible	M- needs to reflect literature – tourism and rec

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59						increased crop yields. This can lead to a perception of bias. You can include such things as reduced cost of snow removal in many cities, reduced heating demand, and enhanced warm-weather recreation opportunities. To put a more positive spin on it, it can also be emphasized that winter is expected to warm more than summer. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	could add positive
E-14-60	A	3		4		Good and consistent use of confidence levels. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	Thanks
E-14-61	A	4	5	4	7	There is no mention here of the vulnerability of indigenous people that results from their relatively low adaptive capacity as function of lesser financial resources, technology, access to information, etc. (David Sauchyn, University of Regina)	M-Can we demonstrate this point? Do we need to say why here? Say so and refer to Ch 11 and ACIA (2005)
E-14-62	A	4	5	4	7	The bullet on p. 13 refers to the role of treaties relative to the projected experience of indigenous peoples, but the point is not made that treaties may constrain adaptation of the tribes as collective units because, while ecosystems may migrate, tribes cannot move beond the historically agreed reservation boundaries. Ecosystem migration is referred to below in the bullet concerning disturbances on p. 4, lines 29-36, but again the implications for tribes as collective units are not mentioned. (Edward Miles, College of Ocean and Fishery Sciences)	M – good point, but perhaps use fewer words
E-14-63	A	4	5	4	7	interesting -indigenous peoples were probably the best adapters in the past despite high vulnerability (Robert Taylor, Bedford Insitute of Oceanography)	L – Much of pre-historic and historic adapatation was by migration
E-14-64	A	4	5			Begin this para with the following: "DESPITE ANY WARMING OVER THE LAST FEW DECADES, AVAILABLE DATA SHOWS THAT LIFE EXPECTANCIES HAVE IMPROVED FOR INDIGENOUS POPULATIONS RESIDENT IN NORTH AMERICA, INCLUDING THOSE LIVING IN THE ARCTIC REGIONS (see Arctic Human Development report, p. 27, available at http://www.svs.is/AHDR/AHDR%20chapters/AHDR_chp%202.pdf). NEVERTHELESS, BECAUSE SUCH POPULATIONS RELY HEAVILY ON NATURAL RESOURCES, SUCH POPULATIONS WILL experience substantial impacts from climate-related events ..." [New language is in BOLD; deletions are not shown.] (Indur Goklany, US Department of the Interior)	M Too complex a statement for the summary. Whole paragraph has been merged with another
E-14-65	A	4	7	4	7	These communites 'are' among the most vulnerable to future climate change not 'will be' (Peter Victor, York University)	M This is intended as a future-oriented statement. Will be in future
E-14-66	A	4	10	4	11	Why assign a confidence measure to this sentence? And why wouldn't the measure be "be very high confidence" if recent hurricanes have shown it to be true that the	M- Drop statement? Reread house select committee? Is it always the case that the poor

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						socially and economically disadvantaged are disproportionately impacted? (Julie Winkler, Michigan State University)	are more harmed? Are we too focused on Katrina, which may be unique?
E-14-67	A	4	10	4	13	Some additional detail or examples would be helpful here. (Gregory McCabe, U.S. Geological Survey)	M Now more balanced.
E-14-68	A	4	15	4	15	The constraint on water resources is that they are heavily allocated; management is as much an opportunity for adaptation as a constraint; however, the over allocation of some water resources in some regions leaves little slack in the management system for adaptation measures. (David Sauchyn, University of Regina)	M That is our point.
E-14-69	A	4	15			What is exactly meant by “constrain”? (Julie Winkler, Michigan State University)	L constrain
E-14-70	A	4	15			Replace "constrain" with "pose additional challenges for". (Indur Goklany, US Department of the Interior)	L constrain does the work of 4 words
E-14-71	A	4	16	4	16	Lumping snowpacks and glaciers together as means of water storage is misleading. Snowpack is a storage that would be expected to renew on an annual basis. With glaciers, on the other hand, we might be able to extract more water in the short term, at the expense of being without glaciers in the future. Anyway, snowpacks are much more widespread and represent a much more important water resource. My recommendation: delete reference to glaciers here. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M We omitted glaciers from the ES.
E-14-72	A	4	19	4	21	I would generalize this affirmation to many watersheds covering more than one jurisdiction (USA vs Mexico, California vs other states, Alberta vs eastern prairies, Ontario vs Quebec vs USA, BC vs Washington) (Alain Bourque, Ouranos)	M Generalized in the FGD.
E-14-73	A	4	23	4	23	The statement that impacts on agriculture "will be positive overall" is inconsistent with statements on page 11 ("increased the vulnerability of the agriculture sector overall") and page 22 where several examples of adverse impact are described. The basis for the statement "positive overall" is unclear. Is this an economic assessment where gains and losses have been compared? If so the assessment should be referenced. If not, then the statement should be removed. (Peter Victor, York University)	M 14.4 revised to clarify.
E-14-74	A	4	27	4	27	I was intrigued by the words "crops with high cultural and tourism value," and wondered what it meant. Of the top of my own head, I thought of wild rice for cultural value and wine grapes for tourism value. However, I looked for this in the two subsections cited--I didn't find anything about cultural and tourism value in section 14.4.4, and didn't find section 14.5.4 at all. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	H – We dropped all mention of ag from the ES.

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E-14-75	A	4	29	4	36	This paragraph needs to expanded to outline the consequences for ecosystem and biodiversity in North America arising from projected climate changes. The current formulation does not give much information as to the significance of projected impacts (William Hare, Potsdam Institute for Climate Impact Research (PIK))	H – revised ecosystem impacts statement in ES.
E-14-76	A	4	29	4	30	The bold title is only partly related to the following lines so I suggest to rather put the second sentence ending with "….. The map of North America ecosystems" as the bolded title and the current bolded title as the second sentence. Some nuance could be added to the word "fundamentally" since the confidence level is only medium (propose: is likely to fundamentally rearrange the map?) (Alain Bourque, Ouranos)	M bullet revised.
E-14-77	A	4	29	4	32	I find it strange that the more specific statement about wildfire and insect outbreaks increasing is assigned high confidence, but the much more generic statement about spatial shifting and rearranging the map is assigned medium confidence. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M We feel that the confidence statements are justified.
E-14-78	A	4	29			Start this para with lines 32-33 on page 11 followed by the full sentence on lines 26-28 of page 20, then segue into the next sentence using a "however", so that sentence reads as follows: "However, disturbances like wildfire… longer growing seasons." (Indur Goklany, US Department of the Interior)	M This whole bullet was extensively revised.
E-14-79	A	4	33	4	34	NPP may continue to increase for the next few decades, but it is probably important to mention the limits on this increased productivity, i.e. levels of soil moisture and nutrients. (David Sauchyn, University of Regina)	M Bullet no longer mentions NPP.
E-14-80	A	5	3	4	3	I suggest re-writing the opening sentence as "The United States (U.S.) and Canada will experience direct impacts of climate change through local changes e.g. …….and indirect effects, transmitted among regions….." (Peter Victor, York University)	M rewritten
E-14-81	A	5	3	5	6	The first sentence of the introduction is very awkwardly written and needs to be edited for clarity. (Edward Miles, College of Ocean and Fishery Sciences)	M rewritten
E-14-82	A	5	3	5	11	Introduction is redundant. Lines 3-7 can be moved to introduce the ES; lines 7-11 can be deleted - this information will be in the Introduction to the volume. (Jean Palutikof, Met Office)	M I think we need to explain why we don't consider the second largest country in North America.
E-14-83	A	5	3	5	6	A stronger introductory sentence is needed. This one is somewhat hard to follow. (Julie Winkler, Michigan State University)	M revised for clarity
E-14-	A	5	6	4	6	I suggest "Variations in wealth, geography and urban form….."	M what is urban form? Geography seems

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84						(Peter Victor, York University)	clearer
E-14-85	A	5	22	5	23	It seems that we assumed greater evapotranspiration: should be a little more explicit (Liette Vasseur, Laurentian University)	M- check if mentioned in TAR
E-14-86	A	5	36			Surprised to read only "possible" for losses since with sea level rise it is already observed. (Liette Vasseur, Laurentian University)	M-OK quote from TAR
E-14-87	A	5	42	5	42	Change "…may require" to "will require" (Peter Victor, York University)	M ok
E-14-88	A	5	48	5	48	Change "…may lead" to "will lead" (Peter Victor, York University)	ok
E-14-89	A	5	50	5	50	Change "…may be exacerbated" to "…will be exacerbated" (Peter Victor, York University)	ok
E-14-90	A	5	51	5	52	Temperature may be important for tick-borne diseases, but so is precipitation. Reductions in precipitation may result in reduced tick-borne diseases even if temperature increases. Some discussion of the influence of precipitation should be included. (see (1) Subak, S., 2003. Effects of climate on variability in Lyme disease incidence in the northeastern United States, American Journal of Epidemeology, 157:531-538., (2) McCabe, G.M., and J. Bunnel 2004. Precipitation and the Occurrence of Lyme Disease in the Northeastern United States, Vector Borne and Zoonotic Diseases, v. 4, n. 2, 129-134., and (3) Estrada-Pena, A., 2001. Forecasting habitat suitability for ticks and prevention of tick-borne diseases. Vet. Parasitol., 1994:91-132). (Gregory McCabe, U.S. Geological Survey)	M-At least one of these 3 refs captures in 14.4
E-14-91	A	6	9	6	9	Change "Advancing building codes" (which really means bringing them on sooner) to "Enhancing" or "Strengthening" (Peter Victor, York University)	M reworded
E-14-92	A	6	14	6	15	The meaning of “emerging adaptation strategies generally address current challenges” is unclear, as “emerging” and “current” suggest different time frames. (Julie Winkler, Michigan State University)	M reworded
E-14-93	A	6	14	6	15	Modify these lines to read as follows: "ALTHOUGH adaptation strategies that address current CLIMATE challenges WILL BE OF BENEFIT IN ADDRESSING FUTURE CLIMATE-SENSITIVE CHALLENGES REGARDLESS OF WHETHER THEY ARE DUE TO CLIMATE, CLIMATE VARIABILITY OR CLIMATE CHANGE (GOKLANY 2000a, 2005A, 2006A), there are few cases of implementing SUCH STRATEGIES to EXPLICITLY DEAL WITH future impacts and opportunities." (Indur Goklany, US Department of the Interior)	M thanks for the suggestion. We reworded the bullet.

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E-14-94	A	6	18	6	32	It is helpful to have this short list of key differences from the TAR. However, some of the items (i.e. role of adaptation and adaptive capacity, are not specific statements). (Kristie Ebi, ESS, LLC)	M We sharpened the list to focus on key differences.
E-14-95	A	6	20	6	32	Section 14.1.2 on the key differences from the TAR is excellent because it is very specific and very succinct. (Edward Miles, College of Ocean and Fishery Sciences)	Thanks
E-14-96	A	6	22	6	32	The bullet items do not have a parallel construction, making it difficult to follow the points the authors are making. (Julie Winkler, Michigan State University)	L reworded
E-14-97	A	6	28			This statement assumes that interacting impacts will necessarily reinforce each other. There is no general showing that this is indeed the case; they could also offset each other. Accordingly, either eliminate this line or replace "may lead to tipping points" with ""may lead to OR REDUCE THE LIKELIHOOD OF tipping points." (Indur Goklany, US Department of the Interior)	M There are lots of ways that conditions in the future might improve. That's why we include the bullets and interactions and adaptations.
E-14-98	A	6	28			I think that "tipping point" needs to be defined here. (Julie Winkler, Michigan State University)	M – check if in glossary
E-14-99	A	6	35			I generally liked Section 14.2 and the concept of separating current sensitivity and vulnerability from future sensitive/vulnerability (i.e., Section 14.4). However, I thought that there was some confusion between the two sections. In particular, some of the statements in Section 14.4 appeared to address current vulnerability and would fit better into Section 14.2. (Julie Winkler, Michigan State University)	In editing proces have checked for sensitivity cases in 14.4 and moved to 14.2
E-14-100	A	6	37	6	38	Why is the increase in temperature in Canada expressed as O.9C and in the US as 0.6C/100 yrs? They should be consistent or the difference explained. (Peter Victor, York University)	Updated and reworded
E-14-101	A	6	37	8	12	Relevant trends and scenarios also included in Barrow, E., B. Maxwell and P. Gachon (Eds), 2004. Climate Variability and Change in Canada: Past Present and Future. ACSD Science Assessment Series No. 2, Meteorological Service of Canada, Environment Canada, Toronto, Ontario, 114p. (Alain Bourque, Ouranos)	M – More on techniques for scenario development
E-14-102	A	6	37	8	12	Examples of detailed regional trend analyses using homogeneized data of possible interest for climate section or figure 14.1: Yagouti, A., Boulet, G. et Vescovi, L. (2006). Homogénéisation des séries de températures et analyse de la variabilité spatio-temporelle de ces séries au Québec méridionnal. Janvier 2006, 154 p. and Gachon, P. et al (2005). A first evaluation of the strength and weaknesses of	M- Short description of overall trends provided here – not the space to provide regional trends This is a methods consideration which is not

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						statistical downscaling methods for simulating extremes over various regions of eastern Canada. Rapport final au Fond d'Action sur le Changement Climatique. Juin 2005, 234 p. all available at http://www.ouranos.ca/doc/produit_f.html (Alain Bourque, Ouranos)	appropriate here
E-14-103	A	6	37	8	13	A heading should be added to section 14.2 to indicate that the first three paragraphs are an overview of recent climate trends. This is an appropriate introduction to the discussion of current sensitivity/vulnerability, but the theme of these paragraphs is exposure to climate variation and not sensitivity or vulnerability. (David Sauchyn, University of Regina)	M Cannot add an extra section here as must maintain consistency of numbering of sections in 14.2 and 14..4 for cross-reading
E-14-104	A	6	39			reference should be to accelerated warming in the "western" arctic - the eastern Canadian arctic has experienced less warming than some of continental North America (Donald Lemmen, Natural Resources Canada)	M done
E-14-105	A	6	39			Change "accelerated warming in the Arctic" to "accelerated warming in SOME PARTS OF the Arctic, ALTHOUGH GREENLAND IS APPROXIMATELY AS WARM TODAY AS IT WAS IN EARLIER DECADES (1930S AND 1940S; SEE, E.G., CHYLEK 2004, 2006)." [References: (1) Chylek, P., Box, J.E. and Lesins, G. 2004. Global warming and the Greenland ice sheet. Climatic Change 63: 201-221. (2) Chylek, P., Dubey, M.K. and Lesins, G. 2006. Greenland warming of 1920-1930 and 1995-2005. Geophysical Research Letters 33: 10.1029/2006GL026510.] (Indur Goklany, US Department of the Interior)	M- Added western
E-14-106	A	6	45	6	47	Add " changes in land use and land cover" to the list of factors influencing warming. (Indur Goklany, US Department of the Interior)	M Agree but reporting specific info from articles
E-14-107	A	6	45			“The largest increase was in the western U.S.” Where and how much? (Julie Winkler, Michigan State University)	M removed
E-14-108	A	6	49	6	50	A wide range (5-30%) is given for Canada and a single figure (7%) for the US. I expect that these are the estimates from the two cited studies. I suggest adding a comment that the estimate for the US is also uncertain. (Peter Victor, York University)	M Yes
E-14-109	A	6	50	6	50	"Heavy precipitation" needs to be defined. (Gregory McCabe, U.S. Geological Survey)	M No room here – place in glossary?
E-14-110	A	6	50			How is “heavy” precipitation defined? The definition of “heavy” can be crucial when comparing the results from one study to the next or from one region to the next. (Julie Winkler, Michigan State University)	M No room here – place in glossary

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-14-111	A	6	52			Implies step change across border between Canada and North America. (Jean Palutikof, Met Office)	M New reference on heavy precip
E-14-112	A	7	1			Figure 14.1 is not very easy to read. The layout of the small graphs is awkward and haphazard and should be improved. Trend lines are included in some of the smaller graphs without an R-squared value which is not good practice. (Peter Victor, York University)	H redrafted
E-14-113	A	7	1			Fig. 14.1 - for graph (h) reference should be to McBean et al. (2005) Arctic Climate: Past and Present (Chapter 2 of ACIA technical report, Fig 2.14 of that chapter) (Donald Lemmen, Natural Resources Canada)	We dropped this panel
E-14-114	A	7	19			Fig. 14.1 (e). This figure forgets context. These declines due to higher temperatures are against a background of generally higher yields. Between 1982 and 1998, corn yields went up from 113.2 bushels per acre to 134.4 bushels per acre despite -- I'm assuming -- a general increase in temperature over this period. To make thi point, we recommend adding a second panel to Fig 14.1 (e) that would show the trend in yield from 1982-1998. These considerations should also be noted on page 11, lines 10-12. (Indur Goklany, US Department of the Interior)	H We dropped this panel
E-14-115	A	7	21			Fig. 14.1(f), lower panel is misleading for several raesons. First, data for deaths due to hurricanes are available back to 1900. Graphing data from 1900 to 2005, will give a radically different idea of trends. It will show peaks in the early 1900s and in the 1920s (if running averages are employed). See Goklany (2006a); also see Goklany (2000a). To get an idea as to whether hurricanes are deadlier, it is more useful to plot death rates because that factors out increases in mortality due to population growth. In fact, the annual death rate due to hurricanes from 2000-2005 was 99 per 100 million population, compared to 1,135 for 1900-1909 and 244 for 1920-1929. [Again see Goklany (2006a, 2000a) for these graphs.] Third, economic damages should be adjusted not only for inflation but also for increases in the assets at risk (see Pielke and Landsea 1998, Goklany 2000a). Fourth, data on economic damages are available back to the 1920s, and this graph shuld also go back to that period. (Indur Goklany, US Department of the Interior)	H- There is a lot of disagreement about the validity of data on hurricane early years, especially before 1940. Death rates don't make the same point. And have been dropped from the figure Increases in assets at risk could not be updated to 2005. We contacted Landsea about obtaining the assets data and he never replied. Data through 1998 was contained in the TAR.
E-14-116	A	7	22	7	22	explain ACE and PDI in text pg 8 if not done elsewhere (Robert Taylor, Bedford Insitute of Oceanography)	M Put in glossary. Costs too many words here.
E-14-117	A	7	32	7	33	are the anomolies in arctic sea ice for the whole arctic or just the area of sea ice in the arctic ocean? -if only the Arctic ocean please clarify in text. (Robert Taylor, Bedford Insitute of Oceanography)	We dropped this panel.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-14-118	A	7		7		Fig. 14.1 on this page has a number of problems. First, the individual panels need to be arranged in a sequence, rather than scattered randomly. Second, use of the word "trend" in the titles of the individual panels is strange, when what is plotted is a quantity on the y axis vs. time on the x axis (panels c and g). It is more appropriate in panels a and e, where one or both of the axes really is representing a trend. Especially egregious, though, is panel d, labeled as "relative sea level rise," even though one of the four stations shows a large drop in sea level and another shows what I perceive as a small drop. The text later helps to explain these as being due to isostatic adjustment. Suggested actions regarding panel d: Do not use the word "rise" for this figure, and if the intention is to assert that there is a rise in sea levels, this panel needs more immediate illumination, or the sea level could be referenced to the geoid rather than a fixed point on the Earth's crust. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	H all panels revised and only the best ones kept.
E-14-119	A	7				Figure: this is a very busy figure but I am concerned that we don't discern what is due to climate change to other human activities, especially for some data such as economic loss (since there are more inhabitants with larger homes, it is expected), etc. (Liette Vasseur, Laurentian University)	H The figure summarizes trends that have a climate component. It is not intended to confirm causation.
E-14-120	A	8	2	8	4	Any discussions on the "raging hurricane debate" should be fully linked and consistent with WG1 report. (Alain Bourque, Ouranos)	H- We just refer the readers over to WG 1 results rather than make an extensive attempt to characterize it.
E-14-121	A	8	7	8	8	Rather than “have not been increasing” I would recommend “have changed little or have decreased in frequency”. (Julie Winkler, Michigan State University)	ok
E-14-122	A	8	10			The phrase, “but no general increase,” makes it seem like an increase in freezing rain is expected in a warmer world. Whether or not an increase is expected depends on location. Freezing rain would likely decrease in frequency in Illinois, for example, and increase in frequency in Minnesota. (Julie Winkler, Michigan State University)	Ok Removed
E-14-123	A	8	15	8	15	In section 14.2.1, there is no assessment of studies of water quality links to climate. Only water quantity is considered. Adding information on water quality also would lengthen this section which seems short, especially in comparison to the section on coastal regions. All North Americans need fresh water, only some live on coastlines. (David Sauchyn, University of Regina)	M/H –adding a few sentences on water quality (and drought and flooding)
E-14-124	A	8	17	8	17	Was the “greater proportion of the US” relative to the proportion in preceding decades of the 20th century or as compared to other countries?	M Removed

