

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
12606	4					There could be more on the issues of fuel poverty amongst rich nations, as the rich/poor divide is still large even there. I will send through a draft chapter from a report I am writing which could help, though it is UK centric. If required a could write a page on these issues for the WG.	Accepted Introduce briefly in 4.1.2.1 Discuss in 4.4.1
4137	4					Please review sections 4.3 and 4.4. in light of chapter 5 discussions. If you feel that these sections contain redundant and/or inconsistent duplications of chapter 5 discussions, please revise your sections.	Noted. Chapter 5 has been reviewed with a view to avoiding redundancies and the text has been adjusted accordingly.
3084	4					Figure heading says 'residential sector' but the figure itself suggests it covers the residential and other sectors. Needs to be clear what's meant by 'other sectors' (see next point)	Accepted. Figure and caption have been revised.
17337	4					The good effort this chapter is doing to link to the concepts presented in Chapter 2 and 3 should continue and link with visions of sustainable development applicable to sectors, where the SD debate has become quite specific. A clear link with the chapters work need to be coming through this chapter in this regard as well.	Accepted, table has been introduced for a better linkage of chapters.
8496	4					Model 3 - (focus shifts vs shifts)	OK
2578	4					No mention to greenwashing, a powerful driver to derailing climate commitments	Accepted. (Esteve, Chuks)
2564	4					Meaningless without references and some minimal empirical data	This is just an illustration of the notion.
2565	4					Meaningless without references and some minimal empirical data	OK, this is an illustration of the notion.
12776	4					Please check, whether the question is sufficiently addressed by the answer given.	Noted.
16262	4					To shorten the chapter I find the following two sections to be of less relevance to the focus of the chapter (i.e. the two way relationship between SD and equity on the one hand and climate change on the other): Section 4.3 Determinants, drivers and barriers (of SD) - this is a rather general and non-exhaustive list of factors impacting on SD. The intention to 'emphasize their relationship with mitigation and adaptation' does not come across clearly. The focus seems to be on determinants of SD rather than on the determinants of the nexus between climate and SD/equity. The section could be significantly shortened by strengthening its focus and omit general talk about determinants of SD. Section 4.6: Mitigative capacity and mitigation and link to adaptive capacity and adaptation - this section also loses its focus by only dealing with climate issues without relating it to SD and equity issues.	Accepted but the sections can be shortened, not deleted.
15458	4					In many countries around the world, the issues of sustainable development and equity are critically linked to problems of accountability, transparency and corruption. Especially when it comes to resource management, management of resource crisis, inequality of resource access, and mitigation strategies, corruption is a huge impediment. Bringing in this issue will create a new focus in linking sustainability and equity issues to climate change debates within the larger context of democratic deliberation.	Accepted. We can include this in a more general section about political economy; i.e., distribution of decision-making power and how it is wielded, and what effect this has in the feasibility of implementing climate policy (and SD policies more generally). (Chuks, in governance/policy capture)

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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7367	4					The distinction based on the Annexes of the Convention makes sense but I am unsure the inclusion of the "LDCs" is important here. Perhaps somehow of reflecting regional contributions, and not just one group of countries?	Intention is to show the relative value of indicators, not suggest value is substantial. Check whether LDCs appears in UNFCCC.
7366	4					The figure runs counter-clockwise which is confusing, the labels should also be above the graphics.	Noted, will improve figure
17301	4					<p>The chapter is well designed. It brings together the concepts of equity and SD in some details. The chapter attempts to do justice to the vast emerging literature.</p> <p>Most of the practice and innovation of both SD and equity is being undertaken in the developing world and mostly as projects. Hence the literature of this area is weak and the assessment in this chapter does not show it well. Attempts may be made to reach out and find the literature on this. As several authors of the chapter probably have access to quality and reliable grey literature.</p> <p>Despite the IPCC strict guideline of inclusion of grey literature, attempts may be made to enrich the chapter with examples.</p> <p>General remark is that the two recent IPCC special reports on (a) Disaster and (b) Renewable Energy can offer input for this chapter.</p> <p>An approach on equity in (a) mitigation (b) adaptation (c) capacity building and (d) finance</p> <p>may form a good basis for supplementing the existing texts.</p> <p>Since the authors have identified a number of gaps where more text will be analyzed and several tables and diagrams, which will be developed further, I am making general comments at this stage of chapter writing. More detailed analysis and review comments will be given to the subsequent drafts.</p>	Taken into account. Ambuj will provide examples to be put in various sections.
2924	4					Is it possible to illustrate only the year 2005? and additional to illustrate a figure from for a limited value of pathways?	Noted, Figure to be revised
2925	4					Is it possible to add a timeschedule of the evolution of conceptual thinking?	Noted, will improve figure
3957	4					A general comment is that this chapter, like chapters 1-3, it ignores the problems of incentives and inadequate information that bedevil political processes and the centralised direction of the activities of vast numbers of individuals. When discussing moral and equity issues they also seem to ignore the critical issue of when it is moral and ethical to use the coercive powers of the state to throw dissenters into prison, or worse.	Taken into account. The governance subsection will be sharpened (Chuks)
4044	4					This section could be substantially shortened if it just dealt with and elaborated on those approaches that consider Sustainable Development and Equity in the context of climate change mitigation/adaptation, rather than discussing the whole raft of 'various' approaches. Particularly section 4.2.1 could do with more extensive editing to just a few sentences that outline key concepts/trends.	Taken into account in the new version of 4.2.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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18345	4					The discussion of drivers needs to be coordinated with Chapter 5 (section 5.3) to sharpen specific SD focus. Please think about how your discussion of determinants, drivers and barriers should be taken up in subsequent chapters and how it is actually taken up.	Coordination with ch5 to be improved (Esteve).
4840	4					Again, this section is too long and should be presented in a more concise manner.	Will shorten and/or make more clear.
8257	4					It should be more consistent or linked with section 4.2.1 in which the definition of sustainability is given and three pillars are spelled out. Similarly, the equity may be explicitly defined in the three broad categories - intergenerational, intra-generational, and procedural.	Taken into account in the revision of 4.2.
8492	4					As noted above, this tends to frame SD as an outcome, rather than a process. Similarly, it may be helpful to discuss proximal and distal drivers in this context, and the importance/relevance of interaction effects between the different determinants	Accepted. We acknowledge the need to show further the interactions between the different determinants. However, we would not support the writing of an additional sub-section on interactions, but rather stressing the interconnections in existing sub-sections. Regarding the "proximal" and "distal" terminology, we are not sure what they mean; i.e. we don't know if they are referring to direct and indirect drivers or to something else.
8258	4					It discusses about the determinants, drivers and barriers of sustainable development, but less about those of equitable development. It would be nice if the authors can discuss about the barriers and drivers of equitable development.	Accepted. We are in agreement with this comment. We need to stress the equity dimension of SD more prominently in each sub-section and we will do so more effectively in the SOD.
13751	4					I miss a bit the role of knowledge as a driver or barrier of change for sustainable development in this section. Isn't in particular scientific knowledge an important driver to address sustainable development issues? This is one of the core ideas behind sustainability science and I would recommend to add a sub-section on knowledge.	Accepted. We agree that the role of knowledge is important and that it may need to be more stressed and highlighted in the text. However, we are inclined to give it more weight on section 4.3.2.
9253	4					There is no mention of the effects on population migration etc due to parts of the northern hemisphere warming more than most of the southern hemisphere. This could be a key factor in changes of resource use, local sustainability and survival. Certainly an issue for small southern hemisphere countries; a mere 4M immigrants to NZ would double the population/demand for food/electricity/water etc.	Accepted. The SOD's section on population and demography will pick up on migration issues and build on existing evidence of climate-induced migration processes -if existing, and in liason with Working Group II-.
4841	4					Again, this section is too long and should be presented in a more concise manner.	Accepted. The section will be synthesized in the SOD.
12707	4					Please take a climat change fokus when addressing the issues (esp. the first two which may also be skipped)	Rejected. We are inclined to think that an introductory paragraph is needed to frame the issue beyond the climate change context.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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4842	4					Again, this section is too long and should be presented in a more concise manner.	Accepted. The section will be synthesized in the SOD.
12708	4					This section can be shortened (you may like to delete all parts which are not directly linked with climate change issues)	Accepted. The section will be synthesized in the SOD.
4843	4					This section is very lengthy. The length should go down considerably here to make it fit into the framework of the report.	Accepted. The section will be synthesized in the SOD.
12710	4					This section can be shortened (you may like to delete all parts which are not directly linked with climate change issues)	Accepted. The section will be synthesized in the SOD.
12714	4					This section can be shortened (you may like to delete all parts which are not directly linked with climate change issues)	Accepted. The section will be synthesized in the SOD.
3233	4					Section is fine as such. But it should be better integrated into the topic of the chapter.	Accepted. The overall SOD, including this section, will strive for further synthesis and integration.
17641	4					Please summarize again this section. The section seems to be long.	Accepted. The overall SOD, including this section, will strive for further synthesis and integration.
12715	4					This section can be shortened (you may like to delete all parts which are not directly linked with climate change issues)	Accepted. The overall SOD, including this section, will strive for further synthesis and integration.
12194	4					I recommend to shorten the descriptive parts of this chapter and instead focus on the analysis of determinants, drivers and barriers with regard to sustainable development and equity.	Accepted. There is generally a need to strike a balance between the framing of SD and equity, the weight we give to these dimensions in each sub-section, and their descriptive content
12195	4					In the context of chapter 4: how do you approach the topic of finance, what is the analytical framework and object of analysis of chapter 4.3.8? Does this chapter aim to cover UN related finance initiatives/literature only? (you refer to the UNCSD and UNFCCC)	Accepted. We agree with the reviewer's comment. There is a need to recognize what sources of finance in the UNFCCC and beyond exist, but we need to place emphasis on how finance is determinant or how it influences SD and equity in the context of climate change. We need to assess a broader question: what role finance plays in acting as a driver or barrier to SD and equity in the context of climate change?
4844	4					This section is again lengthy and is only summing up existing financing funds. There are very few scientific results reported about their impact.	Accepted. See comment above.
12716	4					No comments since it will be rewritten.	Noted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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18337	4					Guiding question: Please think clearly about the purpose of the consumption debate within the AR5 report and liaise with Chapters 5, 12 and 14 regarding a clear and suitable division of labour. What are the relevant insights to be gained from this debate and as discussed in the literature, for e.g. burden sharing proposals? What role does the consumption debate in context of behavioural change play? How should the issue of 'embedded emissions' be taken up in connection with the discussion on trade in Chapters 13 and 14?	Accepted. Meetings organised in Vigo with relevant authors from Chapters 5, 12, and 14. In Chapter 4 we discuss empirical and conceptual aspects of 'consumption' more broadly, focusing on sustainable consumption, and not only in relation to the effects of consumption on GHG emissions.
16245	4					This section makes an implicit assumption that consumption is reflected by flows of goods or services, while ignoring the role of stocks. This neglect of a stocks perspective can be very misleading, because equity, quality of life, and well-being are often better reflected by the stocks of the natural and built environment than by consumption flows into these stocks. This difference is also relevant for carbon accounting: countries that have built up their infrastructure stocks in the past (typically industrialized countries) usually have large stocks but a low demand for emission-intensive materials such as steel and cement, while emerging market economies have still relatively small but rapidly growing stocks, which leads to higher emissions in the production of these key materials (which constitute about half of all industry emissions).	Accepted. We will retain the focus on consumption and also consider the role of stocks in level of consumption, and discuss critically the apparent neglect of life-cycle approaches to consider stocks. Would have been useful with a reference, but we will search for some.