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						(David Sauchyn, University of Regina)	
E-14-125	A	8	17	8	41	Section 14.2.1 is a very fine encapsulation of sub-regional variation with respect to water resources. (Edward Miles, College of Ocean and Fishery Sciences)	Thanks
E-14-126	A	8	17	8	17	Great proportion than what? (Kristie Ebi, ESS, LLC)	M Removed
E-14-127	A	8	17			"a greater proportion"? Compared to what? (Julie Winkler, Michigan State University)	M Removed
E-14-128	A	8	20	8	21	italics not needed (Julie Winkler, Michigan State University)	Removed
E-14-129	A	8	21	8	21	Remove the first "the" from this line. Also the study by Rood et al. (2005) did not encompass western North America, but only streamflows from the hydrographic apex in the Rocky Mountains of northern Montana. (David Sauchyn, University of Regina)	M – change to central NA rocky mountains as per paper
E-14-130	A	8	22	8	23	a short phrase should be added to note the spatial variability in observed increases in evapotranspiration as noted by Walter et al. (Donald Lemmen, Natural Resources Canada)	This point was dropped from the FGD
E-14-131	A	8	26	8	27	Possibly reference McCabe, G.M., and M.P. Clark (2005), Trends and Variability in Snowmelt runoff in the Western United States, Journal of Hydrometeorology, v. 6, 476-482. This paper suggests that the shift in the timing of snowmelt runoff in the western US may have occurred as a step-change rather than as a linear trend. (Gregory McCabe, U.S. Geological Survey)	M Space constraints make it very difficult to introduce new concepts, even good, relevant ones.
E-14-132	A	8	36	8	37	Is the declining runoff noted natural streamflow? To what extent is the change in streamflow related to climate versus water consumptions and withdrawal? Also the authors should note that glacier meltwater makes a significant contribution to summer flows of the Athabasca River and thus the impacts of climate change on this river differ from impacts on the other rivers identified in this section. (David Sauchyn, University of Regina)	M ok
E-14-133	A	8	38			My figures suggest that the statement that the Atabasca River is the largest free flowing River in western Canada is not accurate. It would be the largest free flowing on the Canadian Prairies if youaccept that dams on the Peace discount the MacKenzie or Slave. The Fraser - further west in the Pacific Drainage, has an average flow of about 3620 cubic meters per second while the Athabasca is about 1890 cubic meters per second. The Yukon near where it exits Canada has an estimated annual flow of 2200 cubic meters per second. Environment Canada 1998, Surface Water up until 1998, CD Rom (Ian Church, Yukon Government)	M – removed statement for space

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E-14-134	A	8	48			Is a change in the geographic distribution of ecosystems a direct climate-terrestrial ecosystem connection, or a combination of direct and indirect effects? I suspect the later. (Julie Winkler, Michigan State University)	Direct and indirect
E-14-135	A	8	52	9	8	Some editing is needed here to improve readability. For example, 'Satellite data for 1981-2000 indicates …", and following "many species" should be "lilacs" rather than "lilac blooms", "honeysuckle" rather than "honeysuckle blooms", and so on. (Julie Winkler, Michigan State University)	Sentence has been rephrased
E-14-136	A	9	1	9	14	I also recommend the following references, the second beeing a very recent review: Nemani, R. R., C. D. Keeling, et al. (2003). "Climate-Driven Increases in Global Terrestrial Net Primary Production from 1982 to 1999." Science.). C. and S. W. Running (2006). "Impacts of climate change on natural forest productivity - evidence since the middle of the 20th century." Global Change Biology doi:10.1111/j.1365-2486.2006.01134.x. (Alain Bourque, Ouranos)	I had these references in before and they were removed, have reinserted the 2006 reference. The 2003 reference is covered in Chap 1.
E-14-137	A	9	10	9	10	Replace "North America" with "United States" to reflect the studies cited here. Non pertain to Canada. (David Sauchyn, University of Regina)	OK, fixed
E-14-138	A	9	11	9	11	Does "improved water balance" mean wetter? In section 14.2.1, the authors referred to decreased river flows in this region. Can the water balance "improve" while streamflows are declining? (David Sauchyn, University of Regina)	Yes, there are many dimensions to the land hydrologic cycle and I tried to clarify uncertainties
E-14-139	A	9	11			The phrase: "due to improved…" should read "due in part to…" (other important factors affecting production are noted in 14.2.4) (Ellen Wall, University of Guelph)	OK
E-14-140	A	9	11			By "improved water balance" do you mean "surplus"? (Julie Winkler, Michigan State University)	Not necessarily, it can also be less negative
E-14-141	A	9	16			"major, potentially climate-change sensitive controllers" is awkward (Julie Winkler, Michigan State University)	Agree, text rewritten
E-14-142	A	9	17	9	18	Regarding wildfires, it should be noted that some of the increase is probably due to changes in management policies. (Indur Goklany, US Department of the Interior)	No it isnt, see Box 14.3
E-14-143	A	9	18	9	18	Is the reference to Box 14.1 in this line correct? It seems as though the reader should be referred instead to Box 14.3 (which discusses wildfire and disturbance). (Sarah Shafer, U.S. Geological Survey)	L- formating error
E-14-144	A	9	18			Editorial - reference should be to Box 14.3 (Donald Lemmen, Natural Resources Canada)	L- formating error

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E-14-145	A	9	21	9	44	"the following may be added in Box 14.1: Declines and signals of range expansions of arctic-alpine plants at their souther distribution limits were observed in the Montana Rocky Mountains (Lesica and McCune 2004); full reference: Lesica, P. and B. McCune 2004: Decline of arctic-alpine plants at the southern margin of their range following a decade of climatic warming. Journal of Vegetation Science, 15, 679-690." (Harald Pauli, University of Vienna)	Time period rather short for significance
E-14-146	A	9	22	9	43	It seems relevant to indicate that current (and future) vulnerability to climate variability and change w.r.t. ecosystems is strongly exacerbated by human influences (landuse, demographics…) so that vulnerability is likely (but not always if climate is a driving factor) "not as high" in areas where non-climatic stresses are high (Ex: highly populated southern Canada vs lower populated northen Canada). Vulnerability of ecosystems also highly depend on species resilience, flexibility and hability to migrate(cold water fish vs fox widespread over large unpopulated region), dependency to specific food/habitat/timing of events, ... (Alain Bourque, Ouranos)	Agree with these assertions. There is not sufficient room for these more extended interpretations in the chapter
E-14-147	A	9	24			Meaning of "phenology" in this context is not clear. Do you mean "physiology"? (Julie Winkler, Michigan State University)	No, phenology, which is defined in Intro to 14..2.2
E-14-148	A	9	40	9	43	The spread of fire ants, in my mind at least, is not so much reflective of climate variability and change as it is reflective of invasive species. I think this needs to be made more clear. Also, the relative impact of invasive species on ecosystems compared to that of climate variability and change is probably not sufficiently discussed. (Julie Winkler, Michigan State University)	Most invasive species papers I read found more human disturbance and landcover change causality than climate change
E-14-149	A	9	40			What is meant by "competitively subordinate"? (Julie Winkler, Michigan State University)	Loser in ecosystem competitiveness
E-14-150	A	9	47	10	52	The following massive vulnerability study/report (in french) can be of use to amplify or add on points mentionned in this section. It discusses increased erosion rates, adaptation actions, risks to communities for which 50% lives within 500 meters of coastline, sea level, freeze-thaw cycles... etc...: DUBOIS, J.-M. M., BERNATCHEZ, P., BOUCHARD, J.-D., DAIGNEAULT, B., CAYER, D., DUGAS, S., 2005, Évaluation du risque d'érosion du littoral de la Côte-Nord du Saint-Laurent pour la période de 1996-2003. Conférence régionale des élus de la Côte-Nord, 291 pages, annexes. (Alain Bourque, Ouranos)	M – DF Have cited the following new refereed journal paper (just published, despite 2004 date) in place of the grey literature reference suggested by reviewer: Bernatchez, P. and J.-M.M. Dubois, 2004: Bilan des connaissances de la dynamique de l'érosion des côtes du Québec maritime laurentien. *Géographie physique et Quaternaire*, **58** (1), 45-71.

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E-14-151	A	9	50			I suggest that the term 'relative sea level' be defined. (Peter Victor, York University)	This term is already in the Glossary.
E-14-152	A	10	2			reference Andalo et al 2005 does not seem to be related to sea levels but forestry is it the correct reference? (Robert Taylor, Bedford Insitute of Oceanography)	H – authors need to check Procite assignment of references to ensure that correct references have been inserted This was a technical error with the citation system and has been fixed.
E-14-153	A	10	3			"maximum sea level"? (Julie Winkler, Michigan State University)	L This phrase has been removed.
E-14-154	A	10	5			"low and high water levels" is confusing. Something is probably needed here that Great Lakes water levels have been low recently but they have been high in the fairly recent past. (Julie Winkler, Michigan State University)	M Will try alternative wording but need to reduce length.
E-14-155	A	10	9	10	17	For some regions (Ex: Gulf of St-Lawrence), critical infrastructures like unique access road to remote coastal communities means specific and different types of vulnerabilities (Ex: remnants of Katrina cutting off only road to Baie-Comeau, Sept-Iles, Forestville for up to 5 days in September 2005. This comment could be included in the Human Settlements section. (Alain Bourque, Ouranos)	M Will consider for 14.4.3.
E-14-156	A	10	14	10	17	Should refer to Chapter 6 case studies on Hurricane Katrina here (Jean Palutikof, Met Office)	H Cross-reference has been inserted in 14.2.6 Yes [done].
E-14-157	A	10	19	10	25	I found the discussion here to be somewhat disconnected, moving from real estate cost to El Nino and storm tracks to tide gauge data. (Julie Winkler, Michigan State University)	M Order has been altered in revision for length.
E-14-158	A	10	19	10	24	An additional citation needs to be inserted tying the erosion impacts of El Ninos specifically to the Pacific Northwest (Washington and Oregon). See Kaminsky, G.M., P. Ruggiero, and G. Gelfenbaum. 1998. Monitoring coastal changein southwest Washington and northwest Oregon during the 1997-98 El Nino. SHORE AND BEACH, July:42-51. (Edward Miles, College of Ocean and Fishery Sciences)	M- DF This is not a key reference and pre-dates TAR. Have dropped a couple of other older references in this section.
E-14-159	A	10	25	10	28	can leave as is but this refers to Arctic issues and maybe best in chapter 15 (Robert Taylor, Bedford Insitute of Oceanography)	M – check I have substantially reduced this section. It is a sub-Arctic issue and arguably ours, but specific place names have now been omitted.
E-14-160	A	10	28	10	28	Kivalina was not mentioned previously, so this is unclear. (Kristie Ebi, ESS, LLC)	M Reduced for length.
E-14-	A	10	29			Need to find some way to distinguish between reference to years of specific events	L

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161						(2003, 2004, 2005) and references to publications. (Donald Lemmen, Natural Resources Canada)	New text revised for length has dropped year references.
E-14-162	A	10	33	10	36	The other situation is where sea ice has historically either provided wave protection along coast lines or lessened the fetch of waves. The NWT's Tuktoyaktuk and several Alaskan coastal communities including Barrow are good examples. IN the Yukon infrastructure and herititage resources on Hershel Island are being damaged through the same process. (Ian Church, Yukon Government)	M This is already included and specific Yukon and NWT references belong in Polar chapter.
E-14-163	A	10	48			"mid to high marsh species"? (Julie Winkler, Michigan State University)	M Sentence deleted in editing for length.
E-14-164	A	11	1	12	25	It is not clear why there is no reference to marine fisheries in this section - or at least reference made to where they are discussed in chapters 4 and 5. Fig SPM-5 states that marine ecosystems in North America will be strongly negatively impacted by climate change, there needs to be some supporting evidence presented in this chapter. (Donald Lemmen, Natural Resources Canada)	Elected to foucus on freshwater fish because not addressed in TAR. Chapter 15 addressses east coast cod fishery. Sentence added to point this out
E-14-165	A	11	3	11	15	In general I found this paragraph somewhat disjoint, making it hard to distill the key points that the authors are trying to make regarding the current status of agriculture in the US and Canada. (Julie Winkler, Michigan State University)	M NA changed to US, no new refs on yield change in Canada since TAR
E-14-166	A	11	4	11	4	Again replace "North America" with "United States". All of the publications cited in this paragraph are studies of US agricultural trends. (David Sauchyn, University of Regina)	L see E-14-165
E-14-167	A	11	5	11	6	Rephrase to note that the impacts on yield of any single driver may be positive or negative - as is it could be interpreted to state that any climate changes that have occurred have served to increase yields. Perhaps "These yield trends are the combined result of changes in technology, fertilizer, seed stocks, climate and other factors; the specific impact of any single factor on yields may be positive or negative." (Donald Lemmen, Natural Resources Canada)	M done
E-14-168	A	11	6	11	11	I found lines 6 - 11 on page 11 to be confusing: corn and soybean yields are going up and down over different time periods in different studies. Are the findings contradictory? Is one study more reliable than another? The reader needs some guidance on what to take from these studies. (Geoffrey Wall, University of Waterloo)	M explicit reference to spatial & temporal variability added to end of 1st sentence
E-14-169	A	11	6			"plus any changes due to climate" is rather vague. Are you saying that the changes in agricultural yield due to climate are smaller than those due to other factors? I	M see E 14 166 & 167

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						suspect that would be a fair statement and seems to be the message in the next sentence beginning with the "In the Midwestern U.S. …" Can we assume that is also the case elsewhere in the US and Canada? (Julie Winkler, Michigan State University)	
E-14-170	A	11	7	11	11	It is confusing that line 7 says corn yields increased, then to have line 11 say corn yields decreased. (Kristie Ebi, ESS, LLC)	M see E 14 168
E-14-171	A	11	8	11	10	Is this sentence implying that there has been an increasing trend in the frequency of heavy rain in the US corn belt between 1951-1998 or that heavy rain events later in the period caused greater damage than similar heavy rain events earlier in the period? (Julie Winkler, Michigan State University)	M yes: cited paper refers to "recent heavy precipitation" but does not make inferences to earlier events. No chnage
E-14-172	A	11	9			The statement regarding corn losses over the 47 year period seems astronomical…Is it 20 billion over the entire span (in contant dollars)?. How have reductions in prices paid for corn due to supply/demand been incorporated here? Is the value expressed in net terms? To be credible, this statement needs more elaboration. (Ellen Wall, University of Guelph)	M corrected to $3B/yr as cited in reference
E-14-173	A	11	10	11	12	Please explain how "warm temperature" anomalies caused a decreased yields of corn and soybeans, when the rest of this paragraph suggests that climate warming favours crop productivity and thus reports increased yields, including for the same crops and the same regions (lines 4-7). (David Sauchyn, University of Regina)	M Chris…for this comment & next, I do not have the lobell & asner 2003 reference. Pls check & modify as necessary
E-14-174	A	11	10	11	11	It would be useful to include why the corn and soybeans yields decreased with increased temperatures. Because of greater evapotranspiration and water stress? Or because critical temperature thresholds were surpassed? (Julie Winkler, Michigan State University)	M see above comment
E-14-175	A	11	12	11	13	The statement that warmer nights have enhanced wine grape production seems to contradict the statement on ch. 14, p. 4, line 27 that crops with tourism value are particularly vulnerable. See also my comment on those lines in the exec. summary. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M assume p.4 adjusted
E-14-176	A	11	13	11	15	What is meant by a "positive factor" and a "negative factor"? (Julie Winkler, Michigan State University)	M sentence reworded to remove confusion
E-14-177	A	11	17	11	20	The increased vulnerability of North American agriculture described in these two sentences seems to contradict lines 4-6 in the preceding paragraph where the authors cite Troyer (2004) who reported consistently higher yields of major commodity crops. Is the apparent contradiction just a function of the different time	M The intro sentence to this paragraph now clarifies there is considerable spatial & seasonal variability within this broader trend. See E-14-168 as well.

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						frames: the past decade versus the last century? (David Sauchyn, University of Regina)	
E-14-178	A	11	17	11	29	Add reference to Wheaton, E., Wittrock, V., Kulshretha, S., Koshida, G., Grant, C., Chipanshi, A., and Bonsal, B. 2005. Lessons Learned from the Canadian Drought Years of 2001 and 2002: Synthesis Report. Saskatchewan Research Council Publication No. 11602-46E03. This is the most comprhensive study of the most recent national-scale drought in Canada and includes data on economic impacts, highlighting the vulnerabilities associated with consecutive drought years. Report can be accessed from http://www.agr.gc.ca/pfra/drought/info/11602-46E03.pdf (Donald Lemmen, Natural Resources Canada)	Done …Chris: add ref to Ch14 refs if not alreay there
E-14-179	A	11	18			How is "more variable weather defined"? Scientific papers need to be cited to back up this statement. The Senate of Canada reference is not sufficient. (Julie Winkler, Michigan State University)	H This Senate report includes a section on climate change & variability. Perhaps include a ref to WG I but otherwise this leads readers away from the main discussion.
E-14-180	A	11	21	11	22	I am quite skeptic about this affirmation. Although true for agriculture, adaptation to change is a normal process for most sectors which essentially determine wether you survive or go bankrupt. Maybe this affirmation should link agriculture AND other market driven sectors. Water resources, less market driven, maybe less used to deal with changes, especially rapid (with some advantages to moderate rapidity of changes). This issue could be fowarded to more discussions on mainstreaming, constraints, decision making later on in the document. Liking to paragraph beginning at page 15 and line 47, it is unclear weather market driven sectors really offer resilience to its "members": the energy supply sector is a fascinating one where market driven vision, suppose to be able to quickly adjust to demand, created lack of investments in some infrastructures, decreased the importance of publicly owned long term energy strategies, creates the illusion of adaptability while bringing society mush more vulnerable in reality (especially when some of key market players go bankrupt...). (Alain Bourque, Ouranos)	M revisions to paragraph to ackmowledge multiple dynamic stresses & opportunities.
E-14-181	A	11	23			The Wall et al 2005 reference is acceptable but it is not from a refereed source. A more solid reference is Wall and Smit, 2005 (Wall, E. and B. Smit. 2005.Climate change adaptation in light of sustainable agriculture. Journal of Sustainable Agriculture, 27(1):113-123). (Ellen Wall, University of Guelph)	M done Chris…update ref if need
E-14-182	A	11	24	11	27	I think that some specific examples are needed here. (Julie Winkler, Michigan State University)	M examples added
E-14-	A	11	32	11	50	Note should be made of the very significant outbreak of Mountain Pine Beetle	I looked intensely for REAL REFEREED

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183						currently impacting British Columbia and threatening Yukon and Alberta. I don't think it is sufficient to leave reference to MPB, that has impacted 8.7 million ha of pine forests (BC Ministry of Forests & Range 2006) to citation of Carroll et al (2003) in Box 14.3. Additional appropriate references include: 1 - Safranyik, L.., and Wilson, W.R. 2006. The mountain pine beetle: a synthesis of biology, management, and impacts on lodgepole pine. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, British Columbia. 304 p. 2 - Shore, T.L.; Brooks, J.E.; Stone, J.E., editors. 2004. Mountain Pine Beetle Symposium: Challenges and Solutions. October 30-31, 2003, Kelowna, British Columbia. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. Information Report BC-X-399. 287 p. 3 - MacKendrick, N.A., and Parkins, J.R. 2005. Social Dimensions of Community Vulnerability to Mountain Pine Beetle. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. Mountain Pine Beetle Initiative Working Paper 2005-26. 79 p. [Note all these reports can be downloaded from http://mpb.cfs.nrcan.gc.ca/beetlewatch/index_e.html. Also Britich Columbia Ministry of Forests and Range. (2006). Forest health – aerial overview survey. http://www.for.gov.bc.ca/hfp/health/overview/overview.htm. (Donald Lemmen, Natural Resources Canada)	JOURNAL ARTICLES illustrating a link between climate trends and these latest mtn pine beetle outbreaks. The literature has alot of measures of large areas of affected forest, but little solid evidence relating these outbreaks to any measurable climate trend, and no refereed papers.
E-14-184	A	11	39	11	45	Given the broad scope of this chapter, the three sentences beginning “Relationships between” and ending “water limitations” provide excess detail about tree growth – climate relations for two tree species in subalpine forests in the Pacific Northwest. (David Sauchyn, University of Regina)	This example is meant to illustrate the complexities and non-linearities of forest response, even in a limited area
E-14-185	A	11	50			Update reference to Juday et al (2005) Forests, Land management, and Agriculture. Chapter 14 of ACIA Technical Report. (Donald Lemmen, Natural Resources Canada)	Why? current reference is more comprehensive
E-14-186	A	12	1	12	2	Dictionary.com confirms my suspicion that "First Nations" is a term that is specifically Canadian in usage, so it may have little meaning to many readers. Suggest substituting "indigenous." (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	AGREED
E-14-187	A	12	2	12	2	Is 'First Nations peoples' appropriate for the US? (Kristie Ebi, ESS, LLC)	DITTO
E-14-188	A	12	3			Do you mean only “climate change” or “climate variability and change”? (Julie Winkler, Michigan State University)	ADDED and variability
E-14-189	A	12	7	12	8	Statement that salmonoids are "the most vulnerable" requires a reference and implies that there has been a comprehensive study of the relative vulnerability of all fish species. Alternative wording may be to state that "Salmonoids are particularly	AGREED

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						vulnerable ..." (Donald Lemmen, Natural Resources Canada)	
E-14-190	A	12	8	12	8	Is the statement about the steep decline of sea-run salmon stocks still accurate given the upturn in Canadian salmon runs reported in the media this year? (Peter Victor, York University)	MODIFED TO INDICATE GENERAL DECLINE (It is not practical to comment here on transients that may occur from year to year)
E-14-191	A	12	10			See above for line 3. (Julie Winkler, Michigan State University)	DITTO
E-14-192	A	12	12			"El Nino-linked warm temperatures" are better described by "climate variability" than by "climate change". The point that I am trying to make here is that "climate variability" and "climate change" are intermingled and confused in this paragraph on fisheries. (Julie Winkler, Michigan State University)	AGREED – ADDED VARIABILITY ABOVE and variable in this sentence
E-14-193	A	12	16	12	25	The English is opaque in this paragraph. Line 24 change 'as' to 'with'. Line 22 - what are 'young-of-the-year'? (Jean Palutikof, Met Office)	REARRANGED ORDER OF INFORMATION AND MADE MORE DIRECT LINKS TO CLIMATE. DROPPED TWO REFERENCES
E-14-194	A	12	16	12	17	Perhaps this sentence should go earlier in the discussion of fisheries, before the specific articles cited in the paragraph above. (Julie Winkler, Michigan State University)	AGREED
E-14-195	A	12	16	12	25	It seems that this parapgraph is good at relating factors influencing the biology of fish but does not really limked to climate change. For example, it is one thing to state that Lake Ontario year class productivity is strongly related to temperature but is the temperature increased during the past century and likely to increase in the next century. Considering the previous section, I imagine yes but for someone jumping to this section, it might not be as obvious. Even the additional information on pages 22-23 is different and does not linked to the previous fisheries section. (Liette Vasseur, Laurentian University)	AGREED. REORDERED AND MODIFIED WORDING. I cannnot help it if some reads selectively from the report. There is not room to give detailed background for any specific reference. Readers must consult the literature for more detail.
E-14-196	A	12	18	12	24	lines 18-24 are not about climate change, rather they are about research methods.They should be deleted or made more relevant to climate impacts. Similarly, lines 41 to 43 are about relationships between phenomena but the link to climate change is not made explicitly. (Geoffrey Wall, University of Waterloo)	AGREED. REORDERED/REWORDED AS INDICATED ABOVE
E-14-197	A	12	18			When did this "shift" occur? (Julie Winkler, Michigan State University)	IN THE 1990S - Added
E-14-198	A	12	19			What is "thermal-optical habitat supply"? What about "thermal habitat supply"? How do the two differ?	REWORDED WITH SIMPLER WORDS

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						(Julie Winkler, Michigan State University)	
E-14-199	A	12	20	12	22	The meaning of "scale with growing degree days" is not very clear. Is there, for example, a linear relationship? (Julie Winkler, Michigan State University)	DELETED
E-14-200	A	12	23			Have there been any changes in the "groundwater seeps" and the temperature of the seeps? (Julie Winkler, Michigan State University)	NO but warmer climate will reduce the value of these cold/cool refugia.
E-14-201	A	12	28	13	23	This section should at least discuss extreme weather events, particularly the data coming out on the impacts of the 2005 hurricane season. Page 14, 21-28 summarizes some of this information and could be moved to this section. Also, this section should cross-reference relevant information in Chapter 8. (Kristie Ebi, ESS, LLC)	Editors choice. Think info can remian on page 14.
E-14-202	A	12	28	13	23	More attention should be given to the links between climate change - smog - health impacts. (Peter Victor, York University)	
E-14-203	A	12	30	12	30	I suggest "…cardiovascular and respiratory….." (Peter Victor, York University)	changed
E-14-204	A	12	30	13	23	Maybe two missing issues in this health section: 1) psychosocio impacts of extremes and their aftermath 2) physical impacts (molds, infections...) no reference available. Some references for 1) Maltais, D., Lachance, L., Fortin, M., Robichaud, S., Fortin, C., & Simard, A. (2000). L'état de santé psychologique et physique des sinistrés des inondations de juillet 1996 : étude comparative entre sinistrés et non-sinistrés, dans Santé mentale au Québec, vol. XXV, n° 1, p. 116-138. Klinenberg E. (2002). A social autopsy of disaster in Chicago : heat wave. Chicago: The University of Chicago Press, 305p. DAVID P. LAPLANTE, RONALD G. BARR, ALAIN BRUNET, GUILLAUME GALBAUD DU FORT, MICHAEL L. MEANEY, JEAN-FRANÇOIS SAUCIER, PHILIP R. ZELAZO, and SUZANNE KING. Stress During Pregnancy Affects General Intellectual and Language Functioning in Human Toddlers. Pediatr Res 2004 56: 400-410 http://www.pedresearch.org/cgi/content/full/56/3/400?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=stress&searchid=1&FIRSTINDEX=0&sortspec=relevance&resourcetype=HWCIT (Alain Bourque, Ouranos)	These issues are covered in the TAR and also appear in the health chapter. OK, but the etiology of stress is too broad for including here
E-14-205	A	12	33			Here's an exercice trying to combine socio-economic vulnerabilities and climate changes for Quebec: Vescovi, L. , Rebetez, M. , Rong, F. (2005), Assessing public health risk due to extremely high temperature events : climate and social parameters, Climate Research, Vol. 30:71-78, 2005	Not included

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						(Alain Bourque, Ouranos)	
E-14-206	A	12	35	12	36	This sentence implies that there are a number of infectious diseases transmitted by air that are of importance in the US. The sentence also implies that this will be the subject of the paragraph, which is not true. (Kristie Ebi, ESS, LLC)	Have moved down to end on next paragraph
E-14-207	A	12	39	12	41	What is the weather and climate connection to the drinking water contamination in Walkerton? (Julie Winkler, Michigan State University)	See response to comment 211
E-14-208	A	12	39	12	41	What is the relationship between climate and the Walkerton catastrophe? (David Sauchyn, University of Regina)	See response to comment 211
E-14-209	A	12	39	12	41	This sentence needs to be qualified that failure of infrastructure was key to the outbreak. (Kristie Ebi, ESS, LLC)	See response to comment 211
E-14-210	A	12	39	12	47	Readers may be confused that Campylobacter is identified as both a waterborne and foodborne disease. (Kristie Ebi, ESS, LLC)	We cite the literature, though it is mostly foodborne
E-14-211	A	12	39	12	41	In discussion of Walkerton it is important to note that this was a result of contamination of drinking water following heavy precipitation on manure-covered fields, but that the fields were being managed using accepted best practices. Perhaps "In May 2000, an estimated 2300 people becamme ill and 7 died from exposure to E. coli 0157:H7 and Camplylobacter jejuni in the drinking water of Walkerton, Ontario following heavy rains on agricultural fields that were being managed with accepted best practices". Reference - O'Connor, D., 2002. A Summary Report of the Walkerton Inquiry: The Events of May 2000 and Related Issues. Ontario Ministry of the Attorney General. http://www.attorneygeneral.jus.gov.on.ca (Donald Lemmen, Natural Resources Canada)	. Removed walkerton discussion
E-14-212	A	12	39	12	41	Eliminate the sentence beginning with "In May, 2000 …" The Walkerton episode was due to improper chlorination. In fact, criminal charges were filed in that case because of that. What does it have to do with temperature change? (Indur Goklany, US Department of the Interior)	See response to comment 211
E-14-213	A	12	39	12	41	As far as I know there was no relation between climate change and the water quality problems at Walkerton as implied by the text. This is misleading. (Peter Victor, York University)	See response to comment 211
E-14-214	A	12	52	12	52	This needs a reference. (Kristie Ebi, ESS, LLC)	
E-14-	A	13	3			Sentence beginning 'Lab studies…' is far too obscure and technical for WG2 AR4	Edited and simplified

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215						readership. (Jean Palutikof, Met Office)	
E-14-216	A	13	8	13	10	Is there a specific region on which fears of St. Louis encephalitis are concentrated? I find it hard to believe that it is throughout North America. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	Occurs in much of the US
E-14-217	A	13	12	13	13	Need to mention importance of precipitation on zoonotic diseases. (see (1) Subak, S., 2003. Effects of climate on variability in Lyme disease incidence in the northeastern United States, American Journal of Epidemeology, 157:531-538., (2) McCabe, G.M., and J. Bunnel 2004. Precipitation and the Occurrence of Lyme Disease in the Northeastern United States, Vector Borne and Zoonotic Diseases, v. 4, n. 2, 129-134., and (3) Estrada-Pena, A., 2001. Forecasting habitat suitability for ticks and prevention of tick-borne diseases. Vet. Parasitol., 1994:91-132). (Gregory McCabe, U.S. Geological Survey)	Changed following comment 58
E-14-218	A	13	12			Replace 'zoonotic' with 'tick-borne' (Jean Palutikof, Met Office)	changed
E-14-219	A	13	13	13	15	Can the sentence beginning 'In the field…' be deleted without loss of information? It's too technical. (Jean Palutikof, Met Office)	edited
E-14-220	A	13	13			"humidity" would be a better term to use than "vapour pressure". Vapor pressure is one of many humidity measure, and I suspect a similar relationship would be found if another humidity measure, such as mixing ratio, had been used instead. (Julie Winkler, Michigan State University)	changed
E-14-221	A	13	18	13	23	The burden of heat waves should be mentioned. There are more references on the effectiveness of heat wave early warning systems, including Palecki et al. 2001 and Ebi et al. 2004. Also, the paper by Bernard and McGeehin (2004) that reviewed heat wave early warning systems in the US should be mentioned and referenced in the chapter. (Kristie Ebi, ESS, LLC)	Added Ebi 2004 reference
E-14-222	A	13	18			Put the sentence on this line ["Heat response plans and heat early warning systems can save lives"] into the Executive Summary. (Indur Goklany, US Department of the Interior)	This is not a new finding that needs to go in the exec summary
E-14-223	A	13	20	13	22	FYI: The city of Montreal has an alert system not based on "synoptic-based" approach "promoted" by Kalstein et al. but rather on 1) regular weather forecasts, 2) threshold established from historical analysis linking climate parameters and daily mortality, 3) monitoring of daily acceptance in hospitals and 4) multi-stakeholder agreements to provide response to vulnerable areas (Alain Bourque, Ouranos)	We do not say that it doe and we only use synoptic analysis as example. Now add, "and many cities operate via direct weather parameters"

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-14-224	A	13	22	13	23	Sentence beginning 'EWS for infectious diseases…' can be deleted - appropriate for sectoral chapter, not regional. (Jean Palutikof, Met Office)	deleted
E-14-225	A	13	26	15	1	Vulnerabilities/risks link to avalanches (ref: Karstein L., U. Domaas (2000). Évaluation des risques d'avalanche au Nunavik et sur la Côte-Nord du Québec, Canada. Norwegian Gotechnical Institute. 35p. Produit pour le Ministère de la sécurité publique du Québec.) and landslides (ref?) exists but are rarely documented. Vulnerability to those events could increase in regions where precipitation and precipitation extremes are expected to increase (Ex: northern Canada) (Alain Bourque, Ouranos)	M – Avalanches are mentioned relative to transportation. Was not able to obtain a copy of Karstein reference to evaluate, which in any case may be a more appropriate reference for Chapter 15..- MS May be an issue in Newfoundland as well. I'll check with Dave Liverman on whether there is a Canada-wide or NA reference. - DF
E-14-226	A	13	28	13	31	The "e.g.'s" are out of place. The first should follow "sensitive" and the second should follow "precipitation", although I don't in general particularly care for the structure of this sentence. (Julie Winkler, Michigan State University)	L We significantly reworded the sentence.
E-14-227	A	13	29	13	30	How is drought an example of the effects of warming or precipitation on infrastructure? Drought is a deficiency of water. (David Sauchyn, University of Regina)	M We significantly reworded the sentence.
E-14-228	A	13	29			Phrase '(e.g. loss of resource base)' looks out of context. (Jean Palutikof, Met Office)	L We significantly reworded the sentence.
E-14-229	A	13	33	13	50	Fishing was mentioned earlier in the chapter as an important economic activity, but is not discussed here. (Kristie Ebi, ESS, LLC)	M Fishing is mentioned in this section
E-14-230	A	13	34	13	50	I would recommend that "Indigenous Populations" be treated as a separate subunit rather than being grouped with Resource Dependent Communities. Stronger linkage needs to be made to cultural impacts as well as economic impacts. Each of these changes would be consistent with statement regarding indigenous peoples in teh Executive Summary. Data on indigenous populations in Canada, similar to that given for the US, should be provided and is available from the Department of Indian Affairs and Northern Development. In Canada the Inuit, First Nations and Metis face specific challenges. (Donald Lemmen, Natural Resources Canada)	H - Space constraints did not permit a full treatment. The best we could do was outline a couple of the issues and refer the reader to Chapter 15 and a few of the major underlying reports. The Executive summary point about indigenous peoples was merged with another point about socially and economically disadvantaged peoples
E-14-231	A	12	40	12	41	Can you explain the link between Walkerton case and climate change or is it an exmaple of what may happen? (Liette Vasseur, Laurentian University)	M Walkerton was not mentioned here
E-14-232	A	13	41	13	43	Sentence beginning 'A 1993 hantavirus outbreak…'. What is relevance to climate change?	M Demonstrates vulnerability to climate-caused events (in this case, climate variability)