12720	4					The relevance for climate change issues should come out more clearly. In this regard there should also be some words on the decoupling of growth and emission development. The relationships mentioned, here, also calls climate policy to come up with a shift in current income distributions. This should be made transparent.	Ok, but avoid overlap with other chapters.
12722	4					I miss the link to climate change issues.	Admittedly, the link is indirect, but it is there: Inequality (supposedly) affects consumption patterns, which in turn affect GHG emissions. We will explain the links more clearly in the beginning of 4.4.1. Also, check whether this discussion is also found in Chapter 3.
8494	4					There is a significant literature in public health relating to this issue, and the importance of relative deprivation, and in turn the implications for health and well-being. This extends beyond consumption, to broader questions of income, social gradient and equity. See for example the WHO Commission on the Social Determinants of Health, Marmot (2007) in the Lancet, and the Whitehall Studies (Marmot I 1978) Journal of Epid. and Community Health	Accepted. We will review some references on the general health aspects of well being and the link to consumption levels and inequality, but not literature on the socio-economic determinants of specific diseases. These references will include (Jakab and Marmot, 14; Marmot; Bell et al., 2010). The Whitehall studies from 1978 appear somewhat outdated for the present purpose, so will cite more recent studies.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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12725	4					The link to climat change issues is not obvious. The chapter should be shortened and more focused.	We can shorten this sub section and make the climate linkage explicit. Also need to consider that the link between production and climate change is not treated with as much detail as the consumption discussion, but this is partly due to the initial description of the Chapter, where consumption is explicitly mentioned. Involving Michael Hauschild as Co-Author will help address this bias.
4845	4					For me this section could be most interesting (given my background). Unfortunately, the contributions of John and Tim are not included yet but I trust the two will deliver a good summary of the psychological research in the field.	Accepted.
12727	4					The link to climat change issues is not obvious. The chapter should be shortened and more focused.	There is a link and this can be made more explicit. Check if John and Tim can assist.
4846	4					The usually weak correlation between consumer attitudes in population surveys and consumer behaviour needs to be discussed in this section.	Not relevant.
13689	4					Please add text regarding the importance of voluntary choice of frugal lifestyles, often linked to religious beliefs (see e.g. Lastovicka, J.; Bettencourt, L.; Shaw Hughner, R.; . Kuntze, J. (1999): Lifestyle of the Tight and Frugal: Theory and Measurement, in: Journal of Consumer Research, 26, p. 85-98; Pepper, M.; Jackson, T.; Uzzell, D. (2009): An examination of the values that motivate socially conscious and frugal consumer behaviours, in: International Journal of Consumer Studies, 33, p.126–136); Shaw, D.; Newholm, T. (2002): Voluntary simplicity and the ethics of consumption, in: Psychology and Marketing, 19, p. 167–185; Etzioni (1998): Voluntary simplicity: Characterization, select psychological implications, and societal consequences, in: Journal of Economic Psychology, 19, p. 619-643.	Accepted. We will review the following references on 'voluntary simplicity': (Lastovicka et al., 1999; Shaw and Newholm, 2002; Etzioni, 2004; McDonald et al., 2006; Pepper et al., 2009; Shaw and Moraes, 2009). I included this in section 4.4.3 [JT]
16340	4					A suggestion for evidence for this section which has yet to be written. Residents living in a sustainable community in London report high levels of well being and quality of life even though they are consuming fewer resources than the local average "BedZED seven years on" http://www.bioregional.com/news-views/publications/bedzed-seven-years-on/	Accepted. We will read the suggested report and review scientific literature that reports on similar experiments. Half paragraph on the "attitude-behavior" or "values-action" gap moved from section 4.4.3, adapted and integrated into section 4.4.3.1 [JT]

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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16341	4					I think a reference to the useful application of the forthcoming sustainable development goals would be a good signpost here. It was agreed at Rio+20 (paragraphs 245-251) that a set of "Sustainable Development Goals" will be developed. I think that this should be mentioned in WGIII report, as I think this will be an important way that nations will be delivering truly sustainable development and so mitigation strategies post 2015. The document says that the SDG's should be "action oriented, concise and easy to communicate, limited in number, aspirational, global in nature and universally applicable to all countries while taking into account different national realities, capacities and levels of development and respecting national policies and priorities. (...) Governments should drive implementation with the active involvement of all relevant stakeholders (.....) progress towards the achievement of the goals needs to be assessed and accompanied by targets and indicators (....) The document states that a working group will be set up of experts to report to the 68th session of the UN. There is a process where stakeholders will be able to input to this expert panel and to the UN. IPCC and readers of the IPCC report should be making sure that they have the right science to base the goals on. The UN will be looking for this. The SDG's are expected to be the mainstay of the post 2015 development agenda	Accepted. This comment should probably be addressed sooner Chapter 4 than in Section 4.4.3.2, such as in Section 4.2, and hence by Yokeling.
12730	4					The link to climat change issues is not obvious. The chapter should be shortened and more focused.	Noted.
4847	4					Why is this section included in chapter 4? I do not understand how it fits in here. Since Edgar Hertwich is a lead author in one of the other reports I assume that this topic will be handled in another report much more thoroughly than it can be here. Can 4.4.5 be edited out of report 3?	Not accepted. The reason is that we were asked by the IPCC to do so. The whole section will be better coordinated with Chapter 6 (and 14) through discussion with Edgar and other LAs in that chapter.
4848	4					This section overlaps to a substantial degree with 4.4.5	Accepted. In the SOD, Section 4.4.6 will be limited to a conceptual and methodological discussion of spatial considerations in sustainability assessment (currently the title of section 4.4.6.2) to serve as a guide to the reviews of such assessments throughout the rest of the report. The discussion of GHG emissions embodied in trade will be more generic (not only GHG emissions but a wide range of resources and emission are embodied in trade) and then GHG emission embodied in trade will be further dealt with in Chapter 5.
18338	4					Guiding question: In how far is your development pathways discussion relevant for preparing the discussions in Chapters 5 and 6 (in particular as Chapter 6 does not discuss specific sustainable development pathways)? Also it would be useful to discuss the risks and SD implications of different transformation pathways and related response measures (leapfrogging evidence, trade-offs, synergies, positive and negative co-effects), in particular with a view to the subsequent sectoral analyses.	Link to Ch.5 and 6 critical, explored during LAM3 with relevant chapter authors.
18139	4					Title: Given the preference for using development path in the text as explained in footnote 9, title should also reflect this and state "development paths" instead of "pathways").	Will keep pathway in title (as imposed by IPCC plenary). If necessary, will delete footnote 9.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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16342	4					An example of a civil society approach to implementing sustainable development paths based on limit to resources and equity is "one planet living" http://www.bioregional.com/oneplanetliving/what-is-one-planet-living/	it is better to not quote specific initiatives such as "one planet living" because there is a huge list of similar initiatives.
8495	4					Note the importance of institutions, institutional design and institutional inertia as part of this 'equation'	Good point. Will look for peer reviewed literature.
18346	4					Please link your discussion of different modeling approaches to relevant section in Chapter 3 (3.10.2) to avoid redundancies and sharpen specific chapter-relevant focus.	Will explore link and overlap with Chapter 3
18349	4					Please link this discussion to the relevant section in Chapter 3 (3.12) to sharpen specific SD focus and to avoid redundancies.	Will explore link with Ch.3 but 4.5.3.2 has a priori a different approach so it's not redundant
10431	4					Remove this section or rewrite it as a shorter more applied section	4.5.3.2 is very short. Presents interesting concept of Technological Innovation Systems but can be improved if linking directly to CC and SD.
12739	4					Maybe you like to add an introductory sentence (pointing out that mitigation requires technological transition, so the question arises how to foster).	Accepted.
12198	4					General comment: it is not clear what exactly you are referring to if you speak of 'response capacity' as you do not insert any references; see e.g. the related article by Gallopin (Gallopin, G. C., 2006, Linkages between vulnerability, resilience and adaptive capacity, in: Global Environmental Change 16, 293-303.) on the conceptual interlinkages between vulnerability, resilience, adaptive capacity that outlines part of the respective scientific debate.	Noted. Response capacity is just a catchword for mitigative and adaptive capacity.
8265	4					Section 4.6 could develop more on the differences between reactive adaptation measures and anticipatory adaptation, and provide examples of policies for each type, as well as the pros and cons of each of them (with regard to costs, avoided climate change costs, and how they cope with risk and uncertainty). The section could also develop on planned vs autonomous adaptation. An overview of these types of adaptation can be found at: http://know.climateofconcern.org/index.php?option=com_content&task=article&id=148# ;	Accepted (Dick).
12199	4					What are the references the definition of 'adaptive capacity' is based on?	Noted. (Dick)
12202	4					General comment: The title of this sub-chapter is 'mitigative and adaptive capacities'. Yet in the text you write about 'mitigation' and 'adaptation' and not about 'capacities'	Rejected.
18334	4					The chapter almost seems to begin again from this point, and proceeds with considerable clarity. Almost tempted to say cut and start from here.	Noted.
18339	4					Guiding question: As most of the results presented in the AR5 rely on neoclassical approaches, please think about how to frame your discussion of SD adjustments to existing economic tools (4.7.2) so that it provides a useful framing for the reader?	Noted.
3617	4					Delete or integrate with Chapter 3 (see comment 9 above)	Taken into account.
12750	4					You may like to consider to make either crossreference to Chap. 3 or to place the chapter there.	Taken into account.
3618	4					Delete or integrate with Chapter 3 (see comment 9 above)	Noted.
8935	4					This section can potentially be considerably shortened by summarizing the different approaches in Chapter 13	Coordination with ch 13 is under way.
3619	4					Delete or integrate with Chapter 3 (see comment 9 above)	Noted.
2563	4					Needs more referencing. Too subjective	Accepted.
8498	4					Note that some sustainability planning kits, etc. have added culture and governance as pillars of sustainable development. Most recently, the UN has included institutions	Noted. (Yoke Ling)

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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4839	4					Especially the first half of the summary is too long and too narrative (too little concrete). It should be edited by at least 1/3	Accepted.
17091	4					should specify more clearly state the limitations of modelling in making the transition between pathways AND in addition to technology it must consider lifestyle shifts (demand management) as well	Noted (Franck)
17094	4					'equity and burden sharing in the context of climate policy' should also consider sharing of the global carbon budget and not just costs	See "Resources sharing approaches"
17092	4					"Why sustainability and equity matter" should not be considered in terms of the three pillars of sustainable development because they deal with the integration of policies and not with "equitable access to sustainable development" as agreed at Cancun by all countries, that is, sustainability and equity matter because they are about comparable standards of living and equality within global ecological limits. Please see the 'core principles' in this text in page7 lines 17 – 27	Will reference EASD (in 4.7.3). Insufficient literature on EASD to form basis of this section.
17093	4					the key gap is how all can achieve comparable standards of living within the global carbon budget. The Rio + 20 World Conference of Sustainable Development agreed that people are at the center of sustainable development	Useful overall framing for key gap.
17090	4					not relevant in framing issues with respect to global sustainability, which is the concern here with reference to global equity. If these are retained then the distinction between global and national equity must be made clearly.	Noted.