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						(Jean Palutikof, Met Office)	
E-14-233	A	13	41			Missing date for the reference. Same in line 45. (Julie Winkler, Michigan State University)	L Fixed
E-14-234	A	13	49	13	50	The sentence beginning "In the North, there may be limited ability …" is a statement about adaptive capacity whereas this section otherwise describes the sensitivity of aboriginal populations to climate warming. Limited adaptive capacity may be as important a determinant of vulnerability as exposure and sensitivity to climate change. (David Sauchyn, University of Regina)	M Reworded
E-14-235	A	13	49	13	50	It is not clear what is meant by "there may be limited ability to exploit new resources or economic opportunities". Does this refer to limitations in the existing adaptive capacity of northern communities? If so restate in a more constructive manner, such as "while climate change may present new economic opportunities including access to natural resources, northern communities may not have the capacity to take advantage of such opportunities." (Donald Lemmen, Natural Resources Canada)	M Reword along the lines suggested. This is approximately the point of the original statement
E-14-236	A	13	49			What is meant by "the North"? (Julie Winkler, Michigan State University)	L Define better as Northern Canada and Alaska.
E-14-237	A	13	49			Provide updated reference to specific chapters of ACIA technical report - particularly Nuttall et al. (2005). Hunting, Fishing, and Gathering: Indigenous Peoples and Renewable Resource Use in the Arctic. Chpater 12 of ACIA. Another useful reference is Krupnik, I., and Jolly, D. (eds). 2002. The Earth is Faster Now. Arctic Research Consortium of the United States, Fairbanks, Alaska. (Donald Lemmen, Natural Resources Canada)	M – We cross-refer to Chapter 15, where the topic is treated at greater length and these two references are used. We decided to leave ACIA citation as one report rather than individual chapters.
E-14-238	A	14	2	14	2	Change "…as some" to "…and some" (Peter Victor, York University)	L Reword
E-14-239	A	14	3			The "rising salmon stocks" is not consistent with the discussion of the salmon declines on page 12 which states that "sea-run salmon stocks are already in steep decline throughout North America". (Julie Winkler, Michigan State University)	M Resolve. Statement on page 12 should something with contrast of various stocks. Many are in decline, but some Alskan runs are not. Add reference on this point.
E-14-240	A	14	6	14	28	Excellent assessment of socially constructed vulnerability to extreme events of North American infrastructure and urban systems. (Edward Miles, College of Ocean and Fishery Sciences)	Thanks
E-14-241	A	14	6			Need to define "urban areas" - likely on basis of population density? (Donald Lemmen, Natural Resources Canada)	L Add Census definitions to glossary—different for Canada and the US
E-14-242	A	14	11	14	28	This paragraph refers to vulnerability of urban areas to tropical storms, but seems to have an underlying implication that global warming will enhance tropical	M Now refer to WG I findings in WG I Ch 3, 10,11.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						storm/hurricane activity (frequency and/or intensity). I believe that many readers will assume that this is being said, so it needs to either be backed up with reference to the WG I report, or explicitly not affirmed, with a statement that this paragraph deals only with vulnerability, not anticipated changes in tropical storms. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	
E-14-243	A	14	11	14	13	Need to rephrase as many of the historic events described here did not exceed the "design thresholds" for infrastructure, but rather the infrastructure was not maintained properly and therefore was vulnerable. Perhaps rephrase like "… illustrate the vulnerability of North American infrastructure and urban systems that were either not designed or maintained to adequate climate thresholds". (Donald Lemmen, Natural Resources Canada)	M Rephrase and adopt the suggested words
E-14-244	A	14	21	14	21	"Federal impacts" seems a strange phrase. Replace with "federal government expenditures." (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	L Changed wording to focus on Katrina box Box 7.4) in Ch 7
E-14-245	A	14	24	14	28	Impacts were likely also modulated by behaviors and perceptions (listening to evacuation orders, settling in vulnerable area, massive fraud claims…) (Alain Bourque, Ouranos)	M We consider this part of "execution" of the plan.
E-14-246	A	14	35	14	38	What types of extreme events were evaluated by the studies cited here? Do they affect only infrastructure? If these events have other impacts, then the sentence on these lines belongs at the beginning of sections 14.2. (David Sauchyn, University of Regina)	M Reword here.
E-14-247	A	14	35			"with many" is too vague for me. I suggest including a couple of examples of extreme events with decreasing trends. (Julie Winkler, Michigan State University)	M Reworded to give examples
E-14-248	A	14	39	14	40	This sentence seems more appropriate for the future vulnerabilities section (i.e., Section 14.4). (Julie Winkler, Michigan State University)	M Close decision , but kept sentence. It comes from an article on current societal trends that linked well with the rest of the paragraph. The title of the article is actually "Clarifying the attribution of recent disaster Losses" by Pielke et al. in October 2005.
E-14-249	A	14	44	14	45	I think this sentence ("Cumulative decadal …") needs to be tempered somewhat given the controversy surrounding the articles on hurricane strength. The concerns raised by Landsea a nd others about the quality of hurricane intensity data have some validity and should at least be acknowledged. (Julie Winkler, Michigan State University)	H We now reference the WG 1 results
E-14-250	A	14	46	14	47	This could be moved to the health section. (Kristie Ebi, ESS, LLC)	M We disagree. Yes, it is health, but it also goes with a discussion of hurricane damages.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-14-251	A	14	46	14	46	Replace "hurricanes in the 20th century" with "hurricanes since the beginning of the 20th century." (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	Reworded
E-14-252	A	14	48			Insert a new para that addresses trends in deaths and death rates from extreme weather events in the U.S that would read as follows: "U.S. data on deaths and death rates due to hurricanes from 1900-2005, floods from 1903-2004, tornados from 1916-2004, and lightning from 1959-2004, as well as for cumulative deaths (and death rates) from these four individual categories of events (from 1959 to 2004) indicate that for the most recent 10-year period for which data are available, deaths declined below their earlier peaks in the 10-year moving averages by 56 percent for floods, 58 percent for lightning, 82 percent for tornados and, despite Hurricane Katrina, 80 percent for hurricanes (Goklny 2006b). Corresponding declines for death rates (comparing their peaks with the most recent 10-year period) were 76 percent for floods, 72 percent for lightning, 95 percent for hurricanes and 93 percent for tornados. Such declines in both deaths and death rates are consistent with results of earlier analyses (Goklany 2000a). (Indur Goklany, US Department of the Interior)	M Space does not allow insertion of he whole paragraph. Asentnec has been added to cover the point of both the decline and attribution.
E-14-253	A	14	49	15	1	Also Synergistic events such as spring freshet, rapid snow melt, high temperture, heavy precipitation, ice breakup and jams and topography- Good examples the Highwood River, Old Man & Waterton, Alberta, the Yukon and Porcupine River, in the Yukon and this year the Hay and Mackenzie in the NWT. I think the message here is good that proactive planning is critical and tha tthe individual circumstances of each river and basin is critical to ensure that these cumulative effects are considered. (Ian Church, Yukon Government)	M - Synergistic events important in causing flooding in some circumstnces, but these would be some of the extreme events that should be planned for. No change made.
E-14-254	A	14	50	14	50	The Red River flows from North Dakota and Minnesota into southern Manitoba. This is near the geographic center of North America. It is not “the North”. (David Sauchyn, University of Regina)	L In the United States it is often called the Red River of the North, to distinguish it from the Red River that is a tributary of the Mississippi River and forms part of the border between Texas and Oklahoma. We will use Red River.
E-14-255	A	15	4	15	33	Section 14.2.7 Tourism and Recreation - there is a need to distiguish between impacts on the sector as a whole and impacts on individual operators or locations. It is obvious that severe climate events will prevent people from visiting a specific location, but it is less clear whether they will simply decide to travel somewhere else or not recreate at all. In the former, most likely, case there is no significant impact on the sector.	M This is the litererature avaiable

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						(Donald Lemmen, Natural Resources Canada)	
E-14-256	A	15	7			one) missing after respectively… (Liette Vasseur, Laurentian University)	L ok
E-14-257	A	15	8	15	9	Is the use of “climate variability” intentional or do the authors mean climate change? (David Sauchyn, University of Regina)	M Edited for clarity
E-14-258	A	15	9	15	9	Change "…it impacts" to "…its impacts" (Peter Victor, York University)	L ok
E-14-259	A	15	9			is it "it impacts" or "its impacts"? (Liette Vasseur, Laurentian University)	L ok
E-14-260	A	15	9			“it”? (Julie Winkler, Michigan State University)	L edited
E-14-261	A	15	10			Append the following to the end of the para: "It's important to note that a decline in tourism in one area at a specific time for a particular activity may be made up by greater tourism in another area at another time from another activity. Thus, while tourism revenues may be redistributed in space, time and activity, the net effect on the economy might be small in either direction. It should be noted that in each of the examples offered below regarding the climate-related impacts on tourism, no estimates are provided regarding areas or activities that might have been the beneficiaries of tourism activities." (Indur Goklany, US Department of the Interior)	M Cut material from this section to meet page limits cannot add more text
E-14-262	A	15	12	15	33	I think it needs to be made clearer that only some examples are provided here to illustrate the potential impact of climate variability on tourism, and that other tourism activities and other locales have also been impacted. (Julie Winkler, Michigan State University)	M That was the intent of using the “for example”
E-14-263	A	15	12			Just before the end of the period (full stop) on line 12, insert the following: "in those areas". (Indur Goklany, US Department of the Interior)	L Edited for clarity
E-14-264	A	15	20	15	23	Check data on Lake Mead - a 30 m decline is huge and should have a supporting reference. Check also reference provided for cost estimates, as by the title Allen et al (2003) are looking at flooding events in the Missouri River. (Donald Lemmen, Natural Resources Canada)	M Edited and removed
E-14-265	A	15	21	15	21	Delete "the" before "…the Lake Mead" (Peter Victor, York University)	L Edited out
E-14-266	A	15	30	15	30	There should be a reference to support the statement that "the impact of the four hurricanes……is estimated to be several times higher." (Peter Victor, York University)	M Edited out

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
E-14-267	A	15	36	15	36	There is nothing in this section about the sensitivity of hydroelectric power production to hydrologic drought and fluctuations in streamflow and the levels of reservoirs. (David Sauchyn, University of Regina)	M- Good point. Refer to Great Lakes in 1999
E-14-268	A	15	38	15	38	Edit this line to read "Empirical estimates confirm the high costs of power outages in North America." (David Sauchyn, University of Regina)	L Reword
E-14-269	A	15	40	15	40	Delete "a" before "a direct system restoration costs" (Peter Victor, York University)	L Drop the "a"
E-14-270	A	15	40			"a direct systems restoration costs"? (Julie Winkler, Michigan State University)	L Drop the "a"
E-14-271	A	15	41			Are there only fourteen members of the EEI? (Julie Winkler, Michigan State University)	M No. Many more. Check original reference. Added the word "reporting"
E-14-272	A	15	47	16	3	Large power outage following the 1998 Ice Storm also illustrate impacts on industry, society and governments, and added difficulties when this happens during the cold season! (links to health and safety issues) See full report by Nicolet et al. http://www.msp.gouv.qc.ca/secivile/secivile_en.asp?txtSection=publications&txtCategorie=verglas&txtSousCategorie=nicolet (Alain Bourque, Ouranos)	M –Was in TAR Bookmarked Site
E-14-273	A	15	47	16	3	Delete this para. It's relationship to climate change is, at best, tenuous, unless the point you want make is that there should be enough spare generation capacity to cope with higher summer loads due to greater demand for air conditioning. (Indur Goklany, US Department of the Interior)	M – can link there be a link made through summmer heat, power demand, existing vulnerability? Do not delete, but make better link to climate change
E-14-274	A	16	2	16	3	Are these estimates of outage costs gross or net? When a plant closes down some of its operating costs may be reduced hence the net cost can be less than the gross cost (i.e. loss in revenue.) Also, depending on the facility, some lost production can be made up later which is another reason why gross and net costs can differ. (Peter Victor, York University)	M Check. Point is valid but what companies actually reported is not clear in the source. May have varied by company.
E-14-275	A	16	13	17	17	Section 14.3 is very important, and probably deserves to be moved toward the beginning of the chapter. I have made some comments on individual examples in which a climatic effect was implied but not really stated (e.g. increased hurricane frequency and/or intensity), and consequences were stated without the underlying climatic effect being substantiated. Having said that, though, I understand that the available space for this section is limited, and reliance should be placed on citation of the WG I document or original pieces of the literature. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	H –are there key futue trends that are currently not in this section that should be included to support 14.4 Cannot move section.
E-14-	A	16	15	16	43	Section 14.3.1 - Climate. This section would benefit from the addition of a figure	M We now cite WG1 chapter 11

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276						depicting the spatial variability of the temperature and precipitation projections presented - or at least reference to where such a figure can be accessed. (Donald Lemmen, Natural Resources Canada)	
E-14-277	A	16	15			Section 14.3.1 Climate. The first sentence in this section (line 17) begins as though the section is describing AR4 climate model simulations and it appears that the main source for the information is Ruosteenoja et al. (2003), which is the only source cited in the first paragraph of this section. However, Ruosteenoja et al. only analyzed data from seven GCMs and there are many more GCMs represented in the final AR4 GCM data set. If the data presented in this section (14.3.1) are only a subset of the AR4 GCM data, then that fact should be clearly stated for the reader. Also, Ruosteenoja et al. state that at the time of their analysis they only had GCM data for the A2 and B2 scenarios and so they had to use a "pattern scaling method" to create data for the other models and emission scenarios they analyzed. Section 14.3.1 should be rewritten to make it clear to the reader that the results being described in this section are not from an analysis of the final AR4 GCM data set, that they represent the results of a limited number of GCMs, and that some of the data being described are not GCM output but pattern-scaled results. (Sarah Shafer, U.S. Geological Survey)	H – This is fixed, now that we have access to the full set of AR4 runs.
E-14-278	A	16	15			SECTION 14.3.1 COMMENTThis section seems quite incompleted as it does not cover the literature very well (see eg Giorgi, F., and X. Bi (2005). "Updated regional precipitation and temperature changes for the 21st century from ensembles of recent AOGCM simulations." Geophysical Research Letters 32(21): 1-4.) and should also mention the literature on projected changes in extremes (droughts, heatwaves etc). (William Hare, Potsdam Institute for Climate Impact Research (PIK))	H – need to review WG1 material on regional changes – link with L. Mearns Our cites now emphasis WG1, chapter 11.
E-14-279	A	16	17	16	28	What is the base against which temperature changes noted in this paragraph are estimated. My understanding is that it is based on 1961-1990. Whatever it is, this should be noted explicitly. (Indur Goklany, US Department of the Interior)	M Temperature base now explicitly stated.
E-14-280	A	16	17	16	43	Relevant scenario work in Barrow, E., B. Maxwell and P. Gachon (Eds), 2004. Climate Variability and Change in Canada: Past Present and Future. ACSD Science Assessment Series No. 2, Meteorological Service of Canada, Environment Canada, Toronto, Ontario, 114p. (Alain Bourque, Ouranos)	Space and our emphasis on WG1 do not allow a discussion of all relevant literature.
E-14-281	A	16	17	16	28	It is difficult to reconcile all the temperature ranges in this paragraph. Some re-writing for clarity would help. (Peter Victor, York University)	M – revised for clarity, also with references to WG1

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E-14-282	A	16	17	16	20	Is the "2020 time scale" the same as the "2010-2039 time slice"? Please clarify (Peter Victor, York University)	L now explicit
E-14-283	A	16	17	16	43	I found the climate section much too vague and thought that it did not sufficiently draw on the AR4 model simulations presented in the Working Group I volume. (Julie Winkler, Michigan State University)	H now it does
E-14-284	A	16	17	16	19	How is "range of natural variability" defined? Is this variability based on model simulations, instrumental climate records, or paleo-reconstructions of climate? (Gregory McCabe, U.S. Geological Survey)	M now explicit
E-14-285	A	16	18			"year round"? Do you mean average annual temperatures? Also, I doubt that the 2010-2039 projected annual average temperatures are completely outside the range of values seen in the past, although they may be in the upper quartile. (Julie Winkler, Michigan State University)	M range of natural variation now defined
E-14-286	A	16	19			Why is this sentence based on the CGCM2 and HadCM3 models only and not the other models run for the AR4? Were these the only two with 1000 year simulations? And aren't these TAR-era models? (Julie Winkler, Michigan State University)	M now explained
E-14-287	A	16	20	16	20	Reference is made to a 2020 time slice, but no time slice for a baseline is indicated. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M now explicit
E-14-288	A	16	20	16	22	In consecutive sentences the first refers to "warming" in the 2020 time slice while the second describes "winter warming" for the 2040-2069 time slice. Should be consistent in the use of indicators for each time slice, and can add to that whether the seasonality effects become increasingly pronounced through time. (Donald Lemmen, Natural Resources Canada)	M fixed
E-14-289	A	16	20			"2020 time slice"? Do you mean "2010-2039 time slice"? Also, by "warming" do you mean change in annual average North American temperature'? (Julie Winkler, Michigan State University)	M fixed
E-14-290	A	16	22			Please give dates for the "mid-century time slice", and indicate what parameter is being referred to by "warming". I assume it is annual or seasonal average North American temperatures. (Julie Winkler, Michigan State University)	M fixed
E-14-291	A	16	24	16	26	Do all the AR4 models show these temporal and seasonal patterns? (Julie Winkler, Michigan State University)	M Space limitation prevent a detailed assessment of model to model differences.
E-14-292	A	16	25	16	26	There is a need to define what you mean by the terms "southern part of the region" and "at high latuitudes". Recognize that Canadians and Americans will likley have very different definitions of these terms. (Donald Lemmen, Natural Resources Canada)	M The chapter's spatial domain has pretty clear N and S parts.
E-14-	A	16	26	16	28	I suggest that the authors omit this sentence because scenarios with higher GHG	M We think the timing of the separation

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293						emissions will obviously produce more warming. (David Sauchyn, University of Regina)	among scenarios is very important.
E-14-294	A	16	26	16	28	Delete sentence starting with "By the 2070 to 2099 time slice …" as there is nothing unique to North America here and its not directly relevant to the discussion (and is dealt with in other chapters) (Donald Lemmen, Natural Resources Canada)	M We think the timing of the separation among scenarios is very important.
E-14-295	A	16	26	16	28	"By the 2070 to 2099 time slice … especially after the 2010-2039 time slice". Awkward sentence. Also, why compare the A1FI scenario to just the B1 and B2 scenarios? (Julie Winkler, Michigan State University)	M We think the timing of the separation among scenarios is very important.
E-14-296	A	16	30	16	31	See the results of the paper cited here for a more useful summary of projections Giorgi, F., and X. Bi (2005). "Updated regional precipitation and temperature changes for the 21st century from ensembles of recent AOGCM simulations." Geophysical Research Letters 32(21): 1-4. (William Hare, Potsdam Institute for Climate Impact Research (PIK))	This paragraph is updated with more recent refs.
E-14-297	A	16	30	16	33	Is there something that can be said about soil moisture? (Kristie Ebi, ESS, LLC)	H Good point. Soil moisture now briefly mentioned.
E-14-298	A	16	31			Does "changes in precipitation" refer to annual precipitation? What models are these statements based on? The 2003 date on the article cited to back up this statement suggests that TAR-era models may have been used. [I did not look up the reference to check on this.] (Julie Winkler, Michigan State University)	M Paragraph updated based on WG1, chapter 11.
E-14-299	A	16	32	16	33	I would be surprised if all models show positive correlations between temperature and precipitation in northern North America. (Julie Winkler, Michigan State University)	M Space limitation prevent a detailed assessment of model to model differences.
E-14-300	A	16	32			"later in the century"? When? (Julie Winkler, Michigan State University)	L In the years after the 2010-2039 time slice – later.
E-14-301	A	16	33			Need to define "northern part of the region". (Donald Lemmen, Natural Resources Canada)	L The chapter's spatial domain has pretty clear N and S parts.
E-14-302	A	16	35	16	43	These statements on changes in El Nino are all based on articles from TAR-era models. What do the AR4 simulations suggest regarding changes in El Nino? (Julie Winkler, Michigan State University)	H Updated based on WG1 report.
E-14-303	A	16	35	16	36	Much has happened since the Timmerman paper - see the CMIP review (Collins et al 2005) and the paper by Tsonis et al (2005) Collins, M., and C. C. The CMIP Modelling Groups (BMRC (Australia), CCSR/NIES (Japan), CERFACS (France), CSIRO (Austraila), MPI (Germany), GFDL (USA), GISS (USA), IAP (China), INM (Russia), LMD (France), MRI (Japan), NCAR (USA), NRL (USA), Hadley	H Updated based on WG1 report.

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						Centre (UK) and YNU (South Korea)) (2005). "El Niño- or La Niña-like climate change?" Climate Dynamics. Tsonis, A. A., J. B. Elsner, A. G. Hunt, and T. H. Jagger (2005). "Unfolding the relation between global temperature and ENSO." Geophysical Research Letters 32(9). (William Hare, Potsdam Institute for Climate Impact Research (PIK))	
E-14-304	A	16	37	16	38	More recent papers that should be discussed in this context include those by Elsner and Jaggerm which in general find a that warmer global mean conditions are associated with more intense tropical hurricanes and higher windspeed Elsner, J. B., A. A. Tsonis, and T. H. Jagger (2006). "High-Frequency Variability in Hurricane Power Dissipation and Its Relationship to Global Temperature." Bulletin of the American Meteorological Society 87(6): 763-768. Jagger, T. H., and J. B. Elsner (2006). "Climatology Models for Extreme Hurricane Winds near the United States." Journal of Climate 19(13): 3220-3236. (William Hare, Potsdam Institute for Climate Impact Research (PIK))	H Updated based on WG1 report.
E-14-305	A	16	38			"to other factors" Such as? (Julie Winkler, Michigan State University)	L The reference to WG1 needs to do the work on details of hurricane physics.
E-14-306	A	16	46	17	17	[14.3.2] This section is very inadequate and is a blot on an otherwise informative and well-documented chapter. It is inadequate for what it includes and also for for what it omits. Starting with the inclusions, the economies of Canada and the US are best described as 'mixed' in the sense that they have large private and public sectors. It is unnecessarily ideological to say they are "based on free market mechanisms and the philosphy of private ownership". Markets do play an important role in both economies but to describe them as "free" smacks of too much reliance on econ 101. And private ownership is not a philosophy. In any case, most of the land and natural resources in Canada are owned by the state so there are empirical problems with this statement as well. If you decide to stay with the emphasis on the market then at least point out that without significant government intervention in the form of regulation, taxation and/or emissions trading, it is an ineffective and unreliable institution for dealing with climate change. On a more constructive note, I suggest that this section be completely rewritten specifically to provide a context for the rest of the chapter. Page 34 has a brief discussion of socio-economic factors relating to adaptation. Information on all the factors mentioned there should be provided in this section. So too for the factors listed on line 6 - 10 on page 32. Section 14.5.3. also mentions several socio-economic barriers that suggest an appropriate scope for this section. Information on health care systems,	H – what would be key to include to set context for and support subsequent sections Section extensively rewritten. We have tried to make it less of a blot and more of a beauty spot.

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						constitutional responsibilites, planning (urban, rural etc), and NGOs should be provided since they come into play with respect to mitigation and adaptation. Finally, the section should be properly supported by references to the literature. (Peter Victor, York University)	
E-14-307	A	16	46	17	17	Although Health and socio-economic data usually points at positive changes like increases in average age of mortality, some regional health reports I am aware of are now showing worrying trends from other indicators which will likely play significant roles in future vulnerabilities: Ex: The "average age with good health" in Quebec has started to decrease after sustained increases (other indicators: overweight, lack of exercice with low perception that this is a problem... etc... ref INSPQ, 2001 http://www.inspq.qc.ca/pdf/publications/portrait_de_sante.asp?E). I propose to potentieally add this information IF other health status reports confirm trends elswhere... Those trend could be the sign of "human" equivalent of aging AND degrading infrastructures! (Alain Bourque, Ouranos)	H – health indicators Space limitations prevent a thorough review of public health trends, but this is a good point.
E-14-308	A	16	46			Section 14.3.2: This section should be re-titled to include the technological context, which is a critical factor in both estimating emissions as well as adaptive capacity. The opening paragraph needs to specify what is the potential levels of population, economic development and technological progress assumed in estimating future trends, what is assumed with respect to adapatability, and so forth. (Indur Goklany, US Department of the Interior)	H – We added a few details on population projections and technology.
E-14-309	A	16	48	16	50	Delete this introductory sentence as it adds nothing of value. All countries of the world face a range of economic and geopolitical challenges and budget pressures. Programs that are and are not within our means is strictly a matter of priorities. This sentence reads like an excuse / justification for not doing much - and stretches beyond what is appropriate for a scientific assessment. (Donald Lemmen, Natural Resources Canada)	M done
E-14-310	A	16	50			The phrase "strategies that are... our means..." should be re- phrased as "that are 'affordable'". And since this is an ideological position, affordable should have quotes around it. (Ellen Wall, University of Guelph)	M sentence deleted
E-14-311	A	16	52			"will create" should read "may create"… (Ellen Wall, University of Guelph)	L sentence deleted
E-14-312	A	17	2			[14.3.2] I am surprised that you have some importance on immigration but you don't talk about the fact that aboriginal communities (at least in Canada) are currently increasing in population size and this will have more impacts especially for the communities living in the north or along the coasts	H Good point. We do not have space to present the details of population trajectories.

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						(Liette Vasseur, Laurentian University)	
E-14-313	A	17	5	17	10	This discussion makes it seem that only agriculture in Canada and the U.S. is climate sensitive, but the last paragraph on p. 17, lines 42-52, and running on to line 1 on p. 18 provide powerful evidence of the sensitivity of the entire American West to hydrological shifts and water supply variability. (Edward Miles, College of Ocean and Fishery Sciences)	M Good point. We expand the realm of climate-sensitive activites in the FGD.
E-14-314	A	17	5	17	10	It might be useful to add something about increasing energy requirements. (Kristie Ebi, ESS, LLC)	H Discussed in 14.2.8 and 14.4.8
E-14-315	A	17	8	17	10	Delete final part of sentence talking about increases in the energy efficiency of GDP - it is not relevant to WGII and sounds like it is endorsement of existing mitigation policy. Resulting sentence would read "Recent increases in the fraction of economic activity in the service and technology sectors has decreased the overall regional economic sensitivity to climate change". Alternatively, you could delete entire sentence without losing much. (Donald Lemmen, Natural Resources Canada)	Done
E-14-316	A	17	16	17	17	Delete last sentence of paragraph - it does not add value. (Donald Lemmen, Natural Resources Canada)	L This sentence addresses one of the chapter's core points. We are hesitant to remove it.
E-14-317	A	17	20	30	50	Section 14.4: Despite having "adaptation options" as part of the title for this subsection, adaptation options are for the most part not mentioned within it. We note this explicitly for agriculture and heat wave portions in our comments below, but this is a generic problem with Section 14.4. Without such a discussion it is not possible to have an intelligent discussion about future vulnerability and impacts. This needs to be corrected for each portion of Section 14.4. (Indur Goklany, US Department of the Interior)	H- Some sub-section titles used in the chapter SOD did not follow the PAO – this has been corrected and this section no longer has adaptation in the title. Adaptation is treated in section 14.5 separate from impacts as per the plenary agreed outline
E-14-318	A	17	20			General comment. Some of the subsections in Section 14.4 note the time slices, model experiments and emission scenarios in the discussion of possible future changes. I agree that this information should be included, although currently the insertion of this information is rather awkward and inconsistent. I suggest that a template be designed for how to include the GCM, emission scenario, time slice, etc. into all the subsections. It is important for readers to know what the statements in Section 14.4 are based on. Also, I would suggest that at the beginning of Section 14.4 a sentence or two be added that indicates that most of the analyses of future sensitivities, vulnerabilities, impacts, and adaptation options are based on models older than the AR4 simulations. I think that non-climatologist readers need to understand that there is a (unavoidable) lag between the models shown in the Working Group I report and those used for most of the impact studies discussed in the Working Group II report. This is a particularly critical point for this chapter as	Sentence inserted in introduction to 14.4

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						many of the cited references come from the US National Assessment which used SAR-era models. (Julie Winkler, Michigan State University)	
E-14-319	A	17	20			General comment on Section 14.4. I thought in a number of places that there was considerable confusion between current and future sensitivities, vulnerabilities, etc. and that some of the material presented in Section 14.4 should be in Section 14.2 instead. Also, this section gets off to a rather confusing start with the use of the verb "are" on line 24. Should this be "will be" instead as "the future" is the focus of this section? I have similar concerns about the verb tense throughout this section. (Julie Winkler, Michigan State University)	H – good point – line 24 changed and edited section for other such tense issues
E-14-320	A	17	22	18	1	Extensive work on Quebec watersheds using CRCM and/or many GCMs are ongoing (see http://www.ouranos.ca/doc/ACFAS2006_e.html with presentations relating to urban drainage, multi-users small scale watersheds, hydropower larger scale watersheds) with, unfortunatelly at this moment, little publications other than: Frigon, A., D. Caya, M. Slivitzky et D. Tremblay, 2002: Investigation of the hydrologic cycle simulated by the Canadian Regional Climate Model over Québec/Labrador territory. In Advances in Global Change Research, vol 10, Climatic Change: Implications for the Hydrological Cycle and for Water Management, Ed. M. Beniston, Kluwer Academic Publishers (Dordrecht et Boston) 31-55 or Chaumont, D., Chartier, I. (2005). Développement de scénarios hydrologiques à des fins de modélisation de la dynamique sédimentaire des tributaires du Saint-Laurent dans un contexte de changements climatiques, Ouranos, Rapport technique, 37 p. (http://www.ouranos.ca/doc/produit_e.html) or Sushama, L., R. Laprise, et al. "Integrated hydrologic response of six North American basins in a climate-change projection by the Canadian Regional Climate Model." Submitted to International Journal of Hydrology. (Alain Bourque, Ouranos)	M Will review and consider for inclusion -section under significant length constraints - Frigon – primary focus on RCM flow calibration – more appropriate to WGI or Chapter 4 -; used Sushama ref in Int. J. Climatology
E-14-321	A	17	22			Section on Water 14.4.1. Here it would be good to have 1-2 sentences on how heavily utilized water resources are in some parts of the US, how little margin there is, how vulnerable these regions are to climate change if rainfall/snowfall becomes less. It's hard for people outside the US to appreciate how intensively used water resources are. (Jean Palutikof, Met Office)	M – added text but constrained by text limitations; section already long
E-14-322	A	17	22			Reference below shows that adjustment of watershed allocation criterias could be sufficient to cancel impacts of future CC over southern Quebec (Using two GCM scenarios with Delta method). See Turcotte, R., Fortin, L.G., Pugin, S., Cyr, J.F.	M Turcotte – preliminary results.

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						(2005). Impact des changements climatiques sur les plans de gestion des réservoirs Saint-François et Aylmer: résultats préliminaires. Congrès annuel de l'Association canadienne des barrages, Calgary, AB. 3-5 octobre 2005 or less gray litterature Fortin, L.G., Turcotte, R., Pugin, S., Cyr, J.F., Picard, F, (2006-soumis). Impact des changements climatiques sur les plans de gestion des réservoirs Saint-François et Aylmer au sud du Québec. Revue canadienne de génie civil. (Accepted with minor modification) (Alain Bourque, Ouranos)	Not able to obtain Fortin paper
E-14-323	A	17	25	17	26	Delete reference to NRCan (2002) - it does not appear in reference list and it likely refers to the same chapter on water resources that appears in Lemmen and Warren (2004). (Donald Lemmen, Natural Resources Canada)	L Removed –Endnote fomatting error
E-14-324	A	17	34	17	34	Define HUMUS. (David Sauchyn, University of Regina)	L – will remove and reword – too much detail
E-14-325	A	17	34			What are the time slices referred to by "2030" and "2095"? (Julie Winkler, Michigan State University)	M – removed with reworkding
E-14-326	A	17	35	17	36	"overall increase in water yield for the US with reductions in the western Great Plains" is confusing. (Julie Winkler, Michigan State University)	L reworded
E-14-327	A	17	36	17	38	The sentence "Statistically significant increases …" follows logically from the preceding sentence and the work of Rosenberg et. al. (2003) but presumably this is the work of Sushama et al. (2006). The authors might consider starting the second sentence with "Sushama et al. (2006) found statistically significant increases …" to make a clear distinction from the preceding sentence. Also in northern basins, snowmelt generally occurs in spring and not winter. The results reported here imply that in the future the timing of snowmelt with shift from spring to winter. (David Sauchyn, University of Regina)	M Reworded
E-14-328	A	17	42	17	52	I am very comfortable with the verbs used here. For example to say that winter snow accumulation decreases up to 60% by the late 21st century is not strictly correct. Rather one scenario (in this case a RCM run driven by one GCM) SUGGESTS or PROJECTS that winter snow accumulation will increase. This section comes across as extrapolating "beyond one's data". While more "wordy", I think "are projected","may increase" or similar phrases are more appropriate. (Julie Winkler, Michigan State University)	M Wording changed
E-14-329	A	17	44	17	44	Instead of "Cascade Range and Coast Mountains" should it be "Cascade Mountains and Coast Range"? (Sarah Shafer, U.S. Geological Survey)	L –checked source and this was how they referenced – checked geog names site – both can be used

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E-14-330	A	17	52	18	1	Re "Heavily managed water systems … that rely on capturing snowmelt … are especially vulnerable", water management is an adaptation to reduce vulnerability. The vulnerability arises from the reliance on snowmelt water. Thus use of the phrase "heavily managed" may be misleading by implying that it is a cause of vulnerability. Also the subject of Box 14.2 is the Great Lakes and not the Columbia River. (David Sauchyn, University of Regina)	M – replaced with heavilty utilized Because the systems are heavily utilized, they are vunlnerable to changes in timaing and amount of supply;
E-14-331	A	18	5	18	21	Thanks to the authors and editors for their response to my previous comments on Great Lakes levels. The current version in Box 14.2 is much more balanced than in the previous draft. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	OK
E-14-332	A	18	5			A focus box on the Great Lakes is a good idea as a huge amount of uncertainty surrounds precipitation and hydrologic changes in this area. I think, though, that the box would more accurately reflect this uncertainty if flow charts were created for both high water levels and low water levels. Just including the flow chart for the low water levels suggests that the predominance of evidence suggests future low water levels, which I don't believe is the case. (Julie Winkler, Michigan State University)	M – there have been numerous hydrologic impact assessments for the Great Lakes (different scenarios and mostly the same models); to date most project lower water levels; used a figure from a publicaton that focussed on low water impacts; intention is to communicate that one physical change - water level drop - leads to many interconnected impacts – added clarification
E-14-333	A	18	9			omit "." (Robert Taylor, Bedford Insitute of Oceanography)	L done
E-14-334	A	18	13	18	15	Recently published report explore the impacts and numerous adaptation options for maritime transportation in the St-Lawrence seaway: D'Arcy, P., J.-F. Bibeault, R. Raffa. (2005). Changements climatiques et transport maritime sur le Saint-Laurent. Étude exploratoire d'options d'adaptation. Réalisé pour le Comité de concertation navigation du Plan d'action Saint-Laurent. 140 p. (http://www.ouranos.ca/doc/produit_e.html) (Alain Bourque, Ouranos)	M added
E-14-335	A	19	2	19	4	Re "availability of groundwater depends on … streamflow", usually streamflow reflects the availability of groundwater. (David Sauchyn, University of Regina)	M No – see Allen et al 2004
E-14-336	A	19	8	19	8	I assume what was meant was that the models projected increases and decreases; the past tense is confusing. (Kristie Ebi, ESS, LLC)	M Changed wording
E-14-337	A	19	10			"B.C." British Columbia (Julie Winkler, Michigan State University)	L - done

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E-14-338	A	19	17	19	24	Presumably "the same aquifer" is the Edwards aquifer in Texas, identified two sentences prior. The further information about this aquifer is attributed to Chen and Grasby (2001), however, this study is of an aquifer in southern Manitoba and not in Texas. (David Sauchyn, University of Regina)	M – Procite formatting error
E-14-339	A	19	24			Check reference to Chen and Grasby (2001). That paper examines groundwater dynamics in Manitoba and I would be very surprised if it includes discussion of regional welfare losses in the US. (Donald Lemmen, Natural Resources Canada)	M – Procite formatting error
E-14-340	A	19	26			BMRC? If the model names are to be included (which I think they should), then a table with the defining abbreviations would be useful. The abbreviations for the emission scenarios should also be defined. (Julie Winkler, Michigan State University)	Removed for shortening
E-14-341	A	19	29	19	29	This assessment of potential impacts of climate change on water quality would be enhanced if it was preceded in section 14.2 by a corresponding discussion of the sensitivity of water quality to climate. (David Sauchyn, University of Regina)	HM – consider addition of short paragraph if can find relevant literature
E-14-342	A	19	31			What model? (Julie Winkler, Michigan State University)	M – a range of models used
E-14-343	A	19	39	19	47	Why do we have the same informaiton about the Bay of Quinte in two different paragraph. Would it be better to put this together? (Liette Vasseur, Laurentian University)	M –combined
E-14-344	A	19	43	19	51	This para should be rewritten to address situations where the amount of flow might increase (Indur Goklany, US Department of the Interior)	M – will review to see if any climate change papers relating water quality to extreme precip. – combined sewer overflows available?
E-14-345	A	19	44	19	44	Changing defining to defined would make this a sentence. (Kristie Ebi, ESS, LLC)	L - edtited
E-14-346	A	19	44			Is "factor" the verb for this sentence? (Julie Winkler, Michigan State University)	L- edited
E-14-347	A	19	46			"which reaches 100%"? Does this mean that the REDUCTION in design flow reaches 100%? (Julie Winkler, Michigan State University)	M- yes - editited
E-14-348	A	19	48			Are these the beginning years of 20 year time slices? (Julie Winkler, Michigan State University)	M Removed to meet word limits
E-14-349	A	20	1	20	6	This discussion of rainfall erosivity should be linked to future impacts on agriculture (14.4.4), since the references to soil management and bare soil suggest	M These papers directly discuss implications for

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						that the focus here is on soil erosion on cropland. Also, placing erosion under water quality assumes that the eroded soil is transported to surface water, which occurs only where slopes and streams are linked. (David Sauchyn, University of Regina)	water quality; and bring up an important issue of potentil for increased erosion
E-14-350	A	20	5	20	6	This final sentence would be more meaningful if it included mention of possible soil management practices that would offer sufficient protection - with the most obvious being reversion to permanent cover. (Donald Lemmen, Natural Resources Canada)	M Look for relevant published literature
E-14-351	A	20	9	21	1	Should we highlight the question of uncertainties and tools used as illustrated in Price, D. T. and D. Scott (2006) in Large scale modelling of Canada's forest ecosystem responses to climate change, CCIAP: 53 pp. ? (Alain Bourque, Ouranos)	M This assessment is not to address methods or tools
E-14-352	A	20	9	21	1	As mentionned earlier, Ecosystems will be more at risk in areas where many stresses cumulate and those are usually not taken into account into future vulnerability work. (Alain Bourque, Ouranos)	I agree, but little referencable work to illustrate that point
E-14-353	A	20	9			This (Ecosystems) is the one of only a few sections that uses confidence statements, which is inconsistent. Also, it is not clear how the confidence statements were assigned. (Julie Winkler, Michigan State University)	Confidence statements removed
E-14-354	A	20	12	20	12	There is probably better terminology than “cancelling” - off setting or opposing, for example. (David Sauchyn, University of Regina)	Reworded
E-14-355	A	20	13			“sink strength”? (Julie Winkler, Michigan State University)	Rephrased
E-14-356	A	20	17			Need to define "high latitudes" (Donald Lemmen, Natural Resources Canada)	Nope
E-14-357	A	20	26	20	34	Do these experiments take into account other limiting factors in productivity increase like available nutrients (see Vitousek, P.M., Cassman, K., Cleveland, C., Crews, T., Field, C.B., Grimm, N.B., Howarth, R.W., Marino, R., Martinelli, L., Rastetter, E.B., Sprent, J.I. 1997. Towards an ecological understanding of biological nitrogen fixation. Biogeochemistry 57/58: 1–45). They tend not to, especially in regions where climate was the limiting factor in past climates. (Alain Bourque, Ouranos)	Many of the biogeochemical models evaluate nutrient limitations as a component of carbon cycle dynamics
E-14-358	A	20	37	20	47	this section, but particularly lines 43-45, seem to fit better in Section 14.2. (Julie Winkler, Michigan State University)	Was difficult to decide separation of topics
E-14-	A	20	43	20	44	Specify or give examples of extreme events that are “non-climatic”. In the context	reworded