10274	4	0				K. Akimoto et al., "Consistent assessments of pathways toward sustainable development and climate stabilization", Natural Resource Forum (forthcoming) will provide beneficial information on climate change and sustainable development including their trade-offs and synergies. Please see the paper.	Noted. Will check this paper (Yoke Ling)
3203	4	0				The relationship between avoiding climate change and ensuring sustainable development is commented upon at the beginning of Chapter 4, but not discussed properly later. There is clear evidence for the claim that serious climate change may well undermine future generation's well-being, and thereby undermine sustainability. Hence, avoiding serious climate change is necessary for sustainability. In the report it is also argued that sustainable development is necessary for avoing climate change (see comments below). For this, no empirical evidence is offered. E.g., one might hope that changing consumption patterns so that wellbeing is generated in a more sustainable manner will be an important ingredience in combating climate change. However, the last couple of decades have seen a spread of the consumption patterns of North-America and Western Europe to newly developed countries. Is it at all feasible to implement the required change in consumption patterns during the time available before climate change becomes serious and irreversible? I strongly suggests that Chapter 4 discuss in a serious manner the possibility that effective policies, supported and enforced by a sufficient coalition of countries, that succeed in combating climate change might undermine short-term development in parts of the world and hence, the potential wellbeing of people living there. Also, the emphasis at some instances seems to be whether combating climate change is a means to sustainable development and equity; it should be the overriding goal in this context.	Accepted. We specify the interrelation SD-climate change and policy in the new version (section 4.1.4.2)
8795	4	0				The tenor of much of the chapter makes barely recognised predictive epistemological and utilitarian ethical assumptions.	Taken into account (more references).
8796	4	0				There is a danger that Human capital is an unexamined concept in this chapter and the usage typically makes humans and their relationships little more than cogs in the machinery of industrialism and capitalism. Some uses do suggest a less utilitarian view - e.g. where increased human capital could promote 'for changing consumption patterns'.	Will edit the executive summary to avoid such interpretations. (Esteve)

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18295	4	0				<p>There is much that is terrific about this draft chapter - it is ambitious, scholarly and informative, and often a fine guide to the relevant literature. I want to acknowledge this at the outset, because for brevity's sake I concentrate on my criticisms which will therefore make my response seem unduly negative and tough. Overall I find the chapter is too long and tests endurance. Its overall argument unclear. It crammed with detail but also has sections that are over-elaborated and seem poorly tied to the main task of the chapter and of the IPCC5. Too often I wondered why I was reading what I was - even when it was interesting. Stylistically, the chapter still needs further work to make it less staccato and lumpy. Numerous sections feel as though they are simply parked there rather than part of a larger argument or narrative and its material on climate change could almost be separated out. By contrast, the executive summary does not read as clearly as it must, recognising that this is often all people read of a chapter, and this may also be a reflection on the problem of the clarity of purpose of the chapter overall. The summary presentation of equity principles is confusing and needs clarification. Discussions of sustainable development (SD) are intrinsically fascinating but I feel the chapter sometimes loses itself and is not clear enough about where and how SD and climate change overlap and influence each other. The chapter should be edited with a view to clarifying, enhancing and reinforcing this connection. Its contents needs work to eliminate repetition (for instance, discussions of ethics, and of indicators) crop up several times. The foundational material on ethical principles for both SD and CC should be dealt with once, and early on. The chapter requires a conceptual summary of SD at the outset, introducing the main elements which are then elaborated upon. The reading of the literature on SD is sometimes superficial and needs to be both toughened and deepened, using Brundtland Report more prominently. There are five core principles guiding SD: i) intragenerational equity, ii) intergenerational equity, iii) biodiversity preservation, iv) precaution, v) ecological/planetary limits to growth. The last three are not given full enough consideration. In particular, the chapter offers little comment on three significant related bodies of research: on 'limits to growth' (both in the original debate and more recent revisitations) which has been an important driver of the SD debate, on dematerialisation, or on ecological modernisation. A discussion of critiques of conventional (material-based) economic growth and of green growth is vital, especially post Rio+20. The chapter also underplays the importance of institutions (political, legal and social) as factors guiding and occasionally determining the capacity for social and technological transitions/development.</p>	<p>Agreed: need clarity and coherent narrative.</p> <p>On conceptual summary of SD: 4.2 should address the reviewer's point.</p> <p>Will add a discussion of green growth and its contested relationship with equity (Chuks in 4.2).</p> <p>Also the connection between degrowth and SD, the general decoupling question (Esteve, Franck) in 4.5.</p> <p>Importance of institutions: part of political economy discussion 4.3.4. (Chuks)</p>

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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3276	4	0				<p>The use of the term “luxury” is misleading (see e.g. Sections 4.4.1 and 4.7.3.1): I suggest it is replaced by “non-essential” or “inessential”. This is because luxury consumption can refer to purchase of goods that are higher than average price per unit, such as a Burberry coat or expensive cheese. In fact the purchase of luxury goods by consumers is generally less environmentally damaging than average consumption (Girod and De Haan 2010). The reason is that consumers have income, and once they have it they will either spend it or save (invest) it. But whatever they do with it, it's use will give rise, directly or indirectly, to GHG emissions. So if consumers purchase luxury items which have below average GHG intensity of expenditure (kgCO₂e/\$), emissions will be lower than if they spend the same amount of money on cheaper goods. Also, luxury items are likely to have higher durability and hence longer product lifetimes, which can also reduce the throughput of goods and contribute to reducing emissions. Thus whereas in general the purchase of “inessential” items should be discouraged, the purchase of “luxury” goods by consumers with excess income should be encouraged.</p> <p>This discussion does, of course, lead on to a discussion concerning incomes and and economic growth, which Tim Jackson will, I believe, be adding to the report.</p> <p>Reference: Girod, B. and P. De Haan (2010). "More or Better? A Model for Changes in Household Greenhouse Gas Emissions due to Higher Income." <i>Journal of Industrial Ecology</i> 14(1): 31-49.</p>	<p>We agree that the concept of luxury consumption is imprecisely defined; what is considered luxury today can be considered a necessity tomorrow. It is a value loaded term, which is difficult to apply in an objective way [JT, translation from Danish by Simon]. Yes, luxury consumption may have lower GHG emissions, but not always (e.g. driving a speedboat or a large car, causes large emissions). Over-consumption versus under-consumption, is the main issue, and is linked to inequality. "Essential" versus "In-essential" consumption also lends itself to normative interpretation. The main point is to examine what effect inequality has on emissions. (Simon)</p>
16935	4	0				<p>Despite the flagged sections “to be completed” and some points of disagreement noted below, this chapter is in a superb state for a FOD: congratulations to the authors. The starting review of previous IPCC reports is extremely helpful. As someone not well versed in this area, I found it all an enjoyable and informative read. My comments are correspondingly limited.</p> <p>I have one overall stylistic criticism which is that – in sharp contrast with many of the other chapters – the absence of Figures is striking. Almost the only numeric Figure in this chapter at present (Figure 4.1) is so complex as to be almost incomprehensible. I understand that some more Figures are due to be included in the SOD; give careful thought to this, and also to the clarity of their message.</p> <p>This chapter should potentially have particularly close intellectual relationships to chapters 3, 5, 12 and 14, some way of fostering links could be useful (and possibly it might make sense to move / adapt one or two figures from these). □</p>	<p>Noted. More figures will be added.</p>
18335	4	0				<p>General comment: Chapter 4 still fails to provide a clear and easily accessible framing of sustainable development that can be taken up by subsequent chapters. The TSU is thus submitting a range of questions that can guide the author team in focusing their discussions in the relevant sections.</p>	<p>Taken into account in particular by a new table linking to other chapters.</p>
18336	4	0				<p>Guiding question: Please think carefully about how other chapters, such as Chapter 6, should be read with a view to the SD debate presented in your chapter? Here, you should think about how to provide a vision of what will be discussed (such as the decoupling of growth and emissions, mitigation reductions, the weak and strong SD debate within the context of stabilization scenarios), and clearly outline what is beyond the scope of the AR5. Could you also please develop a clear vision in how far your guiding narrative regarding consumption and wellbeing, equity and capacity building should be taken up in subsequent chapters?</p>	<p>We will connect better to the other chapters (new table).</p> <p>The framing definitions will be improved (4.2).</p>
18340	4	0				<p>The chapter strongly requires the introduction of formal definitions of SD such as those presented in the excellent paper by Fleurbaey, 2009. In this context relevant indicators should be introduced and discussed.</p>	<p>Some formulae can be introduced. (Marc)</p>

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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18341	4	0				The chapter needs to include the co-benefit debate (incl. green growth) and elaborate its importance in the SD context. In this context, linkage to Chapter 3 needs to be improved by highlighting the multi-objective nature of the welfare function. Also, relevant sustainability indicators should be introduced to be taken up in the relevant sections of the sector chapters.	Taken into account. A box on co-benefits and some discussion, coordinated with ch3, will appear in 4.2. (Marc) Noted. A key message is that there are no sector indicators of SD, apart from their contribution to the global components of SD. Macro indicators to be formalized.
18342	4	0				The chapter needs to improve its usage of relevant literature in several sections.	Noted.
18343	4	0				The consistency of the equity and justice discussion needs to be improved and better linked to Chapter 3 (please note the currently unclear distinction/interchangeable use of terms intergenerational justice and intergenerational equity). Following on from this, better guidance on how equity issue could be operationalized for policy making would be useful.	Taken into account in 4.2 and 4.7.
18344	4	0				Regarding the policy and finance context, the chapter should address the following aspects more clearly: a) Access to climate finance for developing countries to avoid lock-in; b) Public-private partnership discussion should be expanded and better linked to SD, c) SD perspective on CDM should be included, d) SD objectives as emerging from international arena (Rio+20 update) should be covered. □	Taken into account in the new finance subsection 4.3.8 and the revised 4.7.3 (Yoke Ling, Sivan, Esteve) CDM might go to finance or technology (Yoke Ling; example of double goal mechanism in 4.2; examples of problems in 4.8 -refer to section 13.13.1.2)
17636	4	0				This chapter was organized previous studies in a careful manner. However it the chapter was seemed to be long. Please try to summarize for each sections for being shortened. The reviewer suggests to make tables for organizing previous studies in order for readers to understand clearly.	Accepted.
18609	4	0				Hard to read since big parts of the intended material is either un-written or will be revised (will be hard since the chapter is already substantially over the target).	Noted.
18610	4	0				An endless overview but leading us to ...?	Noted.
18611	4	0				A practical approach to sustainability is not indicated/presented.	Noted.
18612	4	0				In reality it is probably very hard to agree upon what is sustainable in an absolute sense (sustainable to whom, given what and in which time perspective?)	Noted. We already say there are different meanings provoking different responses.
18613	4	0				Would be more fruitful to relate sustainability to choices to be made and to discuss sustainability in relative terms?	Noted. This is already done to a large extent (indicators).
18614	4	0				Equity is even harder. There is a huge difference between taking equity related issues into account or to use cc measures as tools to achieve equity but the difference is not made. The latter will make it even harder to agree on any sort of progress in the cc area.	Noted. The former is indeed the focus of this chapter, as far as equity is concerned.
18615	4	0				FAQs much clearer in message – why?	Noted.
9018	4	0				There is a need to revise the executive summary to capture the relationship between mitigation and adaptation and sustainable development, particularly the relationship between the last two concepts.	Accepted.
9019	4	0				The Chapter must elaborate on the relationship among the three pillars – economic, social and the environment - in sustainable development. Potential policy instruments – such as carbon taxes, trade policy, international financial mechanisms – have each their own differential impact on these three pillars.	True but not directly relevant, as policy instruments are not the topic of this chapter.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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9020	4	0				There should be greater use of tables and figures in the Chapter to illustrate concepts such as the equitable access to sustainable development.	Accepted.
9021	4	0				It is important to expand the discussion on the role of inequality, burden sharing, and the concept of common but differentiated responsibility in this chapter on sustainable development. Income inequality is the driver of inequality in consumption and inequality in consumption is in turn the main determinant of the availability of development space for poor countries. Excess or luxury consumption is needed in order to sustain jobs and exports among developing countries. Luxury consumption in turn closes off development space.	Accepted. Sections 4.2 and 4.4 will clarify, as well as 4.7.
9023	4	0				There should be a broader discussion of technological development and transfer within the framework of sustainable development. There should be a discussion of why relying on voluntary, private channels will be inadequate to provide the scale and affordability of the transfer needed to developing countries. The precedents of the green revolution and the Montreal protocol can be recognized as successful precedents on the role of international public policy and resources to transfer technology commensurate to the scale and timeliness required.	1) The technology point can be integrated into our sub section on sustainable production 2) The mechanism (policy and resources) of spreading the green revolution was effective.
9024	4	0				There is inadequate coverage of the financial transfers required for sustainable development. The Convention has set out the responsibilities for developed and developing countries in terms of technology transfer and financial support for realizing sustainable development goals	Transfers required for SD -- is it well defined? For CC -- should be taken up in Ch 16. In Ch 4, can raise issue and connect to equity discussion (4.7.3) and finance subsection (Sivan, Yoke Ling)
11126	4	0				It would be beneficial if it were substantially reduced, in particular sections 4.2.1, 4.2.2 and 4.3.5. In particular, discussion of equity is too long and the same is true for the concept of PAT and how it's components are presented in this chapter.	Noted (accepted re shortening).
12841	4	0				In English speaking countries the word sustainable means ecological sustainable where as in Brasil it means economical sustainable. I propose to add a new FAQ "Is economical sustainable equal to ecological sustainable?" The content could be: in the long term it is, but for the short term it is not always true.	Taken into account in 4.2 (Yoke Ling)
3143	4	0				There is a huge overlap with chapter 3. I suggest that authors of both chapters review the other carefully and make some decisions about the strategy. For example, much of section 4.7 overlaps chapter 3. Discussions of justice also overlap. The chapter is massively over limit; maybe it could be trimmed by focusing more squarely on what's new since AR4. The chapter is very heavy on theory and large passages of text and has much too little real empirical information. Section 4.3 and 4.4 overlap other chapters—such as the discussion of drivers (chapter 1, chapter 5, 6, and 7) and the discussion of social decision making (chapter 2).	Taken into account in the revision (shortening). But theory and reference to chap3 and concepts prior to AR4 are needed for this framing chapter. Coordination with other chapters under way.
18457	4	0				Clearly, the authors of this chapter have done a very thorough professional job of presenting the current knowledge base about many aspects of sustainable development and its connections with equity issues. The authors really know their stuff.	Noted (thank you).

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
18458	4	0				Clearly, the authors of this chapter have done a very thorough professional job of presenting the current knowledge base about many aspects of sustainable development and its connections with equity issues. The authors really know their stuff. The general question is whether, at this stage in the evolution of IPCC reports, it makes sense any longer to conceive of an IPCC chapter as an encyclopedic coverage of diverse literatures – given the expanding knowledge base and the explosion of published literatures. Many observers think that, instead, chapters should be moving toward assessments of the literatures and the main points to be drawn from those foundations for the WG report. In other words, rather than saying “here is the knowledge base,” a chapter should be saying “here is what the knowledge base tells us.” In this case, it seems to me that the chapter covers so much territory that it loses any thread of main arguments and points. It is too long and too detailed, following an Executive Summary that comes across as dense and academic. It would be highly useful to (a) extract from the content of the chapter a limited number of key takeaway messages, (b) organize the ES around those messages, maybe in bulleted form, and (c) then use that structure to rethink what to say in the body of the chapter (and how to shorten it). For example, after p. 15 the chapter does not really return to a discussion of equity issues until p. 59, essentially allocating only about 20 of the 81 pages to equity. My suggestion would be that the discussions of sustainable development – sections 4.3, 4.4, 4.5, and 4.6 – be substantially condensed, in a number of cases recognizing significant overlaps with other chapters (e.g., regarding development pathway transitions with Chapter 6). This part of the chapter might have twice the impact if it were half as long.	These remarks will help us shorten and clarify.
6091	4	0				It may be better to add a paragraph describing that climate change is one of the very important factors of sustainable development and, therefore, how to allocate scarce resources among various issues including poverty, health care, climate change etc. is one of the key issues in pursuing SD (Refer to 1st paragraph of the Executive Summary of Chapter 6). Also, though there are frequent citation of Rio Declaration in 1992, I found very few description on RIO + 20. What is important here is that, after 20 years, SD is becoming more and more urgent issues. This kind of description should be welcomed if readers find them in executive summary.	CC as important factor of SD is main point made in second para of key message (see p.10). This will improve in the new section 4.2. Will discuss Rio+20.
4026	4	0	0	0	0	The current draft represents a good and comprehensive overview of the topic. However I fully agree with the TSU that the text needs to be shortened. On the other hand, I would not suggest leaving out any (sub)section of the chapter completely. They are all important. The authors will likely need to find the way to shorten almost each and every section of the report. For example, the historical perspective might be shortened while the focus on recent developments, which are directly relevant to the climate change politics, needs to be preserved. This actually brings me to say that the chapter might as well need to be streamlined. All in all this is the climate assessment but it is yet to be clarified what is driving what? Is sustainable development driving the climate change policies or it is the other way round – the climate change policies is now a main driver of decision-making for sustainable development? For example, FAQ4.1 does not provide a consistent response. Otherwise, I do not have particular comments. Thank you.	Taken into account. Will shorten as part of overall shortening. The relation SD-climate policy will be specified further (inducing a revision of FAQ 4.1) (Marc, Sivan)
10433	4	0	0			There is no flow between paragraphs in this chapter	Accepted, will try to improve.
5461	4	1		7		The executive summary of this chapter does not discuss a key element of sustainable development- the potential for common pathways to this goal. The chapter summary seems focused more on the concept of SD rather than the implementation or tools to reach this goal. As authors note on pg 6 one 7 studies indicate a path forward- yet they seem to contradict themselves in a following paragraph- pg 6 line 15- the paragraph starting on line 18 seems to be the key to this discussion and the focus on elucidating solutions should be more pronounced- the discussion on most of pg 7 seems superfluous and not likely to reach consensus	Focus on "how do we get there" could provide helpful way to tighten narrative.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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5492	4	1		82		This chapter reads as though the authors were overwhelmed by the quantity of potentially pertinent information and unclear as to how to best synthesize it. Sustainability is not a clear concept and can have varying meanings based on the frame of reference used. Because of this, much of the chapter is devoted to review of concepts of sustainability, that while potentially related, are less critical than a more focused and narrow discussion with limited mention of the related topics. Personal happiness is one example of this. Perhaps the authors could more clearly couch their discussion in the Millenium Development Goals- and by doing so more clearly relate sustainability to GHG emissions	Discussion of MDGs may be useful as one small (and intermediate) step toward SD.
3375	4	1				I have difficulties figuring out what the punchline of this chapter is. Could the chapter summarize relevant sustainable development dimensions at the end, providing a guide for the sectoral chapters when it is their turn to discuss SD issues?	4.8 does this and will substantiate more (new table)
16677	4	1				This chapter needs to lose 25 pages. The first 4 sections could certainly be shortened. While the equity discussion should remain it should be shortened and back reerence the previous chapter. Part of the problems is that equity as it is used in this chapter is rather different than the notions of ethics and justice used in the previous chapter.	Noted.
15217	4	1				There are some repeated topics and descriptions. It needs to be restructure the chapter.	Will shorten and tighten narrative focus.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
13995	4	1		1		<p>Chapter 4 covers an important theme in a WGIII context, as it links sustainability and responses to climate change. In terms of responses such as adaptation, transformation and linkages to equity and sustainable development, these are also broadly discussed in WGII. What is clear from reviewing both drafts is that WGIII approaches the concepts and relationships with a narrower lens that is very much informed by economic perspectives. Other perspectives and literatures are not well represented and assessed. Clearly, to understand how change comes about (particularly at the magnitude and scale being discussed here) calls for an assessment of knowledge on the personal, cultural, institutional and systems changes that are needed to foster more resilient and sustainable development paths. This also involves questioning business-as-usual and asking what role culture and cognition (translated into economic and social policies, legal and legislative frameworks, resource management practices, educational systems, and power relationships) play in facilitating change. One specific example is the lack of reference to behavioral psychology in the discussion about consumption. Some may be covered 4.3.3, but a more holistic discussion on what drives and limits responses would include these perspectives throughout the chapter. Literature to consider: David Manuel-Navarrete (2010) Power, realism, and the ideal of human emancipation in a climate of change. WIREs Clim Change 2010, 1, pp. 781-785; David Manuel-Navarrete, Mark Pelling, Michael Redcliff (2011) Critical adaptation to hurricanes in the Mexican Caribbean: Development visions, governance structures, and coping strategies, Global Environmental Change 21, 249-258; O'Brien, K. 2011. Global Environmental Change (2): From Adaptation to Deliberate Transformation. Progress in Human Geography. Published Online 10 November 2011; Brown, L. 2010. PLAN B 4.0. New York: W.W. Norton and Company; Mezirow, J. 2000. Learning as Transformation: Critical Perspectives on a Theory in Progress. NY: Jossey-Bass; Hayward, B. 2008. Let's talk about the weather: Decentering democratic debate on climate change. Hypatia 23: 79-98; Moser, S. C. and J. Ekstrom . 2010) A framework to diagnose barriers to climate change adaptation. PNAS 107: 22026; Newman, P et al. 2009. Resilient Cities. Responding to Peak Oil and Climate Change. Island Press. Washington D.C; Westley, F., Olsson, P. Folke C. et al. 2011. Tipping Towards Sustainability: Emerging Pathways of Transformation. 3rd Nobel Laureate Symposium on Sustainability. Stockholm; Hulme and H. Neufeld (eds.) Making climate change work for us. Cambridge UK: Cambridge University Press; Patt, Anthony, Diana Reckien, Richard J.T. Klein, Detlef van Vuuren, Markus Wrobel, Nico Bauer, Gunnar S. Eskeland and Tom Downing (2010). What can social science tell us about meeting the challenge of climate change: five insights from five years that might make a difference. In M. Hulme and H. Neufeld (eds.) Making climate change work for us. Cambridge UK: Cambridge University Press, pp. 369 – 388; Meadows, D. 1999. Leverage Points: Places to Intervene in a System. Sustainability Institute Papers. Hartland, VT: Sustainability Institute; Geels, F. W., 2002. Technological transitions as evolutionary reconfiguration processes: a multilevel perspective and case study, Research Policy 31(8/9): 1257-1274; Berkhout, F. 2002. Technological regimes, path dependency and the environment. Global Env. Ch., 12(1): 1-4; Barbier, E.D: 2010. A Global Green New Deal: Rethinking the Economic Recovery. Cambridge Univ. Press; Anderson, K. L. and Bows, A. 2008. "Reframing the climate change challenge in light of post-2000 emission trends." Philosophical Transactions of the Royal Society A: Mathematical, Physical & Engineering Sci. 366: 3863-3882.</p>	<p>Helpful references. Will review WGII. Dimensions that need to be added: Questioning BAU: Culture/cognition: 4.3.3 and 4.3.2? Power relationships: Discussion of political economy</p>
13996	4	1		1		<p>The chapter starts out quite clear and structured, but from section 4.6 and onwards the text comes across as unstructured and lacking flow. The author team may consider reorganizing some of the text and also cutting back on sub-headings. In some cases the sub-headings do not match the text that follows. One example is 4.6.1.2.</p>	<p>Noted.</p>

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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13997	4	1		1		The chapter aims to discuss responses to climate change, including both mitigation and adaptation, and adaptive capacity and mitigation capacity. The chapter also wants to get at the root causes that climate change shares with other global challenges that both generate risks and push the world into unsustainability. If these deeper root causes had been the backbone for the discussion in chapter 4, it may have been easier to cover both mitigation and adaptation. But as the chapter now reads, it only partly covers both and in some parts it is even stated that the primary focus of the chapter is on mitigation. It would have been good to present the aim of the chapter more clearly upfront. This chapter has a difficult task, and unfortunately it suffers from the rather artificial thematic division between WGII and WGIII in terms of mitigation and adaptation responses. There is little doubt in the literature that ethical and sustainable responses to climate change include both mitigation and adaptation. Some even argue that mitigation is the greatest adaptation that society can do, and as the more newly introduced transformation theme takes form, there will potentially be more literature focused on ways to increase capacities and competencies of individuals, groups and institutions to understand, initiate and facilitate change and responses.	Primary focus is mitigation. Still, point is well taken, Chapter could benefit from focus on root causes (beyond those drivers discussed in 4.3, such as those discussed in Sygna's comment immediately below)
13998	4	1		1		There is a focus on consumption and production in this chapter, and subsequent chapters will focus on sectors. Since this chapter is that overarching one where responses are linked to the wider sustainability debate, there should be more coverage of the role of the financial and trade systems, governance and development paradigms, power and gender relations, knowledge production systems, and values and worldviews.	Accepted.