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359						of climate change, extreme implies a climatic event. (David Sauchyn, University of Regina)	
E-14-360	A	20	44			The term "extreme events" should not be used here since it is associated strongly with climate/weather conditions. (Ellen Wall, University of Guelph)	reworded
E-14-361	A	20	44			Possible confusion by stating that "extreme events" is a non-climate factor (Alain Bourque, Ouranos)	reworded
E-14-362	A	20	49	20	50	"long term trends (millennia)"? Are these projected future trends or observed trends? (Julie Winkler, Michigan State University)	Words from the original paper
E-14-363	A	20	50	21	1	It is difficult to appreciate this sentence. Do the data refer to the global picture or to North America? Requires assessment of how meaningful it is to make conclusions based on relationships between habitat area and biodiversity. Species will migrate as best they are able. The phrase "committed to extinction" by 2050 is both depressing and misleading - and presumably needs to be linked to a specfic emission scenario. From a geologic perspective one could reasonably argue that 100% of plant and animal species are already committed to extinction. (Donald Lemmen, Natural Resources Canada)	Obviously these future projections are speculative. I have attempted to provide appropriate caveats, but this is the best current science on potential future directions of biodiversity, despite how unsatisfying the rigor of the science
E-14-364	A	20	51	20	52	"global sample"? (Julie Winkler, Michigan State University)	yes
E-14-365	A	20	52	21	1	The Thomas et al. (2004) study did not take into consideration the role of CO2 in changing moisture requirements for plants or on plant productivity (and, therefore, other plant dependent species). Nor did it consider the effect of CO2 on the temperature tolerance on plants. In light of all these effects, how would these impacts of CO2 interact with changes in temperature and water availability to affect interspecies competition, and extinction potential of each species? Moreover, climate change isn't the only pressure on species and biodiversity. Primary threats are conversion of habitat to human uses, but these threats will themselves be modified by climate change and CO2 effects. In particular, if temperature changes are low to moderate, productivity of agriculture and forestry will increase which – all else being equal -- should relieve some of these pressures (because less land would need to be cultivated or harvested for timber). [Of course, if temperature change is high enough, we would expect that productivity would decline, and pressures would increase.] Also, the study does not consider that if a species moves out, something else might take its place – and probably will, since nature abhors a vacuum. All these shortcomings are in addition to the fact that at regional and, especially local, scales the basic climatic inputs used by the studies employed by	Obviously these future projections are speculative. I have attempted to provide appropriate caveats, but this is the best current science on potential future directions of biodiversity, despite how unsatisfying the rigor of the science

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Notes of the writing team
						Thomas et al, are highly uncertain. Moreover, while the claim that a substantial fraction of global plant and animal species would be committed to extinction by 2050 does not seem to be a verifiable hypothesis – how do you verify that something not-yet-extinct is nevertheless committed to extinction? -- some light can be shed on it by looking at paleo evidence from eras when temperature changes have changed dramatically. For example, did the warming subsequent to the Last Glacial Maximum lead to massive temperature/climate related extinctions, what fraction of species went extinct, did it decrease biological diversity, and how much did biological productivity change? However, absent some exploration of these issues -- and a critical evaluation of the methodology used by Thomas et al. (2004) -- this statement is quite tenuous, and this ought to be noted, as should the shortcomings of this study. (Indur Goklany, US Department of the Interior)	
E-14-366	A	21	4	22	3	See comment 13 above with upcoming results, not peer-reviewed yet, essentially consistant with what is indicated in this section pointing towards increased vulnerability coming from all 4 major climatic factors aggravating erosion (ice cover, freeze-thaw cycle, SLR, storm frequency/intensity) . Ref of interest: Geng,Q. and Sugi,M. 2003. Possible change of extratropical cyclone activity due to enhanced greenhouse gases and sulfate aerosols - study with a high resolution AGCM. J. Climate 16:2262+ and McDonald, R.E., D.G. Bleaken, D.R. Cresswell, V.D. Pope, C.A. Senior, 2005. Tropical storms: representation and diagnosis in climate models and the impacts of climate change. Climate Dynamics, 25, 19-36. (The first experiment highlight an increase in intense extra-tropical storms the latter a decrease in numbers of tropical cyclone but possible increase in its intensity) (Alain Bourque, Ouranos)	M I downloaded these articles, but this is Don's to answer. Refer to WGI results Reference to freeze-thaw added.
E-14-367	A	21	4			This is one of the other sections that includes confidence statements. Again, how the confidence labels were assigned is not clear. (Julie Winkler, Michigan State University)	H Based on degree of consensus and certainty in literature.
E-14-368	A	21	32	21	33	What GCM and emission scenario is this projection based on? (Julie Winkler, Michigan State University)	M The estimate of inundation in Najjar et al. is based on the SAR WG1 (Warrick et al., 1996) central estimate combined with vertical motion in the Delaware region - thus on a SAR-era estimate of global SLR and IS92a. However the authors do not give any indication of the SLR or scenario used for the estimate of 21% wetland loss. We might infer

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							that the same values are used as for the inundation estimate, but they do not say so. Text not changed
E-14-369	A	21	32		34	replace "will" with "may" (Ellen Wall, University of Guelph)	L Replaced by 'are potentially at risk of inundation'.
E-14-370	A	21	47	21	49	Difficult to justify "widespread problems" on transportation for whole of coastal North America. Suggest rephrase to state "Higher sea levels, coupled with storm surges will cause widespread problems for transportation along the Gulf and Atlantic coasts". (Donald Lemmen, Natural Resources Canada)	L Done and saves a line.
E-14-371	A	21	52			"by 2020 over the coming decades" Awkward. (Julie Winkler, Michigan State University)	L This was an editing glitch and has been fixed.
E-14-372	A	22	8	22	35	Since this section is looking at the future, there should be a discussion about the possibility/likelihood of relieving the various climate-related problems that might occur in the future (e.g., over the rest of this century). Specifically, it should address the following issues: what is the possibility that with additional R&D current climate thresholds for various cultivars could be modified (see lines 16-18), or the risk of frosts and thaws (lines 23-24) be reduced, or water use be made more efficient through, e.g., greater diffusion of precison agriculture, development of new cultivars, water pricing, etc.? (Indur Goklany, US Department of the Interior)	M revisions to 3rd paragraph in 14.4.4
E-14-373	A	22	14			Delete "High resolution assessments" unless the methodology (high spatial resolution?) resulted in conclusions that would not be apparent from other studies. (Donald Lemmen, Natural Resources Canada)	L Done
E-14-374	A	22	16	22	18	I think that readers will find this statement contradictory to the sentence regarding wine grapes on page 11 lines 12-13. (Julie Winkler, Michigan State University)	M "but additional warming may not result in similar increases" added to Sec 14.2.4
E-14-375	A	22	22	22	24	Also include this excellent reference: Bélanger, G., Rochette, P., Castonguay, Y. et Bootsma, A., Mongrain, D. et Ryand, A.J. (2002). «Climate change and winter survival of perennial forage crops in Eastern Canada». Agronomy Journal, 94: 1120-1130 (Alain Bourque, Ouranos)	M Done
E-14-376	A	22	24			Rather than "can more", perhaps "may"? (Julie Winkler, Michigan State University)	L done
E-14-	A	22	25	22	25	Is soil moisture an issue?	M no … no change made

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377						(Kristie Ebi, ESS, LLC)	
E-14-378	A	22	32			Are the authors referring to "decreased vulnerability" to future change or to "decreased vulnerability" to current variability in water resources? (Julie Winkler, Michigan State University)	clarified
E-14-379	A	22	42	22	43	Sentence starting "Breshears et al…" would seem to fit better in Section 14.2. (Julie Winkler, Michigan State University)	Sorry
E-14-380	A	22	42	22	43	Breshears et al. (2005) is a case of sensitivity to current climate (a recent climate event) and not of sensitivity to future climate. (David Sauchyn, University of Regina)	That's true, still highly relevant
E-14-381	A	22	49	23	15	In addition to discussion of predatory species it would also be important to discuss the importance of invasive species, and that warmer waters may either allow new invasives to become established or extend existing ranges. Unfortunately I can't track down a reference. (Donald Lemmen, Natural Resources Canada)	Key references given in paragraph 1. Otherwise no room to explore issue here.
E-14-382	A	22	50			Should be "affected". (Julie Winkler, Michigan State University)	YES
E-14-383	A	23	1	23	15	It needs to be made clearer that these changes are likely rather than they "will" happen. (Julie Winkler, Michigan State University)	AGREED modified leading clauses to indicate likely
E-14-384	A	23	11	23	15	Similar reference highlighting links Breton, Marie-Claude, Garneau, Michelle, Fortier, Isabel, Guay, Frédéric et Jacques, Louis (in press) Relationship between climate, pollen concentration of Ambrosia and medical consultations for allergic rhinitis in Montreal, 1994-2002 Science of the Total Environment (Alain Bourque, Ouranos)	Not added
E-14-385	A	23	20	23	21	It will also be very strongly modulated by percpetions, behaviors highly correlated with socio-economic factors, see comment 17 on Chicago for example (Alain Bourque, Ouranos)	Not added
E-14-386	A	23	20	23	25	Is there something that can be said about projections past 2010? (Kristie Ebi, ESS, LLC)	Not added
E-14-387	A	23	28	23	33	Reference should be made to similar data for Canadian cities. One appropriate reference is Cheng, S., Campbell, M., Li, Q., Guilong, Li., Auld, H., Day, N., Pengelly, D., Gingrich, S., Klaassen, J., MacIver, D., Comer, N., Mao, Y., Thompson, W. and H. Lin. 2005. Differential and Combined Impacts of Winter and Summer Weather and Air Pollution due to Global Warming on Human Mortality in South-Central Canada. Technical report (Health Policy Research Program: Project Number 6795-15-2001/4400011). (Donald Lemmen, Natural Resources Canada)	Added reference

E-14-388	A	23	32			"12 to 44-95" Awkward. (Julie Winkler, Michigan State University)	
E-14-389	A	23	35	23	39	This reference includes links between climate-mortality and scenarios using optimistic/pessimistic scenarios for 2020s, 2050s, 2080s: Doyon B, Bélanger D, Gosselin P. 2006. Effets du climat sur la mortalité au Québec méridional de 1981 à 1999 et simulations pour des scénarios climatiques futurs. Institut national de santé publique du Québec, Québec. Sous presse. (Alain Bourque, Ouranos)	Will defer to our Canadian CLA to obtain report
E-14-390	A	23	35	23	39	This paragraph belongs in Section 14.2. (Julie Winkler, Michigan State University)	Moved to 14.2
E-14-391	A	23	35	23	35	There is no discussion as to what might happen with cold-related morbidity and mortality. (Kristie Ebi, ESS, LLC)	We mention heat and cold mortality, but cold-slope is much less robust than heat-slope.
E-14-392	A	23	35	23	50	Similarly, these two paragraphs describe sensitivities to current climate and thus belong in section 14.2 rather than in section 14.4. (David Sauchyn, University of Regina)	Moved to 14.2
E-14-393	A	23	40			There should be a few sentences noting that many adaptation measures are available and have, in the past, been effectively implemented in areas such as Milwaukee (see page 13). (Indur Goklany, US Department of the Interior)	We already include this.
E-14-394	A	23	41	23	50	For up to date work in Canda, please note Health Canada is completing work on climate change and air quality (sensitivity studies). Unknown if published yet. (Alain Bourque, Ouranos)	Not completed
E-14-395	A	23	52	24	15	What GCM simulations are these statements based on? (Julie Winkler, Michigan State University)	Already stated in text, A2 scenario
E-14-396	A	23	52	24	9	The uncertainty with respect to clouds under climate change projections, with associated uncertainty in health projections, needs to be mentioned. (Kristie Ebi, ESS, LLC)	This is beyond the scope of this section
E-14-397	A	24	1	24	9	Are there any studies on the frequency of weather patterns that are conducive to high ground-level ozone concentration? (Strong low-level inversion, critical wind direction, etc.) (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	Yes, but such background studies belong in climate chapters
E-14-398	A	24	6			Reference needed after "currently polluted cities". (Julie Winkler, Michigan State University)	It's the same reference, Hogrefe.
E-14-399	A	24	11	24	15	The evidence on this is limited as the Ziska et al. study has not been replicated. Certainly more research is needed. (Kristie Ebi, ESS, LLC)	We also cite Wayne et al.
E-14-400	A	24	12			I believe it reads better to state: "Pollen, another air contaminant may increase with elevated CO2. For instance…" . Although increased CO2 gives rise to climate change, it is not its equivalent. (Ellen Wall, University of Guelph)	edited
E-14-	A	24	13	24	13	Given the uncertainties associated with climate modeling, how can the paper cited	Deleted 61% and now say, "by over 50%"

401						report a change of 61%. (David Sauchyn, University of Regina)	
E-14-402	A	24	15	24	15	Delete “ragweed”. It is redundant. (David Sauchyn, University of Regina)	deleted
E-14-403	A	24	37	24	41	The lmit of Lyme disease also may be determined by precipitation. (see (1) Subak, S., 2003. Effects of climate on variability in Lyme disease incidence in the northeastern United States, American Journal of Epidemeology, 157:531-538., (2) McCabe, G.M., and J. Bunnel 2004. Precipitation and the Occurrence of Lyme Disease in the Northeastern United States, Vector Borne and Zoonotic Diseases, v. 4, n. 2, 129-134., and (3) Estrada-Pena, A., 2001. Forecasting habitat suitability for ticks and prevention of tick-borne diseases. Vet. Parasitol., 1994:91-132). (Gregory McCabe, U.S. Geological Survey)	These studies are not of future climate projections (the topic of this section)
E-14-404	A	24	48		49	replace" unusually" with "especially"..there is nothing unusual about it when you consider their economic systems. As well, that sentence should end at climate change, removing the reference to "winners and losers" since that trivializes the seriousness of the situation. (Ellen Wall, University of Guelph)	L Made the change
E-14-405	A	24	49		51	Remove "although relatively few people are affected"..how do you know this?..all Canadians/Americans could be affected by climate change challenges in the North. (Ellen Wall, University of Guelph)	M Phrase dropped as unnecessary
E-14-406	A	24				I think figure 14.3 should come before the discussion on pollen (Ellen Wall, University of Guelph)	L-
E-14-407	A	24				Fig. 14.3 caption should start with "Simulated change in ozone…" (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	L
E-14-408	A	25	0			The timing of special events, such as festivals associated with the agricultural round, may be dislocated as a result of seasonal changes e.g. a tulip festival without tulips!. Scott et al. have some interesting work of this type in Event Management. (Geoffrey Wall, University of Waterloo)	M
E-14-409	A	25	3	25	14	Extensive assessment of impacts of permafrost melting, vulnerability mapping and some adaptation options for a specific community in Allard, M., R. Fortier, O. Gagnon and Y. Michaud (2006). Salluit: Une communauté en croissance sur un terrain sensible au changement climatique. 93p. Centre d'études nordiques. Université Laval. Produit pour le Ministère de la sécurité publique du Québec. (Alain Bourque, Ouranos)	M – Was not able to locate this report using Google. However, paragraph was extensively reworked to shorten it and cross-reference to Section 15.7.1.
E-14-410	A	25	4	25	15	Smith and Burgess (2004) examined the sensitivity of permafrost in Canada to climate change and perhaps this should be mentioned to show that there are also Canadian studies that identified areas that have a high sensitivity to permafrost thaw etc. Couture et al 2003 also provides a review of potential impacts (related to permafrost) of climate change in Canada's north. It is important to include relevant Canadian papers in these discussions of permafrost. Reference:Smith, S.L. and Burgess, M.M. 2004. Sensitivity of permafrost to climate warming in Canada. Geological Survey of Canada Bulletin 579. Couture, R., Smith, S., Robinson,	M Smith and Burgess : Would have to buy it at http://geoscan.ess.nrcan.gc.ca/cgi-bin/starfinder/0?path=geoscan.fl&id=fastlink&pass=&search=R%3D216137&format=FLFULL Couture et al Saved

						S.D., Burgess, M.M. and Solomon, S. 2003. On the hazards to infrastructure in the Canadian north associated with thawing of permafrost. Proceedings of Geohazards 2003, 3rd Canadian Conference on Geotechnique and Natural Hazards, The Canadian Geotechncial Society, p. 97-104. (Sharon Smith, Natural Resources Canada)	These documents were used in chapter 15 and we refer the reader there.
E-14-411	A	25	5	25	5	Use “and” instead of “or” since changes in both precipitation and extreme events are likely. (David Sauchyn, University of Regina)	L Change made
E-14-412	A	25	6		1	Reference to "northern areas of both Canada and the US" is confusing. If northern US refers to Alaska then use that instead. If it refers to the contiguous US then will need to rephrase. (Donald Lemmen, Natural Resources Canada)	M Alaska and Northern Canada
E-14-413	A	25	6			In contrast to what? Northern Canada and the US compared to all of North America? Or is temperature change being contrasted to precipitation change? (Julie Winkler, Michigan State University)	L Dropped words “in contrast” and used however.
E-14-414	A	25	8	25	8	It is important to indicate that it is the thawing of ice-rich permafrost that presents problems. Permafrost thaw is a better term to use than permafrost melt. (Sharon Smith, Natural Resources Canada)	M Make the suggested change
E-14-415	A	25	10	25	14	Listing these specific infrastructures and locales seems overly specific to me. Why, for example, would airfields in the Hudson Bay region be more vulnerable than airfields near Prudhoe Bay? (Julie Winkler, Michigan State University)	M We knew about these examples from studies
E-14-416	A	25	10	25	14	At a minimum you could confidently add Tuktoyaktuk, Northwest Territories (Robinson, S., Couture, R., and Burgess, M. 2002. Climate Change, Permafrost, and Community Infrastructure: A Compilation of Background Material from a Pilot Study of Tuktoyaktuk, Northwest Territories, Geological Survey of Canada Open File #3867) and Salluit, Quebec, to list of sites where infrastructure is at moderate to high hazard. (Donald Lemmen, Natural Resources Canada)	M – We will stick with our list of examples
E-14-417	A	25	13	25	14	These are early vintage GCMs. (Julie Winkler, Michigan State University)	M Yes, but that is what was used…
E-14-418	A	25	19	25	20	Repeat information on Boston. (Kristie Ebi, ESS, LLC)	L Drop repeat
E-14-419	A	25	21			What about the New York Metropolitan region and the Mid Atlantic? Are the findings for Boston representative of those of the other regions? (Julie Winkler, Michigan State University)	M Probably not. Add a sentence or two for those studies?
E-14-420	A	25	22			is "led" the correct word? Do you mean "is projected to result in" (Ellen Wall, University of Guelph)	L Rephrase as requested
E-14-421	A	25	23	25	24	Need to clarify whether Suarez et al (2005) are refering to costs associated with existing infrastructure or whether they are talking about costs involved with the design and constructure of new infrastructure that takes into account changing climate.	M Check and rephrase if necessary