11567	4	1		43		Very interesting and well discussed passages.	Noted (thank you).
7751	4	1		115		I wanted to preface my comments with a short note to explain: i) I am an LA for WGII and wanted to review something in WGIII to get a sense of what was evolving - to make sure we are linking appropriately with WGIII; ii) I am not an expert in mitigation; iii) I have only reviewed the parts of this chapter on which I feel that I have some expertise - hence there are many sections that I have not read.	Noted.
18302	4	10	1			The point is better made here.... CC underlines the potential for equity and SD.	Accepted.
18303	4	10	10	7	14	'Can help' is an overstatement. If this second claim is to be made, it needs to be referenced. While I do not hold to the line that authoritarian action around climate change can be sustained indefinitely, the effectiveness of very different governance regimes in implementing short term technology-altering change is clear, and the 'inequitable' nature of those regimes may be central to their success. This chapter fails to grapple with this problem.	Noted. Here we do not talk about political regimees, only about general equity.
14009	4	10	12			Suggest adding "...without QUESTIONING EXISTING DEVELOPMENT PRIORITIES and adopting..."	Accepted.
14377	4	10	15			Sounds like Club of Rome in 1970s	Will delete the "transgressing planetary boundaries"
14313	4	10	21	10	24	Given the chapter focus on both mitigative and adaptive capacity, have/will cross-linkages with WGII chapter 20 on Climate-resilient pathways: adaptation, mitigation, and sustainable development been/be taken more explicitly into consideration in the next draft versions of chapter 4?	Will review latest WGII draft.
18304	4	10	22			Suggest changing 'will' to 'may'. The assertion about the link between SD and equity, and CC responses is discussed above. The assertion here is a value position which may be challenged. For instance, it is arguable that emphasising the SD elements of CDM may (sadly) lead to poorer mitigation outcomes. Also, the term 'climate challenge' is an aggregation that limits consideration. Change to 'the challenges of mitigation and adaptation'.	Accepted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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14010	4	10	23		24	Since the chapter aims towards discussing both mitigative and adaptive capacity, there needs to be a deeper discussion of why this is important in a sustainable development context, and that means going deeper into the social and human dimensions of responses and change. It should also be discussed whether adaptive capacity in SD context is different from what is talked about in WG II, where it partly is limited to responses to impacts.	Important point. General socioeconomic development (such as educating girls) as part of SD strengthens adaptive capacity but is different from specific adaptation measures
5463	4	10	25	10	43	Two paragraphs are great-	Noted.
8797	4	10	32	10	35	Discussion of the harm to individuals, societies and nature from over consumption and under consumption could include mention of 'Global Virtue Tradition' - in particular moderation or temperance - that stretches back before Aristotle's Nicomachean Ethics, is arguably the ethical starting point of the majority of the global population, includes epistemology most capable of coping with difficulties in predicting the Earth System and includes directly relevant literature such as http://www.earthcharterinaction.org/invent/images/uploads/echarter_english.pdf , Palmer M and Finlay V (2003, n.b. page xi, Faith in conservation: New approaches to religions and the environment, Washington DC: The World Bank, http://go.worldbank.org/3L9IDQNFO0 or http://www.arcworld.org/books_resources.asp . Accessed 9 May 2011); Engel JR & Engel JG (Eds.) (1990) Ethics of environment and development: Global challenge, international response, London: Belhaven; Connolly J (2006) 'The virtue of environmental citizenship' in Dobson A and Bell D (Eds.) Environmental Citizenship, Cambridge, Mass.: MIT press; Sandler R and Cafaro P (Eds.) (2005) Environmental virtue ethics, Lanham, Md.: Rowman indicates something of the connection between consumption, ethics and climate science, with my currently unpublished book manuscript being a much more in depth treatment.	Helpful references (for 4.3.3); Melissa Lane's book is another reference.
18305	4	10	36			The term 'data' is plural.... 'there are more data'...	Accepted.
3215	4	10	48	11	2	A just transition to reduced emissions is a nice plan A. Does there exist a plan B and do we need it?	Noted. Interesting question.
18306	4	10	48	10	48	A just transition is desirable... but it may not be necessary in the short term... Perhaps 'A just transition is desirable if enduring public support is to be gained....'	Accepted.
2914	4	10	36	10	43	proposal is to remove this alinea	To revise. What is meant is lack of access to meeting basic needs.
6891	4	10	4	11	5	Please provide more specific references to WGI/WGII AR5.	Accepted.
8491	4	11	10		12	See comment 20	See response to comment 20.
5464	4	11	21			Would seem logical to mention valuation of ecosystem services in this section	Rejected. This is dealt with in 4.7.
8798	4	11	26	11	27	That the key message understood by Chapter 4 from Chapter 3 is 'notions of wellbeing and social welfare function' is unsurprising but a sad indictment of the narrow focus of Chapter 3 on undemocratic and irrational utilitarian ethics in the face of an unpredictable Earth System which cannot be adequately understood to be fed in to CBA (Charlesworth and Okereke, 2010).	Taken into account. The notion of wellbeing is explained to be broader than this reader might think.
3216	4	11	3	11	4	What is the empirical basis for stating that this is likely?	Taken into account in the revision, by improving the framing of key concepts.
7761	4	11	33	17	16	This section, 4.2, is very theoretical and lacks empirical evidence. I have to admit the text looks much like my introductory lecture to sustainable development that I give to the 3rs year undergrads. A lot of this information provided in this section is straight from text books, it is not cutting edge research with relevance for climate change mitigation. I would reduce the entire section in its current form to a couple of paragraphs and use the remaining space to provide up to date and relevant empirical evidence. Specific comments on this section follow	Taken into account in the revision (shortening, but key concepts must be introduced). Not all readers will have followed your 3rd year lecture.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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7762	4	11	39	13	21	This section 4.2.1 seems unnecessary, refer to a text book which describes all this, cut to a couple of sentences - what is new in this area?	See previous box.
11731	4	11	4	11	6	Those targets and time peaking are not political agreement. Amendant to the aproprate wording is needed. Refer Decision 1/CP.16 and Decision 1/CP.17.	The term used in this sentence is part of the Executive Summary and so we need to revisit the section that addresses this too. On page 11, It is explicitly stated as "politically agreed targets". 2C was politically agreed in the Copenhagen Accord of 2009 but several UNFCCC Parties objected to the non-participatory manner that document was forged so it is in its entirety only formally "noted". 1.5 C is a call by a number of developing countries. Proposal for the chapter team: we can consider "politically noted" or "noted"
10642	4	11	4	11	6	Those targets and time peaking are not politically agreed. Amendant to the aproprate wording is needed. Refer Decision 1/CP.16 and Decision 1/CP.17.	See previous box.
9980	4	11	4	11	6	This part should be changed from "agreed targets such as 1.5 or 2C" to "noted targets such as 2°C". These targets are not agreed but only politically mentioned. In addition, the 1.5C target is not realistic and even 2C target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). <Reference> [1] Höhne, N., C. Taylor, et al (2011). National GHG emissions reduction pledges and 2C: comparison of studies. Climate Policy, 1-22, DOI:10.1080/14693062.2011.637818. Available at: http://iopscience.iop.org/1748-9326/5/3/034013/fulltext/ [2] Rogelj, J., W. Hare, C. Chen & M. Meinshausen (2011). Discrepancies in historical emissions point to a wider 2020 gap between 2°C benchmarks and aggregated national mitigation pledges. Environmental Research Letters 6, 9, DOI:10.1088/1748-9326/6/2/024002.	Accepted.
9813	4	11	44	11	45	Especially in this chapter you should add a very important part of the Brundtlanddefinition, that is omitted quite often "and chose their own lifestyle"	Noted. There is a long discussion of lifestyles in the chapter (section 4.4).
18307	4	11	5			Delete 'rather'	Accepted (Yoke Ling).
3217	4	11	7	11	9	Are we going to change the way people think within the very years available before GHG emissions must be reduced significantly? And how?	Agree - the UNFCCC/Kyoto Protocol legal regime as well as the Bali Roadmap were all agreements that would have made a difference if they had been implemented fully and meaningfully. Will need to flesh out 4.3 and rework the executive summary. (Chuks)

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
15651	4	11	10		12	One area where social scientific assessment can inform policy on the issue of equity is through empirical assessment of the strength of particular perceptions among different groups about what is equitable in the context of climate change policy. See e.g. Lange, A., C. Vogt, and A. Ziegler. 2007. On the Importance of Equity in International Climate Policy: An Empirical Analysis. <i>Energy Economics</i> 29:545-62. This area of research could be accorded more prominence in Chapters 4 (as opposed to the more theoretical literature covered in Chapter 3).	Accepted. Useful reference.
10977	4	11	4	11	6	Is the target of one point five degrees centigrade really agreed politically? It might be difficult to achieve even two centigrade.	This needs to be clarified. "Politically discussed targets" ?
6892	4	11	4	11	6	Such statements on projected climate change need to be based on the WGI AR5 assessment, probably best on WGI AR5 Chapter 12. Reference needs to be added.	Accepted.
13272	4	11	26	11	26	It is said: "(...) the hazard confronting future generations"; it should say "(...) the hazard confronting current and future generations"	Accepted.
18308	4	11				This section does not really deal with the issue of SD indicators.	Accepted. There was a typo in the title.
14314	4	11	33			The section on approaches and indicators remains quite general and the presentation of key concepts of SD and equity could be tightened up. More generally, the added value of repeating literature findings and discussions that in many cases precede both AR4 and AR3 can be questioned. It would be interesting and novel if the section could have a more pronounced emphasis on tying up the concepts of SD and equity directly to climate change and to the latest literature and 'real world' trends. It does so at the very end, page 17 line 4 to line 16, but the discussion of low carbon development strategies/economy/society/energy development could be expanded to include e.g. the concept of 'climate compatible development', 'climate resilient development', NAMAs, the issue of mainstreaming climate change into development planning and decision-making processes, and these approaches or concepts could then be discussed in the context of the original and broader definitions and interpretations of SD and equity and their theoretical underpinnings be explored.	Taken into account (Yoke Ling)
4684	4	11	39			This chapter could be appreciated as the first comprehensive review of IPCC reports regarding sustainability and sustainable development. A more detailed explanation of the concept and its definition, along with historical background before publication of the Brundtland report is needed. The Brundtland report was not the first to launch the concept and definition, and these concepts should be understood within their historical context. For example, please see: - Lele (1991), <i>World Development</i> 19(6): 607-621. - Dresner (2008), <i>Earthscan</i> . - Robinson (2004), <i>EcolEcon</i> , 48(4): 369-384.	Rejected. We are asked to streamline and focus on recent ideas/facts.
12683	4	11	40	12	10	In addition you may like to mention that the Brundtland Report includes intergenerational justice ("... the ability of future generations to meet...") as well as the need principle ("... in particular the essential needs of the world's poor...").	Accepted (Yoke Ling).
9814	4	12	1	12	4	Besides the concept of needs and limitations you should add the concept of lifestyle, that is actually addressed in other parts of the report.	Accepted (Yoke Ling).

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
18311	4	12	11	12	16	This para is insufficiently clear. The Brundtland Report does not do this unless you are reducing 'development' to mean an increase in 'material capacity', which that report does not do. Debate over its definition of SD has recognised that tension exists between its desire for intragenerational equity and intergenerational equity. A development path is 'sustainable if the capacities for development can be preserved etc'. It is unclear in the present sentence what 'benefits' might be and can be read to suggest that material outcomes must endure eternally. The debate referred to later on this page - between supporters of weak SD, who believed that under SD resources and nature can be transformed to/substituted by capital for human benefit, and supporters of strong SD, who are much more limiting - should be introduced here.	Accepted, the paragraph will be deleted.
18313	4	12	17	4	25	This para weakly fails to take a position on a central debate about SD. If one accepts a triple-bottom-line version which gives each element equal priority, then what are the consequences for action around climate change, specifically for biodiversity preservation? This discussion should follow that about weak and strong SD.	To be taken into account (Yoke Ling).
9815	4	12	17	12	25	When defining sustainable development you should also include the time perspective. Especially in the current economic system shorttermism is a	Noted.
8256	4	12	26	12	41	Two approaches of sustainability, weak sustainability V.S. strong sustainability, are reviewed here. It would be more illuminating to provide some evidences or arguments to shed light on which approach is more relevant or realistic.	Noted. This is an ethical divide, not an empirical issue.
18135	4	12	27	12	29	Reference required.	Accepted (Yoke Ling).
5465	4	12	30			Here appropriate valuation of factors in strong sustainability would seem to remove this discrepancy	Noted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
8711	4	12	42	12	45	<p>One of the most important tools in monitoring and predicting the health of ecosystems is the use of biological parameters, as the composition and abundance of species within ecosystems, research in this direction are able to determine what the characteristics of natural ecosystems are and how this can change over the changes caused by climate change. The effects are shifts in geographical range, promoted by shifts in temperature patterns that delimit species boundaries. Each 1o C of change moves ecological zones on Earth about 160 Km. The methods to monitor this changes include long-term observation and re-surveys of previously sampled sites (Thuiller, W . Climate Change and the ecologist. Nature. Vol 448 / 2 August 2007.). But only the monitoring of taxonomical composition of ecosystems couldn't be enough to understand how the ecosystem functionality is affected by climate change. A new approach for this is the identification of functions related to each species with the intention to understand the importance of species organization to maintain the ecosystems service, trough this is possible to develop a computational model capable to predict how and when these functions can collapse. A good model for this is called Complex Adaptive Systems (CAS), which is a self-organized system, where the controlling rules define how the system changes in response to changes of the past and present in the environment where they are submitted (LEVIN, S. 1999. Fragile Dominion. Complexity and the Commons. Massachusetts, Perseus Books). In CASs systems, the redundancy of species playing the same function in ecosystem is much more important than the simple number of individuals or species. In this sense, different species can play the same function at different conditions, so the system acquires resilience to face changes like climate changes. The universality of the concept of complex adaptive systems brings out an alternative perspective to the context of ecosystems involving great diversity of organisms and complex trophic interactions. For example, in the case of tropical ecosystems, it's possible to understand not only the role of taxonomic groups, such as is the case of genres or species, but also the role that taxa take when organized into functional groups. Thus we can understand how changes in the scale of observation can influence the perception of the different functional behavior of ecosystems, and from that understand how their integrity is maintained, and most importantly, how and when it can collapse (Gontijo, A.B. 2009 "Estudo e modelagem das dinâmicas estruturais de assembléias de formigas tropicais em diferentes escalas ecológicas" Master's degree dissertation. Federal University of Ouro Preto. Tropical Biomes Ecology Program. http://www.repositorio.ufop.br/handle/123456789/397?mode=full&submit_simple=Apresentar+o+registro+completo).</p>	These useful references are introduced.
14011	4	12	42		45	<p>There is now a large and well established literature on vulnerability, and the new direction is more on how to adress vulnerabilities and create human security through climate change responses and sustainable development.</p>	OK
15271	4	12	42	12	45	<p>In addition to vulnerability, the notion of resilience should be mentioned here as an important concept in discussing sustainability. Sustainability of a system can be understood as a balance between efficiency and resilience (Lietaer, Ulanowicz, and Goerner, 2009). Resilience is dependent upon diversity and connectivity. Diversity refers to the existence of different types of agents acting as "nodes" in the network. Connectivity concerns the number of pathways between agents. A system's resilience is enhanced by more diversity and more connections to fall back on in times of trouble or change. In many cases efficiency tends to increase through streamlining, which usually reduces resilience by decreasing diversity and connectivity. Goerner, Sally J., Bernard Lietaer, and Robert E. Ulanowicz (2009). "Quantifying Economic Sustainability: Implications for Free-Enterprise Theory, Policy and Practice." Ecological Economics, 69, 76-81.</p>	Reference introduced.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
18310	4	12	6	12	8	This treatment of sustainability seems to ignore a body of writing on this issue. For effective reference, see Dobson in the journal Environmental Politics. Sustainability does not refer to 'the preservation of a certain state of affairs' but rather to the maintenance of the capacity of human and biological systems to evolve over time. Similarly, the definition of 'progress' has been much debated and cannot be simply invoked here. Perhaps better to write "development refers to the improvement of welfare and well being in human societies, and etc...". It would be good to introduce, here, the fact that - definitionally - sustainability (and SD), has temporal and spatial elements, and also encompasses humans and other species. Then these elements can be expounded systematically... with some reference to how climate change affects them. Some of them do come through, but seemingly more haphazardly, later in the chapter. The 'rights of Nature', however, is generally poorly handled and largely overlooked in this rather anthropocentric view of SD.	Taken into account (Yoke Ling).
13273	4	12	16	12	16	At the end of the paragraph I suggest to add: "(...). And in this sense, the climate system is a key environment component to consider when addressing Sustainable Development and environmental issues."	This is clarified in the new version, 4.2 is substantially revised.
15108	4	12	20	12	22	Add: " Sustainability in the economic sphere has to do with the preservation of a healthy economic and financial system IN BEBEPFIT OF THE WHOLE, while sustainability in the social sphere is TO WORK FOR THE BENEFIT OF THE POPULATION INSTEAD OF about avoiding conflicts and social unrest".	The sentence has been deleted.
13274	4	12	21	12	22	Social conflicts are inherent of social dynamics, so maybe it is better to replace "avoid" with "properly manage"	The sentence has been deleted.
18316	4	13				There is no mention of the spatial dimension of sustainability - global, regional, local?	Accepted.
12684	4	13	1	13	10	Maybe you like to reconsider whether the statements made, here, are in line with the concept of SD.	Not relevant.
8800	4	13	22	17	16	It may be more useful to focus on inequity principally created by market ideology, market fundamentalism or market dogmatism (e.g. Soros G (1998) The Crisis of Global Capitalism) and Stiglitz (http://www.nobelprize.org/nobel_prizes/economics/laureates/2001/stiglitz-autobio.html). That is it is easier to identify inequity and its causes and perhaps address these causes than produce a universally agreed description of equity which can be worked towards. To be even blunter, working against inequity is 'easier' than achieving equity.	There is a tension over the extent of the role of the market and there is interesting analysis in the wake of the recent financial crises and the limits even viability of the carbon market in the absence of ambitious emissions reduction targets. We can include this without taking an ideological stand.
18317	4	13	22			This tighter discussion of distributional, allocative and procedural elements of equity could have been prefigured in the introduction and the earlier section on 'principles'.	It is indeed in the introduction.
5466	4	13	23			This paragraph can be deleted	Rephrased.
12686	4	13	23	13	32	You may like to proof whether "Equity Theory" is the right wording, here, or whether it might make more sense to talk about different dimensions of Equity and ways of operationaliz the concept. You may like to check Adams, J.S. (1965). Inequity in social exchange. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 2, pp. 267-299). New York: Academic Press.	This comment ignores the relevant scholarship. Thomson 2011 is more relevant.
18314	4	13	4			This needs clarification. The first part of this sentence can be true only if the time frame is cut short, and therefore the notion of sustainability becomes purely semantic. The second part can be right, as benefits need not be distributed equitably.	This paragraph has been deleted.
5467	4	13	44			Is it possible to consider equity for a finite period and would that make use of this concept less cumbersome?	This had to be shortened drastically.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
8799	4	13	44	14	3	It can be argued that the problem is less discounting than it is 'comparing streams of utility over time'. Asking the broader question 'what is the right thing to do or right approach to take' should lead to more satisfying answers, as this can include a range of ethical schemes with virtue typically being more comfortable with taking a longer view than at least utilitarian ethics - this can often be seen by the organisations and individuals who take a long term view rather than maximising short term profit.	Not clear comment.
18315	4	13	6			Counter-intuitive. An example would be useful here. Swidden agriculture - logging forests intermittently with stone axes and then burning them on a long cycle ??	This paragraph has been deleted.
2915	4	13	11	13	21	Suggestion is to start with 'Indeed ... sustainable development. One guiding principle is	Not relevant.
18136	4	13	3	13	3	The concepts here are quite complex and could be simplified .For example, the difference between welfare and well-being needs to be elaborated. The thrust of the paragraph and what it intends to convey is not easily apparent.	Accepted, will clarify.
18309	4	13				This section does not deal effectively with equity in climate policy	Rejected.
18312	4	13				This section does not deal effectively with equity in climate policy. It should come after section 4.2.3. (which should include the more general discussions that are also part of this sub section) and specifically confine itself to the underlying philosophical considerations of 'common but differentiated responsibility' (CBDR) specifically in relation to issues of historical, distributional and procedural justice...	Chapter 3 deals with the concept and philosophy of historical and distributive justice.
12685	4	13	23	13	23	Sustainability might be one form of equity or at least contain a limited number of equity characteristics that match with the sustainability definition (SD). So the SD already contains the relevant equity principles in its notion even if it is controversial which equity characteristics are leading the process of sustainable development. In any case, there are equity concerns definitely not belonging to sustainability. They can be left aside for climate change discussions. Moreover it is not obvious why sustainability and equity are dealt with in a separate way at several places of the chapter. So if there is a reason for not dealing with equity and sustainability in an integrative way, the difference between the two normative concepts should be outlined at the beginning of the chapter. In the other case for the climate change discussion relevant characteristics of the equity principle could be considered with regard to potential controversies under the headline sustainability principle.	Noted. Sustainability is not the same as equity.