						(Donald Lemmen, Natural Resources Canada)	
E-14-422	A	25	25	25	25	loses in instead of losing? (Kristie Ebi, ESS, LLC)	LParagraph removed
E-14-423	A	25	25	25	25	"Losses" rather than "losing"? (David Sauchyn, University of Regina)	L Paragraph removed
E-14-424	A	25	25			"losses" rather than "losing" (Julie Winkler, Michigan State University)	L Paragraph removed
E-14-425	A	25	29	25	33	See comments 7 and 28 with respect to storminess and 13 w.r.t. coastal vulnerability (Alain Bourque, Ouranos)	Paragraph removed
E-14-426	A	25	29			It is "not known", rather than "not clear". (Ellen Wall, University of Guelph)	L Paragraph removed
E-14-427	A	25	31			"has tracked" Awkward. (Julie Winkler, Michigan State University)	L Paragraph removed
E-14-428	A	25	32			Just one year – 2080? Or was this a time slice beginning with 2080? Also, which GCMs? (Julie Winkler, Michigan State University)	M Paragraph removed
E-14-429	A	25	35	25	37	This paragraph seems out of place or at a minimum needs more context. (Julie Winkler, Michigan State University)	M Paragraph removed
E-14-430	A	25	40	26	33	Tourism overall should be unaffected. Some places will gain, others will lose. (Thomas Gale Moore, Stanford University)	Insightful comment. One objective is to figure out the potential 'winners and losers' so that adaptation might commence.
E-14-431	A	25	40	26	37	Should we highlight/mention the importance of critical dates, "decoupling to climate" strategies (4 season centers), opportunities because of less cold winters, marketing options to take advantage of gradient of impacts, water supply, importance of perception which would create more damage than the physiqcal impacts themselves... Singh, B., Bryant, C., and al. 2006. Impact et adaptation aux changements climatiques pour les activités de ski et de golf et l'industrie touristique: le cas du Québec. Rapport final, projet Ouranos. (Alain Bourque, Ouranos)	Given other reviewers request to cut this section, there is no space to engage in such a discussion. The skiing portion of the report cited essentially replicates the results of the two peer-reviewed citations for eastern North America (the authors followed the methods of Scott et al). There are peer-reviewed golf sector results available (Scott and Jones 2006 – J. of Leisure Research), but because of space restrictions I have not included them here. Thus, I have not cited this non-peer reviewed study either.
E-14-432	A	25	40	26	33	Section 14.4.7 - Tourism and Recreation. This section is too long and provides too much detail given that it draws on very few studies - largely by a single researcher (Scott) and its significance relative to sectors such as Agriculture, Forestry and Fisheries and Human Settlements. (Donald Lemmen, Natural Resources Canada)	The T&R section has been shortened by approximately 25-30%. Note that several other relevant peer reviewed publications by the author I assume the reviwer is referring to have not been cited in

							this section. Also note that Statistic Canada indicates this sector is worth more than forestry and fisheries combined (GDP and jobs).
E-14-433	A	25	40	26	33	I still find the overemphasis on recreation/tourism to be out of place, especially when the references are overwhelmingly from one author. Forestry, Fisheries and Agriculture receive approximately the same space as Recreation and Tourism. Is this justified? (Ellen Wall, University of Guelph)	The T&R section has been shortened by approximately 25-30%.
E-14-434	A	25	45			Which GCM? It is important to include the GCM as a number of studies have suggested that the uncertainty introduced by the choice of GCM is greater than the uncertainty introduced by the choice of emission scenario. (Julie Winkler, Michigan State University)	GCMs used have been inserted, except where several (5) were used (space restrictions).
E-14-435	A	25	47	25	48	Delete ", but decrease tourism in Mexico (Hamilton et al., 2006)" as it is not relevant to this chapter. (Donald Lemmen, Natural Resources Canada)	Addressed in revised text.
E-14-436	A	26	12	26	15	But the people taking the survey are unlikely to be around at the end of the 21st century! More context is needed here. (Julie Winkler, Michigan State University)	Agreed and the publcation discusses this. Unfortunately, no space available to do anything more than highlight results of each study.
E-14-437	A	26	17	26	22	The connection between the first and second sentence in this paragraph is not clear. (Julie Winkler, Michigan State University)	
E-14-438	A	26	17	26	33	It should be noted that despite a decline in skiing, many ski facilities may continue to see tourists because they would attract people for their scenery, hiking, riding, etc., provided the operators of these facilities are willing to adapt. (Indur Goklany, US Department of the Interior)	The publications cited discuss this in some detail, but a discussion of adaptation options cannot be included here. There is an entire paper on adaptation in the ski industry that is in press, but cannot be cited here due to space restrictions.
E-14-439	A	26	23	26	24	What are the time slices that 2050 and 2080 refer to? (Julie Winkler, Michigan State University)	See revised text.
E-14-440	A	26	26			What is the reference for the analysis for Banff? (Julie Winkler, Michigan State University)	Included
E-14-441	A	26	33			Reference? (Julie Winkler, Michigan State University)	Included
E-14-442	A	26	42	27	12	As somewhat pointed to in this section but could be more strongly emphasized, impacts would vary between energy "markets" which sometimes have different energy policies/strategies/interconnections. Updated to Ouranos 2004b is Lafrance, G. and Desjarlais, C. (2006). L'impact du changement climatique sur la demande d'énergie. Ouranos. Sous presse (available in September at http://www.ouranos.ca/doc/produit_e.html) which includes subsectorial analyses, energy forms, penetration of technologies and energy efficiency, socio-economic	M Unsure what his point is.

						growth (providing % changes considering future economic growth) (Alain Bourque, Ouranos)	
E-14-443	A	26	43	26	45	Re "a small net change in the demand for energy … but a significant increase in demand for electricity", electricity is a type of energy. (David Sauchyn, University of Regina)	M Yes. Small net change in the demand for total energy, but… Reword
E-14-444	A	26	43			Is the small net change up or down? (Geoffrey Wall, University of Waterloo)	M Depends on the study. Clarified
E-14-445	A	26	50			Eight emission scenarios? (Julie Winkler, Michigan State University)	Climate scenarios. But line was dropped
E-14-446	A	27	7	27	12	Need to align that air-conditioning demand in Quebec will increase four fold with statement that peak electricity demand will decline by noting that current peak occurs in winter and is associated with heating. (Donald Lemmen, Natural Resources Canada)	M Added clarifying wording
E-14-447	A	27	8	27	8	Please define PJ. (Kristie Ebi, ESS, LLC)	M petajoules. Redo as 10^15 joules
E-14-448	A	27	8			PJ? (Julie Winkler, Michigan State University)	M petajoules
E-14-449	A	27	8			Delete "32 PJ, or" as units are meaningless to most readers. (Donald Lemmen, Natural Resources Canada)	M petajoules
E-14-450	A	27	9			CGCM1? (Julie Winkler, Michigan State University)	L I think that's the right model. Double-check
E-14-451	A	27	14	27	14	There is nothing in this section on the vulnerability of the recovery of oil and gas to changes in water supplies. In particular, processing of the oil sands in northern Alberta requires vast quantities of water from the Athabasca River (identified under impacts on Freshwater Resources). This deposit of heavy oil is the world's second larges source of crude oil and in the next decade will attract 10s of billions dollars for expanded production. (David Sauchyn, University of Regina)	M Cross-refer to fresh water resources section. Need a reference for this water need.
E-14-452	A	27	16	27	17	"B.C. Hydro" should be written out. (Julie Winkler, Michigan State University)	L Reword as requested or refer to location
E-14-453	A	27	20			By "flows" do the authors mean streamflows? (Julie Winkler, Michigan State University)	L Yes. Reword
E-14-454	A	27	25			Why does this statement about the Colorado River hydropower have only medium confidence whereas the statement about the Columbia River system has high confidence? (Julie Winkler, Michigan State University)	M Not as many studies, I think
E-14-455	A	27	27			"firm hydroelectric supply"? "conflict"? (Julie Winkler, Michigan State University)	? The conflict is correct…reword
E-14-456	A	27	31			"run-of-the river"? (Julie Winkler, Michigan State University)	L Term of art…reword?
E-14-457	A	27	36			"constrained"? (Julie Winkler, Michigan State University)	L Use a different term

E-14-458	A	27	41			0-30% is a rather large range. Was there any spatial patterns in the projected changes? (Julie Winkler, Michigan State University)	M The next two sentences give the regional detail. Combine into one well-crafted sentence?
E-14-459	A	27	42	27	43	The statement that wind resources increased in the southern and northwestern US contradicts to some degree the statement in the line above that a 0-30% decrease in power availability in the U.S. is expected. Are these statements based on the same reference? (Julie Winkler, Michigan State University)	M Overall and yes.
E-14-460	A	27	44	27	46	This sentence seems out of place in a paragraph about wind resources. (Julie Winkler, Michigan State University)	M Paragraph is about renewables, but point well-taken. Reword.
E-14-461	A	27	51			"farm gate price of $33/Mg"? What is "farm gate price"? What is "Mg"? (Julie Winkler, Michigan State University)	M Define terms in glossary
E-14-462	A	28	10			Earlier in the document statements on the potential changes in ice storms and hurricanes are made. Here the changes in these phenomena are said to be "unknown". (Julie Winkler, Michigan State University)	M What is known is fairly general and not preceise enough geographically or temporally to serve as input to such an analysis.
E-14-463	A	28	14	28	27	Following reference uses CRCM results to produce 2050s IDF curves with a conclusion that (1961-1990 return periods for 24 hr max) = 0.67*(2041-2070 return periods for 24 hr max). See Mailhot, A., S. Duchesne, et al. (2006). Climate and change impacts on the performance of urban drainage systems for Southern Quebec. Climate Change Technology Conference, Engineering Challenges for and Solution in the 21st Century, Ottawa, Ontario, Canada. Also relevant ref w.r.t. urban drainage impacts and adaptation: Kije Sipi Ltd. (2001): Impacts and adaptation of drainage systems, design methods and policies; report prepared for the Climate Change Action Fund, 119 p (Alain Bourque, Ouranos)	M Used Kije Sipi
E-14-464	A	28	15	28	15	Re "unproven", the consequences of climate change probably will never be absolutely proven; therefore, uncertain is a better choice of words. (David Sauchyn, University of Regina)	M - reworded
E-14-465	A	28	15	28	27	A useful example is Dawson City Yukon where permafrost degradation has collapsed the sewer collector system. Norm Carlson at the City of Dawson would be a reference telephone 867 993 7400 (Ian Church, Yukon Government)	M – need reference – cross reference with Chapter 15
E-14-466	A	28	25			"depression storage"? (Julie Winkler, Michigan State University)	L - reworded
E-14-467	A	28	30	28	35	Couture et al. (2003 ref provided in previous comment) or Nelson et al 2002 (already cited in reference list) provide a comprehensive review of potential impacts related to permafrost. (Sharon Smith, Natural Resources Canada)	M Directed to chapter 15
E-14-468	A	28	30		36	Construction industry should gain with fewer days of extreme cold with snow and ice. (Thomas Gale Moore, Stanford University)	M ok

E-14-469	A	28	31	28	33	Reference to the actual ACIA (2005) document and specifically the chapter on infrastructure would be preferable to the summary document. (Sharon Smith, Natural Resources Canada)	M Referred to ACIA
E-14-470	A	28	31	28	33	Lawrence and Slater (2005) could be considered a weak reference in terms of the results produced from its simulations (there are important limitations to models used)- numerous comments were made in review of WG1 which will not be repeated here. Nelson et al (2002) and Smith and Burgess (2004 - see earlier comment for citation) are better references for delineating areas where thawing of permafrost may result in reductions in soil strength, ground instability and problems for infrastructure (note Smith and Burgess provides information for Canada, while Nelson presents a circumpolar view) (Sharon Smith, Natural Resources Canada)	M Removed
E-14-471	A	28	31	28	33	Changes in ground temperature will also result in reductions in soil strength (i.e. permafrost does not necessarily have to thaw). Also, complete loss of permafrost from a region (eg. where permafrost is very thin) does not necessarily present more problems than a gradual degradation of permafrost in areas where it is thicker. The statement should also reflect the fact that it is ice-rich permafrost that is of concern. A more correct statement should say: Warming and thawing of ice-rich permafrost and increases in active layer thickness ….. (Sharon Smith, Natural Resources Canada)	M Directed to chapt 15
E-14-472	A	28	33	28	35	One could argue that construction methods may not necessarily change because engineering design already considers the presence of permafrost and ground ice and that some thaw will occur due to surface disturbance, construction and operation of structures (this occurs even under a stable climate). For the most part similar techniques will be used but the way they are applied or where they are applied may change. For eg. there more be an increased use of thermosyphons to maintain frozen conditions, thicker gravel pads may be required, more use of insulation etc. Where permafrost is very thin, once it is gone (which could happen following land clearing and prior to construction if construction is delayed), designs similar to those used in non permafrost areas could be used. Smith et al 2001 discusses challenges to development in permafrost areas and comments on techniques used to deal with these challenges (several older publications also discuss this). Couture et al 2003 (citation provided in earlier comment) also comments on techniques that may be used to reduce/mitigate impacts of climate change. ACIA (2005) report, Ch 16 also comments on adaptation techniques. Reference for Smith et al 2001: Smith. S.L., Burgess, M.M. and Heginbottom, J.A., 2001. Permafrost in Canada, a challenge to northern development; in A Synthesis of Geological Hazards in Canada, G.R. Brooks (ed.). Geological Survey of Canada Bulletin #548, p. 241-264. (Sharon Smith, Natural Resources Canada)	M Directed to chapter 15
E-14-473	A	28	33	28	34	Construction methods already are different in permafrost regions to account for the unstable ground. What further changes to conventional methods will be necessary	M Directed to chapter 15

						to adapt construction to further loss of permafrost under climate warming? (David Sauchyn, University of Regina)	
E-14-474	A	28	33	28	35	Change to state that "Construction methods may have to change in some areas underlain by permafrost …". The present text suggests that permafrost degradation is a new challenge for northern construction whereas in fact they have been dealing successfully with permafrost issues for several decades in most major infrastructure. The impacts on permafrost associated with ground disturbance during construction are generally far more significant than impacts of climate change. It would also be useful to give example of thermosyphons as an adaptation measure to retain the integrity of permafrost. Reference to ACIA (2004) should be updated to Instanes, A. et al. 2005. Infrastructure: Buildings, Support Systems and Industrial Facilities. Chapter 16 of the ACIA (Donald Lemmen, Natural Resources Canada)	M – this issue is treated in Chapter 15
E-14-475	A	28	38	28	51	See comment 22 (Alain Bourque, Ouranos)	?
E-14-476	A	28	38	28	43	A dramatic example of the impact of a shortened Ice Road season occurred during the winter of 2006 when the shortened season resulted in the inability to move over 2000 truck loads (of a planned 9000) over roads supplying diamond mines and other abandoned mines going through decommissioning. Materials and supplys are now being moved by one of the world's largest helic0pters brought in from Russia. Evidently they are using the same adaptative strategy in some of the oil fields in northern Alberta- contact (Ian Church, Yukon Government)	M- need a reference
E-14-477	A	28	42	28	43	And the implications are? Generally fewer transportation problems in a warmer world? (Julie Winkler, Michigan State University)	M not necessarily
E-14-478	A	28	43	28	51	The references to Warren et al. (2004) would be most appropriate as either Lemmen and Warren (2004), already in reference list, or Andrey, J. and Mills, B. 2004. Transportation. In Climate Change Impacts and Adaptation: a Canadian Perspective. Edited by D.S. Lemmen and F.J. Warren. Natural Resources Canada, Ottawa, Ontario (note F.J. Warren was the principal writer for all but three chapters of that volume, but actually had limited input on the Transportation chapter) (Donald Lemmen, Natural Resources Canada)	M changed
E-14-479	A	28	45	28	51	The complication here is that scenarios based on some of the GCM simulations show increased precipitation and higher water levels. (Julie Winkler, Michigan State University)	M- few for Great Lake
E-14-480	A	28	49	28	51	You might also indicate that dredging channels has consequences in terms of water flow rate. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M No references related to climate change
E-14-481	A	29	1	29	2	It is unclear if the statement referring to reduced reliability due to warmer winters is specifically referring to winter roads (snow and ice roads). One also assues that the 2nd sentence which refers to permafrost degradation and reduction in bearing	M Reworded to clarify

						capacity is referring to all weather roads. Warmer winters are a problem for winter roads as the freezing of the ground or water body is delayed - this however is not really an issue of permafrost degradation. Permafrost degradation will however pose problems for all weather roads, and can lead to differential settlement etc. Some clarification is required to indicate that the two sentences are dealing with two different things. (Sharon Smith, Natural Resources Canada)	
E-14-482	A	29	2			The Yukon Geological Survey has been carrying out considerable research on landslide potential as a result of degrading permafrost along the potential Alaska Highway Gas Pipeline Right of Way. For further information and specific references contact Director Grant Abbott 867 667 3200 (Ian Church, Yukon Government)	M – Need a reference
E-14-483	A	29	3	29	3	Allard et al (2002) is a conference abstract - is this an appropriate reference? The are other publications such as those already cited or mentioned in previous comments (eg. Couture et al. 2003) that provide a more comprehensive discussion of impacts of permafrost degradation. (Sharon Smith, Natural Resources Canada)	M - removed
E-14-484	A	29	8	29	13	Are there any studies on the effect of changes in freeze-thaw cycle on the maintenance of roads, or other transportation infrastructure? (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	M – only presentation
E-14-485	A	29	22			"declining fog trend". Awkward. (Julie Winkler, Michigan State University)	L No wording change
E-14-486	A	29	31	29	33	Suggest you group the references in a single list at end of sentence as most, if not all, of those papers acknowledge that the impacts of climate change do not occur in isolation. (Donald Lemmen, Natural Resources Canada)	L good suggestion - done
E-14-487	A	29	44	29	46	Restricted availability of water requires only that outputs, consumption and evapotranspiration, exceed inputs of rain, snow and ice, and thus will occur with scenarios besides just decreased precipitation. (David Sauchyn, University of Regina)	M reworded (and moved to 14.4.4)
E-14-488	A	29	50			Editorial - should refer to Box 14.3 (Donald Lemmen, Natural Resources Canada)	L fixed
E-14-489	A	29	51	30	2	This related to Fig. 14.4: while it is an interesting figure, it is somewhat difficult to get all the information without some thinking. Considering the audience, I would add a couple of lines to better explain the graphs. (Liette Vasseur, Laurentian University)	H figure deleted to save space
E-14-490	A	30	8			health add the l (Robert Taylor, Bedford Insitute of Oceanography)	L fixed
E-14-491	A	30	10			Editorial - should refer to Fig 14.4 (Donald Lemmen, Natural Resources Canada)	L figure deleted to save space
E-14-492	A	30	14	30	44	Figure 14.4 requires more explanation. The temperature increase scales seem specific to each graph yet the less impact - more impact scale runs across the entire	H figure deleted to save space

						figure. This is confusing. (Peter Victor, York University)	
E-14-493	A	30	15	30	44	This figure is unclear. (Kristie Ebi, ESS, LLC)	H figure deleted to save space
E-14-494	A	30	15			I do not find this figure useful. Rather, it is quite confusing. How, for example, can the bottom two panels be appropriate for "water born disease" when none of the axes refer to precipitation change? (Julie Winkler, Michigan State University)	H figure deleted to save space
E-14-495	A	30	15			Fig. 14.4 - I question whether the value of this figure justifies the space it requires. It makes the very simple point that additional factors can either enhance or decrease impacts relative to those associated with climate changes alone. The illustrations could be made in a couple of text lines. (Donald Lemmen, Natural Resources Canada)	H figure deleted to save space
E-14-496	A	30	41	30	42	Where does this figure account for climatic variability, that is, departures from mean conditions, such as drought? (David Sauchyn, University of Regina)	H figure deleted to save space
E-14-497	A	30	49	30	50	The sentence "Knowledge of the impacts on North America of climate change in other regions is very limited" is very important and should be moved forward in the chapter - perhaps as a chapeau in section 14.4, as it is an important contraint on the statements within the rest of that section. Example of a paper that has undertaken such an analysis, in this case for the forestry sector, is Sohngen, B., Sedjo, R. 2005. Impacts of climate change on forest product markets: Implications for North American producers. Forestry Chronicle, 81 (5), Pages 669-674. (Donald Lemmen, Natural Resources Canada)	M section reworded to highlight this comment. It is also repeated in 14.8
E-14-498	A	31	9	31	11	This sentence is run-on and should be rephrased to make it stronger and clearer. It is an important point. (Ellen Wall, University of Guelph)	Addressed, text revised to make two short sentences
E-14-499	A	31	9	31	9	Delete "adaptation to". The authors probably did not intend to write "Adaptation to … adaptation strategies". (David Sauchyn, University of Regina)	Addressed, text revised to remove comma, now two sentences
E-14-500	A	31	9			Editorial but important - delete comma after "reactive" (Donald Lemmen, Natural Resources Canada)	Addressed, text revised to remove comma
E-14-501	A	31	33	31	36	There are better examples of adaptation to climate change than increased use of air conditioning. (David Sauchyn, University of Regina)	Addressed, text revised to accept the proposal in the next comment
E-14-502	A	31	33	31	35	Modify this sentence to read as follows: " Though driven by declining costs for equipment and rising living standards TRANSLATED INTO THE NEED TO BETTER INSULATE THEMSELVES FROM CURRENT CLIMATE AND CLIMATE VARIABILITY rather than climate change, the number of housholds with air conditioning has tripled in the last 25 years (refs..)" (Indur Goklany, US Department of the Interior)	Addressed, text revised to accept the proposed edits
E-14-	A	31	33	31	36	Although wealth is the most significant factor, reference at comment #40 indicates	Not addressed