12687	4	13	27	13	28	The impact of democracy on sustainability could be explained in more detail. It might be useful to base this question on the sustainability issue of the Brundtland Report definition rather than on the three pillar model (see comment 1, 21). For the temporal dimension of the last mentioned model democracy is not necessarily constitutive. Citizens of democracies have the highest amount of per capita emissions today (especially European states and the USA). Moreover engagement of democracies for sustainability may not be due to the democratic structure of the state but could also be a result of the scarcity of resources or due to high damage potential in the course of climate change. Above that the mentioned motives may not only be found in democratic but non-democratic states, too. In contrast, with regard to the spatial dimension of sustainability, democracy could gain importance, especially if there is proof for the thesis that democratic states might be more willing to share wealth with each other than with non-democratic states. In this case, e.g., the contraction and convergence approach (see IPCC Draft, Chapter 4, Section 4.7.3.3, p. 70, line 38) might be easier to implement within democratic than non-democratic structures. In any case it should be laid out at which level democratic structures are helpful: a) at the national level, b) at the international level or c) both. Here, the international level might be the most interesting "democracy" concern. Still only some characteristics of democracy may play a role when dealing with climate protection (e.g. equal representation, transparency and the integration of equity concerns may help to reach an international agreement).	To be taken into account.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
18318	4	14	14			I don't understand this sentence.	This has been revised and shortened due to space constraint.
3218	4	14	16	14	29	The argument of Asheim et al. (2012) is reliant on the modeling of the future as consisting of an infinite number of generations. If the present is better off than the future, then a uniform addition to future generation's wellbeing at the sacrifice of present wellbeing reduces inequality and increases the sum of utility independently of the degree of inequality aversion (i.e. how wellbeing is mapped into utility).	The new formulation here is actually more general as it is compatible with a finite horizon (the priority for the future is then not absolute but strong).
18319	4	14	33			This sentence seems a little loose.	It has been deleted.
14012	4	14	35		39	A very important point with reference to preserving the status quo, that in many cases is the source of the problem.	Noted.
5468	4	14	4	29		Could more clearly be illustrated with a figure	Rejected for lack of space (and this is not central to the chapter).
7763	4	14	4	14	39	I am not convinced by this argument. I would either think how better to explain these points or delete all this text	This has been revised and shortened due to space constraint.
7764	4	14	40	14	50	Nicely argued, BUT there are no references, on what are you basing this?	Accepted.
14378	4	14	41			Basically misguided to contend that the 4 billion have not cannot aspire to current living standards of the top 1-2 billion because that would be inherently unsustainable. Even with current "production processes," but that is a red herring because productivity will increase. Don't forget that the same arguments were made in the 1970s and shown to be wrong: the global economy did not collapse because of the exhaustion of natural resources.	Taken into account, see 4.2.2 and 4.5.
3219	4	14	45	14	48	Is the following statement an empirical fact or an ethically based side constraint on climate policies: "Put more bluntly, any attempt to preserve the natural environment by keeping living standards low for a large part of the world population will face strong political resistance, and will almost certainly fail."	This is empirical.
12690	4	14	49	14	50	Is it really the question? Or should not rather climate policy fulfil the claims of SD?	The sentence has been deleted.
2916	4	14	1	14	3	suggestion: IPCC WG3 consider that the horizon in finite and uncertain. Remove sentence 2 and 3	Rejected, this is a misunderstanding.
15109	4	14	41	14	43	Add: "On the one hand, the convergence of developing countries toward the standard of living of the richest populations is admittedly unsustainable if the consumption and production processes of the rich are universally adopted, AND WILL EXCEED THE REGENERATION CAPACITY OF EARTH " .	Accepted.
12688	4	14	16	14	18	For sustainability questions equity needs to focus on contradicting interests between the present and future generations. But it may not imply an unconditional preferential treatment of future generations. Discounting of future generation's interests is e.g. dealt with in Arrow, Kenneth J., Discounting, Morality and Gaming, in: Portney, Paul R. Weyant, John P. (Eds.), Discounting and International Equity, Washington 1999, pp. 13-22. Discounting is mostly based on attended (technological) efficiency increase and on uncertainties (see e.g. Buchholz W., Schumacher, J. (2008), Discounting and Welfare Analysis Over Time: Choosing the η CESifo Working Paper Series). So the conflict between present and future generations might be resolved best when the discounting rate is well justified and the critic is given with regard to the assumptions of discounting (too optimistic efficiency assumption or a too pessimistic assumption about the uncertain utility of natural resources in future, cf. Buchholz/Schumacher, ibid). You may also like to add the idea of Mansbridge, Jane, Rethinking Representation, in: American Political Science Review 2003, S. 515-527 (515).	Noted. Note that there is a key difference between discounting utility and discounting money (or consumption).
12689	4	14	49	14	50	Maybe it makes sense to differentiate between intragenerational and intergenerational equity. Intergenerational equity is according to the Brundtland Report part of sustainability. So the phrase "sustainability can be achieved via equity principles" may be misleading as it suggests that sustainability does not imply intergenerational equity. So it maybe helpful to use the term "intragenerational equity" here.	The sentence has been deleted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
5470	4	15				It appears from this discussion that the concept of SD can also be used to describe social goals from a particular perspective ie women's rights. It seems to the reader that these alternative views of SD are tangential to the discussion- could be condensed and summarized by saying as has been said earlier, that SD can have a human focus (soft) or an ecological focus (hard). Subsets of the soft SD include particular perspectives such as income distribution or women's rights- this would allow you to cut a significant portion of the discussion without sacrificing much	OK - to be condensed.
14379	4	15	1	15	14	Doesn't acknowledge the reality that Copenhagen has succeeded Kyoto as more practical given the essential inclusion of China and other major emerging market economies in emissions restraint.	Misinterpretation/mis-understanding of Copenhagen and entire set of climate agreements and decisions. See YL response to comment 319.
7765	4	15	1	15	14	Delete - unnecessary	See YL response re: 319 and 320
12693	4	15	19	15	20	Is Equity the antonym of unequal? You may like to reconsider the wording.	The wording seems good.
3220	4	15	21	15	22	Empirical basis for the statement that the mentioned approach is gaining ground? What is meant by sustainable development being a human right?	The first statement has been deleted. The second is referenced.
3221	4	15	26	15	30	Are "principles of gender inequality" a desirable side-constraint on climate policies? Or needed for effective climate policies? If so, why?	The sentence has been deleted.
7766	4	15	26	15	30	No reference. Reference needed to verify this. If there is no reference - delete	The sentence has been deleted.
12691	4	15	31		33	You may also like to look at Kals, E., Maes, J. (Hrsg.), Justice and Conflicts: Theoretical and Empirical Contributions. Springer, Berlin,Heidelberg, ISBN 978-3-642-19034-6, 269-282.	This reference is added.
12279	4	15	42	17	16	Please consider to include some of the conclusions from O'Briens study; O'Brien, K., 2011: Global environmental change II: From adaptation to deliberate transformation. Prog Hum Geogr, in section 4.2.3	This reference is added.
18320	4	15	43			The phrase often used about SD is that it is a 'contested concept', which means that many competing definitions abound, and the vagueness of th Brundtland definition itself spawned many of these competing versions. Again, see article on SD definitions by A Dobson in 'Environmental Politics'. It is vital to have the debate about thecontested meaning of development noted here. Herman Daly.	OK
8801	4	15	47	15	49	It should be noted that von Weizsäcker et al. (1998) is critical of contemporary economic structures and the philosophical assumptions that underpin these (ibid, 143-209, 271-299). Further it suggests that efficiency gains will not be enough (ibid, 258, 269, 292-3), particularly given that the advertising industry (and much popular culture) can probably create infinite wants. (ibid, xxvi-xxviii) give examples of how contemporary economic structures unjustly militate against taking action to address environmental issues and have questionable moral and philosophical underpinnings (ibid, 271-299). In particular von Weizsäcker et al. (1998, 139-142) suggest that finance structures tend to favour investment in resource use rather than resource efficiency, which is linked with a tendency to subsidise non-renewable energy production a huge amount, even by so called 'free-market' governments (ibid, 153-4). It is worth noting that von Weizsäcker et al. also suggest that current market economies encourage the 'seven deadly sins' or encourage classical vices (ibid, 1998, 143).	Noted. This part has moved to 4.5.
5469	4	15	5	18		Some comment on whether this perspective on SD is compatible with emissions reductions or an obstacle to them would be helpful- discussion can also be edited	This refers to a different paragraph. This is a study that needs due attention as it is one of very few from a developing country perspective on equity and burden sharing in the climate arena. Can rework this discussion.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
9295	4	15	42	17	16	In order to facilitate sustainable development, the cement industry in Japan has integrated climate policy with recycling policy. The reference shows a case study to make an analysis of treatment cost of municipality wastes (MORIMOTO, NGUYEN, CHIHARA, HONDA and YAMAMOTO; Journal of Life Cycle Assessment, Japan, Vol.2 No.4 October 2006 "Proposals for Classification and an Environmental Impact Evaluation Method for Eco-Services: Case study of Municipal Waste Treatment in Cement Production")	Noted. We need to decide how to deal with specific case studies or practices.
12694	4	15	26	15	29	As democracy, human rights are important in international politics in general. But in international law human rights are not absolutely binding. For example the human rights covenants are not signed and ratified by every state of the world and so can be considered as binding law for the ratifying states only. The Universal Declaration of Human Rights is a resolution of the UN only which has recommending but not binding character. Regional agreements on human rights, eg. the European Convention on Human Rights have no universal coverage, too. Human rights within customary law are only viewed as binding when referring to the minimum standard (ius cogens). It is controversial which human rights are ius cogens norms. Zenović mentions the right to live, the right to humane treatment, the prohibition of criminal ex post facto laws, the prohibition of genocide, the prohibition of war crimes, the prohibition of slavery, prohibition of discrimination on the basis of race, color, sex, language, religion, or social origin. On the other hand there are human rights which are not in focus, the prohibition of imprisonment for civil debt and the prohibition of crimes against humanity, the right to legal personhood, freedom of conscience and the right to selfdetermination. And "negative freedoms" and broad positive obligations of states are no ius cogens norms at all (Zenović, Predrag, Human rights enforcement via peremptory norms – a challenge to state sovereignty, Riga 2012, http://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&ved=0CH0QFjAJ&url=http%3A%2F%2Fwww.rgsi.edu.lv%2Ffiles%2Fdownload%2F33&ei=3udJUNiXLZCTswaVo4CADQ&usg=AFQjCNHcW1EhKJtL6nO4BPImTyQdArR5tA , pp. 35-36). So it seems problematic to talk of an absolute "legal duty" to cooperate in order to realize human rights.	OK. There is however under the Covenant on Economic, Social and Cultural Rights the obligation of Parties to "take steps... to the maximum of its available resources, with a view to achieving progressively the full realization of the rights recognized in the present Covenant by all appropriate means, including particularly the adoption of legislative measures"
18137	4	15	27	15	30	It would be useful to state why this recommendation was made.	The sentence has been deleted.
12695	4	15	29	15	29	The inclusion of gender research with regard to the climate change problem should be motivated more clearly (what is the difference if aspects of gender are not included?).	The quoted literature shows the strong potential impact of changing gender roles.
12692	4	15	1	15	14	This is a repetition of passage p.13, 11-21 and also outlaid in Chap. 3. So it can be shortened or even deleted.	1) Shorten to include the reaffirmation of equity and CBDR at Rio+20 with specific reference to climate negotiations 2) Clarify that the UNFCCC and Kyoto Protocol are the current legal regime; any new agreement for post 2020 will also be under the UNFCCC.
18322	4	16				By this stage of the chapter, I was wondering how this material linked to climate change. A tougher and earlier linkage - in the intro? - through the Rio Declaration, the requirements of CBDR and of the UNFCCC might help	Accepted - also Rio+20 outcome
3222	4	16	33	16	35	Is social transformation something that the IPCC should be concerned over and beyond the need for reducing the GHG intensity of wellbeing.	Sure, because it may belong to the list of objectives that put demands on policies along climate issues.