503						that penetration of air conditionning in different states/provinces is correlated with average summer temperature (either for poor or rich states/provinces), suggesting that increase temperature would generate an increase in demand for air conditionning (and that incentives by government would probably not too much exept slightly accelerate the process...) (Alain Bourque, Ouranos)	
E-14-504	A	31	38	31	41	The connection between the two sentences in this paragraph is not clear. (Julie Winkler, Michigan State University)	Addressed, text modified to clearly link the sentences
E-14-505	A	31	52	32	1	Please alter the introductory phrase about weather forecasts to "With highly detailed information on weather conditions" since that is more accurate. (Ellen Wall, University of Guelph)	Addressed, text modified as proposed
E-14-506	A	32	6	33	13	Some governement climate change action plans/strategies are now introducing more and more concrete climate science, impacts, adaptation and vulnerability objectives, helping to increase adaptive capacity as a whole. (most are still simply describing impacts to justify reduction of GHG). The recent Quebec provincial government plan is a good example http://www.mddep.gouv.qc.ca/changements/plan_action/index-en.htm. (Alain Bourque, Ouranos)	Addressed, text modified and reference added
E-14-507	A	32	6	33	13	Relevant ref for this section and others: Burton, I., Huq, S., Lim, B., Pilifosova, O., Schipper, E.L. 2002. From Impacts Assessment to Adaptation Priorities: the Shapping of Adaptation Policy. Climate Policy, Amsterdam, Vol.2, 145-159. (Alain Bourque, Ouranos)	Addressed, text modified and reference added
E-14-508	A	32	24	32	25	Although this could apply to page 33 line 52: The Ice storm of January 1998 and the Saguenay of July 1996 initiated a review of the Quebec Civil Protection Act, forcing municipalities and other stakeholders to develop more adapted emergency plans (with legal consequences if not) (ref: http://www.msp.gouv.qc.ca/secivile/secivile_en.asp?txtSection=loi) (Alain Bourque, Ouranos)	Addressed, text modified as proposed and reference added on page 33
E-14-509	A	32	28			backshore? (Julie Winkler, Michigan State University)	Addressed, text removed as proposed
E-14-510	A	32	44	32	45	Is Manitoba the only place where climate change is part of the curriculum? Or is it the only place where it is required to be part of the curriculum? (Julie Winkler, Michigan State University)	Addressed, text modified to clarify as proposed
E-14-511	A	33	9	33	9	Which weather hazards are not climatically sensitive? (David Sauchyn, University of Regina)	Not addressed, the text already states “climate change sensitive” not “climate sensitive”
E-14-512	A	33	11	33	13	One problem, though, of using a flood diversion channel as an example is that it does not reflect the debate regarding structural vs non-structural flood control measures and the concerns surrounding structural measures such as channels. (Julie Winkler, Michigan State University)	Addressed, text modified to clarify
E-14-513	A	33	11			I suspect that the national Dopper radar network has increased the lead time for tornado warnings in other areas besides Oklahoma. (Julie Winkler, Michigan State University)	Addressed, text removed as proposed

E-14-514	A	33	16	35	5	Section 14.5.2 - Mainstreaming Adaptation. This section addresses a very important topic, but a fair bit of the text actually focuses on adaptive capacity rather than mainstreaming. I would recommend that the section on Socio-economic factors (p.34, l. 8-22) and the first part of the political and institutional capacity section (p.34, l. 24-40) would be better placed in a seperate section titled "Adaptive Capacity" which is relevant to, but not the same as, mainstreaming. Within an adaptive capacity discussion there is need to raise the important issue of "Adaptation to what?" (Smit, B., Burton, I., Klein, R.J.T., Wandel, J. 2000. An anatomy of adaptation to climate change and variability. Climatic Change, 45 (1), Pages 223-251) to move us away from the simplistic concept that adaptive capacity is a singular attribute (generally correlated with wealth). Any individual, group or community can have a high capacity to adapt to one impact and a low capacity to adapt to another. (Donald Lemmen, Natural Resources Canada)	Not addressed, this section could be retitled "Adaptive capacity" is that is permited by IPCC Addressed, the text has been modified to add reference
E-14-515	A	33	28			You have too many)(between references (Liette Vasseur, Laurentian University)	Addressed, the text has been modified as proposed
E-14-516	A	33	33			This sentence basically repeats the sentence on line 24. In fact, I don't think this paragraph adds much to the previous paragraph. Perhaps they can be combined into one, shorter paragraph. (Julie Winkler, Michigan State University)	Not addressed, line 24 addresses behaviour while line 33 focuses on the narrower concept of coping
E-14-517	A	33	43	33	44	I don't think the heat wave warning system is a good example of a step that has been influenced by climate change projections. My reading of this work is that these are real time warning systems, at least for Philadelphia. (Julie Winkler, Michigan State University)	Not addressed, the text refers to literature that states that the Toronto system was established, in part, due to climate projections
E-14-518	A	33	44			I am very surprised that there is no words regarding the integration of climate change impacts and adaptations into Environmental Impact Assessment process. This has been quite well integrated with examples in Atlantic Canada (e.g. Bell, A., N. Collins, S. Duncan, et R. Young, R. 2002. Practitioner's guide to incorporating climate change into the environmental impact assessment process. Rapport. Nova Scotia Climate Change Initiative. 23 pages; Johnson, D.E., et S. Dagg 2003. Achieving public participation in coastal zone environmental impact assessment. J. Coastal Conserv. 9: 13-18; Lee, R.J. 2001. Changement climatique et évaluation environnementale. Partie 1: Examen des facteurs de changement climatique dans des évaluations environnementales antérieures choisies . Collection de monographies en recherche et développement, Recherches appuyées par l'Agence canadienne d'évaluation environnementale. Ottawa. 87 pages) (Liette Vasseur, Laurentian University)	Addressed, text modified as proposed and references added
E-14-519	A	34	2	34	4	This general finding has been reported by numerous studies dating back many years to the early work of Gilbert White and contemporaries/disciples. (Julie Winkler, Michigan State University)	Addressed, text modified
E-14-520	A	34	9	34	11	Modify this sentence to read as follows: "Wealthier societies have GREATER access to technology AND INFORMATION, HIGHER HUMAN CAPITAL	Addressed, text modified as proposed

						(THROUGH HIGHER LEVELS OF education and training), MORE DEVELOPED infrastructure and MORE stable institutions (Easterling et al. 2004; GOKLANY 1995, 2001a), which build capacity for individual and COLLECTIVE action to adapt to climate change (Moss et al. 2001, GOKLANY 2006a)." (Indur Goklany, US Department of the Interior)	
E-14-521	A	34	11	34	14	These two sentences seem contradictory. (Julie Winkler, Michigan State University)	Addressed, text modified to clarify
E-14-522	A	34	20	34	22	This paragraph is out of place and is somewhat repetitive. (Julie Winkler, Michigan State University)	Addressed, text modified to remove paragraph
E-14-523	A	34	28			I know very few people who know about the 72 hours- adaptation begins with communication (Ian Church, Yukon Government)	Addressed, text modfied
E-14-524	A	35	8	36	12	Subsection 14.5.3 is a very important one, and much of the information here is not specific to North America. This information should be considered for inclusion in some of the introductory chapters to the entire volume. (Brent Lofgren, NOAA/Great Lakes Environmental Research Laboratory)	Not applicable
E-14-525	A	35	8	36	12	Section 14.5.3 - Constraints and Opportunities. There needs to be mention made of legislative and regulatory constraints that can serve as barriers to adaptation, and highlights an important role for governments in removing such barriers. Many existing water allocation agreements and transboundery water agreements are good examples. (Donald Lemmen, Natural Resources Canada)	Not applicable, I am aware of one study concerning Canada/US transborder water agreements but there is not sufficient literature to make this point at this time
E-14-526	A	35	13	35	33	Adding to the comment referencing Ouranos 2004b, one of the challenge fully applicable to climate change science and mainstreaming adaptation is the need for efficient technology/information transfert. How to do/fund research? Stakholders involvment? Linkages between communities-governments-markets-R&D? Champions and expertise development... (Alain Bourque, Ouranos)	Addressed, text modified
E-14-527	A	35	16	35	23	Not all of the content in this paragraph relates to Social and Cultural barriers. Starting from "The concept of mainstreaming climate risk …" to end of paragraph is better placed in the section on mainstreaming. (Donald Lemmen, Natural Resources Canada)	Not addressed
E-14-528	A	35	17			"The concept … describes processes"? (Julie Winkler, Michigan State University)	Addressed, text modified to clarify
E-14-529	A	35	34			Add the following new paragraph on line 34 that would read as foillows: "A potentially major constraint is resistance to new technologies. For example, many promising approaches that could help adaptation in the agricultural, water resource mangement and forestry sectors could be still born or retarded due to opposition from groups that are not favorably disposed toward genetically modified crops, for whatever reason (see, e.g., Goklany 2000, 2001b)." (Indur Goklany, US Department of the Interior)	Addressed, text modified
E-14-	A	35	43			add "with" earlier studies	Addressed, text modified as proposed

530						(Robert Taylor, Bedford Insitute of Oceanography)	
E-14-531	A	36	4	36	4	Delete "in" before "building code" (Peter Victor, York University)	Addressed, text removed as proposed
E-14-532	A	36	16			Fig 14.5 - need to make clear whether the figure relates to new infrastructure (presumably built in 2005) or to existing infrastructure. What would be particularly useful (though I don't have a reference) would be a figure demonstrating the age profile of North American infrastructure against its typical lifetime, which would help depict the opportunity for mainstreaming climate change into future infrastructure cycles. (Donald Lemmen, Natural Resources Canada)	M- good point. Make sure it is clear that this is new infrastructure built in 2005. I don't have the distribution either.
E-14-533	A	36	18	36	38	figure 14.5 -not clear what the point is? What I concluded is that bridges and long term infrastructure experience the whole range of temperature change and there is less chance to adapt because more permanent whereas cars only last a short time and each production is only affected by limited temperature changes and could be adapted.-if correct then no changes required (Robert Taylor, Bedford Insitute of Oceanography)	M That's right. Add a sentence to lead people to this conclusion.
E-14-534	A	36	30			Why are there two arrows from the "Auto" bubble? Or should the second arrow be connected to the "Air conditioner…" bubble? (Julie Winkler, Michigan State University)	Draft figure to show correct bent arrow to air conditioner.
E-14-535	A	36	41			Wouldn't an introductory paragraph on how the case studies were chosen, what they are suppose to represent, etc. be useful? (Julie Winkler, Michigan State University)	H – discuss with TSU plans for positioning and intros for the case studies
E-14-536	A	37	25	38	45	No mention of the demands for irrigation. BLM's other reason (other than flood control) for originally constructing the Grand Coolee was irrigation. Significnat water is diverted for this purpose. (Ian Church, Yukon Government)	M- Mention these demands
E-14-537	A	37	36			"junior water users"? Is this a legal term? (Julie Winkler, Michigan State University)	L- Briefly describe
E-14-538	A	38	8	38	9	"Rules changes would interact with these changes". Awkward sentence. (Julie Winkler, Michigan State University)	L Reword
E-14-539	A	38	9			"firm power"? (Julie Winkler, Michigan State University)	L Define
E-14-540	A	38	10	38	11	showed" used twice in same sentence. (Julie Winkler, Michigan State University)	L delete
E-14-541	A	38	10			This is the first time the PDO has been evoked in this chapter. Needs to be written out in full and probably defined. (Julie Winkler, Michigan State University)	L Write out and define, at least in glossary
E-14-542	A	38	13			"been" not be en (Robert Taylor, Bedford Insitute of Oceanography)	L Change
E-14-543	A	38	16			"Integration Boundaries"? (Julie Winkler, Michigan State University)	L Figure deleted to save space
E-14-	A	38	34			"listings"?	L figure deleted to save space

544						(Julie Winkler, Michigan State University)	
E-14-545	A	39	12			"high tides, El Nino conditions, and storms" have different temporal scales with El Nino conditions having the longest time scale. Many high tides will come and go during an El Nino event. It is more appropriate to talk about high tides and storms coinciding. (Julie Winkler, Michigan State University)	M Actually, it's high tides and storms During El Nino conditions
E-14-546	A	39	31			"minority sections"? (Julie Winkler, Michigan State University)	M reworded for clarity
E-14-547	A	39	33	39	35	Most of the transmission lines can also be vulnerable since they are routed through Mountain passes that are vulnerable to avalanches, slides etc. Obviously transmission lines are less vulnerable than roads , railroads etc. since they can be designed so towers are sited in seriously vulnerable locations- a cumulative risk factor. (Ian Church, Yukon Government)	M It would be good to add this thought, but space limitations are too severe.
E-14-548	A	39	45			"greater increasing variability"? (Julie Winkler, Michigan State University)	L reworded
E-14-549	A	40	15			Does "sustainability" need to be defined? Is it defined anywhere in the Working Group II document? (Julie Winkler, Michigan State University)	M – in glossary
E-14-550	A	40	26	40	30	Key issue is the short term and medium term need for resources and capital to put in place adaptive mechanisms and strategy when there is short term competition for resource and capital coming form other directions- even when adaptation is clearly demonstrated. We are currently witnessing this in the post Katrina restoration of flood control in New Orleans (Ian Church, Yukon Government)	M I think this is agreeing with our point in this sentence.
E-14-551	A	40	28	4	28	The statement that Canada and the United States "have abundant capacity" for technological and social innovation should be supported by references and in particular, references that show that this capacity is suitable for addressing climate change as the text implies. (Peter Victor, York University)	M wow – this is a good point, but our thinking has been that this section builds on referenced sections earlier in the chapter.
E-14-552	A	40	28	40	28	What about the need for investment in technology? This could be cross-referenced to WGIII. (Kristie Ebi, ESS, LLC)	M good point – added technology
E-14-553	A	40	37			I wouldn't call "wildfires" a "climate extreme", although some, but not all, wildfires occur during times of climate extremes. (Julie Winkler, Michigan State University)	M changed to climate-related extremes
E-14-554	A	41	6	41	6	Re "climate changes are uncertain", this statement is too general and WGI likely argues that temperature changes are not uncertain. (David Sauchyn, University of Regina)	M reworded
E-14-555	A	41	10	41	11	This seems to me to be a rather obvious statement. (Julie Winkler, Michigan State University)	L yes
E-14-	A	41	11	41	16	A relationship between climate extremes and averages has not been discussed up to	H? added to 14.3

556						this point. This seems to be an odd time to introduce it. Also, why can't climate extremes (and future changes in climate extremes) be studied directly? Why do climate extremes have to be linked to average conditions? To me, this approach goes against the classic work of Kates and Brown who showed that changes in extremes are more a function of changes in variability than changes in the mean. (Julie Winkler, Michigan State University)	
E-14-557	A	41	14	41	16	Make a distinction between extreme events and climate variability (short-term departures from average conditions). Consult WGI for this important definition of scales of climate variation. Prolonged drought is an expression of climate variability and not an extreme event like storms or heat waves. (David Sauchyn, University of Regina)	M – changed extreme events to extremes
E-14-558	A	41	17	41	23	The phrase "tipping points" is used on lines 18 and 23, but the only other place it is used in the chapter is in section 14.1.2 (Key differences from TAR). Hence there is neither support or context for using the term in this concluding section. Suggest you either use something different here, or insert references to "tipping points" as appropriate in sections 14.3 and 14.4. (Donald Lemmen, Natural Resources Canada)	H – added tipping points in a few more places
E-14-559	A	41	17	41	19	I don't think this point was clearly made in the preceding text (i.e., Section 14.4). In fact, the tools for studying climate change were not really addressed, and the studies cited in the chapter used a wide variety of tools. (Julie Winkler, Michigan State University)	M we feel that it has been addressed sufficiently to have a place in this section. Note that this section is not a summary.
E-14-560	A	41	24	41	25	This sentence is not useful and could be omitted. The point is made best by starting with the next sentence. (David Sauchyn, University of Regina)	L good point. Sentence deleted
E-14-561	A	41	25			Insert "limited" prior to "adaptation" on line 25. (Indur Goklany, US Department of the Interior)	L sentence deleted
E-14-562	A	41	35			Delete phrase "even in the absence of intentional adaptation". The value and even the meaning of the phrase is not clear - is it refering to adaptation that is undertaken as a result of explicit consideration of climate change only?? If so it is a very narrow and not helpful use of the term adaptation. (Donald Lemmen, Natural Resources Canada)	M ok
E-14-563	A	41	36			Add a new bullet on line 36 which would read as follows: "More work needs to be done on estimating future adaptive capacity and developing adaptation options that would be available to future societies if their future levels of technological and economic development grow as assumed in the IPCC's scenarios. Part of this challenge is to factor in secular technological change that should occur with the march of time, even if societies don't become wealthier (see Goklany 2006a)" (Indur Goklany, US Department of the Interior)	M a legitimate point, but it doesn't add enough value to justify the extra space
E-14-564	A	41	38	41	39	"mixing of ecosystems"? (Julie Winkler, Michigan State University)	L yes
E-14-565	A	41	39	41	42	Delete "especially where people, economies, or ecosystems are unusually vulnerable". It adds no value - and is potentially confusing - particularly the term	M our sense is that this concept is important

						"unusually" vulnerable. (Donald Lemmen, Natural Resources Canada)	
E-14-566	A	65	11			Typo: Should read "D. Caya" and not "D. Cayan" (Alain Bourque, Ouranos)	M ok