12698	4	16	40	16	47	What would that mean for climate policy? There is no link presented.	To be developed (CA).

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
14315	4	16	5	16	18	The concept of sustainable economic development is not explained, nor are the arguments of Allaby, Hopwood et al, and Schelling balanced by inclusion of references that could support, or the opposite, their theoretical and empirical validity.	Noted.
7767	4	16	5	16	39	I am not clear what point is being made here, or how this section is relevant to sustainable development and mitigation? I would delete	Not relevant.
18321	4	16	9			The term 'economic wellbeing' is confusing....and mixes two conceptual languages.	Accepted. Will try "affluence".
2917	4	16	4	16	4	Please refer also to more recent literature when available. It is a relevant topic.	Moved to 4.5.
6321	4	16	26	16	39	I hope that the authors will not think me to be too presumptuous but I would like to suggest that "alternative paradigms of sustainable development" are the topic of my book: Ingrid Leman Stefanovic, SAFEGUARDING OUR COMMON FUTURE: RETHINKING SUSTAINABLE DEVELOPMENT (Albany: State University of New York Press, 2000.) The argument is made that a condition of achieving sustainability is to augment primarily calculative, reductionist modes of thinking that are common today, with more thoughtful, originative perspectives.	OK
12696	4	16	7	16	12	Arguing for a high growth level as a driver towards sustainability is problematic even if poor countries receive the whole benefits. It might be more plausible if the spatial dimension of sustainability is taken into account as is the case in the sustainability definition of the Brundtland Report (IPCC Draft, Chapter 4, Section 4.2.1., pp. 11-12 and Section 4.2.2, p. 13, lines 25-26). There, the spatial dimension of sustainability tries to ameliorate the situation of poor countries. In contrast, e.g., the contraction and convergence approach (see IPCC Draft, Chapter 4, Section 4.7.3.3, p. 70, line 38) does not necessarily depend on growth but can also be based on redistribution. Consequently economic growth is no synonym of sustainability (Since e.g. redistribution could be a more sustainable path, especially, if material growth depends on scarce resources which cannot be substituted. And because, in the past, growth accelerated climate change and did not limit it as outlined in this chapter, e.g., p. 32, line 4-5; p. 34, line 14-15). Even if partial respectively limited growth could be useful for introducing sustainable politics, respectively, departing from unsustainable paths a materialistic growth policy remains problematic against the background of the three pillar model (see comment 1). So it might be better to talk about "sustainable growth" or "long durable global wealth", here.	Here we just mention one view among others.
12697	4	16	31	16	34	Which inequities are meant in detail? How is environmental justice defined in Hopwood et al. (2005)? The definition and application is an important part to analyze environmental as well as economical impacts (refer to Chap.3).	More detail is provided.
11269	4	17	1	17	3	"market-friendly reforms" has been implemented everywhere, especially since the 90s. However, since the electricity crisis in California, reforms have been critically scrutinized and have caused social outcries. This added -more recently in the context of the global crisis-, to concerns related to energy security has pushed reforms into the background. Serious assessments of those reforms in different countries are available: at least they have mixed results.	Accepted.
3224	4	17	12	17	12	What is the relevance of a niche market in this context?	Not relevant.
14013	4	17	17	31	20	Section 4.3 has a challenging task, as it aims at discussing determinants of sustainable development and equity, and at the same time it aims to say why this is relevant for adaptation and mitigation (or probably the capacity to respond). To some extent the chapter meets the first aim, but not the second.	Accepted. We need to ensure that the determinants of the entire section speak to both SD and equity, and to CC mitigation/adaptation.
14014	4	17	26	19	3	Is this where the research stands on what drives or hinders sustainable adaptation? At least the section presenting the I=PAT (page 18, line 28-31) seems to be very much outdated and calling it a traditional method seems inappropriate.	Accepted. The debates around the Holdridge identity will be updated, and cross-referencing to chapter 5 (where this is fully developed and applied) will be ensured.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
7768	4	17	26	18	44	This section (4.3.1) focusses on basic population and demography issues, while this provides an interesting background for people with no knowledge about this area it is not about mitigation and sustainable development. There are many clear links between population, demography and sustainable development, this is an area full of interesting issues, e.g. discussion of IPAT and its failings, emissions pathways, cultural practices around emissions...it would be good to see more of this, and less of the current content. I would delete the current text	Accepted. We take note of the reviewer's concerns and we agree that there is a need for updated engagement with the population/climate change literature.
12701	4	17	27	18	27	This part can be shortened as it is not directly linked with climate change issues. The link is not provided till line 28.	Accepted. The overall SOD, including this section, will strive for further synthesis and integration.
12700	4	17	32			The relation between SD and Equity is not clear. Which are the reference points for an equitable future and how do age, sex etc. relate to them?	Accepted. The SOD will develop our conceptual framework much better in section 4.2 and such framework will help to structure the argument of subsequent sections. Section on population and demography will account for the reviewer's comment.
7451	4	17	4	17	5	Mention is made here of 'low carbon economy' and 'low carbon society'. All living things depend on carbon for subsistence.	Not relevant.
7452	4	17	4	17	5	A distinction should be made between 'renewable carbon' and non-renewable' carbon. Increasing the use of 'renewable carbon' should be vigorously pursued.	Accepted.
3223	4	17	7	17	10	Controlling emissions (by increasing the cost of fossil fuels) will have a negative effect on development. That is the premise for the discussion earlier, on avoiding climate change by keeping people undeveloped. If this premise is not clear to the reader (or some author) at this point, then it should be emphasized earlier.	Accepted.
10859	4	17				This has a lot of overlap with Chapter 5 in parts	Accepted. Overlaps with chapter 5 will be addressed in the SOD.
18323	4	17				This subsection does not deal with barriers systematically. It could also include mention of the "population rebound effect" - namely the problem that the rapid decline in fertility experienced in certain developing countries is coming at the expense of - and counter-balanced by - a major rise in per capita consumption.	Accepted. We are committed to search in the literature for referencing that proves the kind of relationship implicit in the comment. 4.3.1. needs to indicate more explicitly what is the relationship between fertility decline, age structure, etc. on per capita consumption in diverse contexts.
12699	4	17		19		Especially the first part of this section emphasizes the relationship of fertility and the actual population size. So the explanations can be shortened or even deleted, here.	Accepted. This section will be synthesized and better framed in the SOD.
18324	4	18	28	18	33	The discussion of I+PAT could come earlier and introduce and structure this section.	Noted.
14015	4	18	45	19	3	Again, this is not a new insight or research field. The social vulnerability theme has been around for a long time, first in the disaster community and then increasingly in the climate change community in the late 1990s and early 2000s. What would be interesting is to include the implications that this insight has for climate change responses.	Accepted. We will make sure to incorporate references to this literature in the SOD.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
14016	4	18	49	19	3	The literature on vulnerability shows that there are complex arrays of social, economic, political, cultural and environmental factors that affects vulnerability. And that individual characteristics go beyond age and gender to also include the more subjective dimensions, such as attitudes, beliefs, superstitions, etc.	Noted.
3225	4	18	5	18	8	This point was already (indirectly) made in the previous paragraph. Can be written more efficiently.	Noted.
2918	4	18	28	18	28	The I=PAD identity is possibly a simplification which has been valueble, which suggestion has the WGIII to optimize this identity?	Accepted. The debates around the Holdridge identity will be updated, and cross-referencing to chapter 5 (where this is fully developed and applied) will be ensured. The way in which this identity is applied and improved is taken up by chapter 5.
8802	4	19	19	19	20	It would be truer to say that population is ethically and politically sensitive but that consumption is really only politically sensitive to 'liberal democracies' that 'buy' votes by offering ever greater material wealth to the majority of their population.	Noted.
14017	4	19	2			Suggest adding "...a fact that is increasingly considered by impact AND ADAPTATION studies."	Noted.
14018	4	19	26	20	22	Can this discussion be made broader to talk about humans as agents of change (thus much broader than agents in production), and where education, learning and leadership are important determinant for thriving development? Literature to consider in this section or in section 4.3.3: On humans as agents of change: Meadows, D. 1999. Leverage Points: Places to Intervene in a System. Sustainability Institute Papers. Hartland, VT: Sustainability Institute. On Learning: Mezirow, J. 2000. Learning as Transformation: Critical Perspectives on a Theory in Progress. NY: Jossey-Bass; Pelling, M., C. High, J. Dearing, and D. Smith. 2008. Shadow spaces for social learning: a relational understanding of adaptive capacity to climate change within organisations. Environment and Planning A 40: 867–884; Tschakert, P., K. Dietrich.2010: Anticipatory learning for CC adaptation and resilience. Ecology & Society 15 (2),11. On leadership: See recent writings by Ina Horlings, Susanne Moser.	Noted. We are going to take into account the comment and literature suggested
3226	4	19	27	19	29	Human capital cannot be defined as the capacity to do these things, it must be the results of such efforts. (Not the container, but the content of the container.) In any case, it might be better to define INVESTMENTS in human capital as schooling, training, etc. which result in better skills, higher earning potential, better health, and higher wellbeing.	Accepted. We don't understand the first part of the comment but we agree on the second and we will make sure to address it.
10424	4	19	27	20	3	Remove the 1st two paragraphs	Rejected. We don't agree with this comment. We acknowledge the need to be more concise in the starting of this section (as recognized as well for other parts of the chapter) but we advocate for the need to define the terms that we use in each section/sub-section.
12703	4	19	27	20	3	I cannot see the link to climate change issues.	Noted. This link should be further stressed. See some of our previous responses above.
7770	4	19	27	20	14	all intersting text but not related to mitigation - delete	Noted. This link should be further stressed. See some of our previous responses above.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
12702	4	19	4	19	25	I cannot see the link to climate change issues.	Accepted. The overall SOD, including this section, will strive for further synthesis and integration, to reflect implications for both SD and equity.
17639	4	19	41	19	41	The reviewer thinks "human capital, education and knowledge" are associated with social development as well. Why the author mentions these three elements are associated with economic development only?	Accepted. We will make sure that the links of human capital with other human and social considerations are also spelled out.
18138	4	19	12	19	16	References required for these synthesis statements on population and sustainable development.	Noted. Updated references will be provided.
12704	4	19	40	19	40	See comment 21.	Rejected. We are not sure what comment the reviewer is referring to.
7771	4	20	15	20	22	Nice, clear, concise and well referenced paragraph	Noted.
17144	4	20	23			Suggest that this section also includes a discussion of culture, sustainability and indigenous peoples	OK noted
14019	4	20	23		35	I look forward to reading this section in the SOD. It will be important to get at those deeper human and societal dimensions. Literature to consider: Hulme, M. 2009. Why we Disagree about Climate Change. Cambridge; Cambridge; Leiserowitz, A. A., R. Kates, and T. M. Parris. 2006. Sustainability values, attitudes, and behaviors: A review of multinational and global trends. Annu. Rev. Environ. Resour. 31: 413-44; Moloney, S., Horne, R. E. and Fien, J. 2010. Transitioning to low carbon communities—from behaviour change to systemic change: Lessons from Australia. Energy Policy, 38(12): 7614-7623; Elizabeth Shove 2010 Beyond the ABC: climate change policy and theories of social change. Environment and Planning A, volume 42, pp. 1273-1285; O'Brien, K. and J. Wolf. 2010. A Values-based Approach to Vulnerability and Adaptation to Climate Change. Wiley Interdisciplinary Reviews: Climate Change 1:232-242;	Accepted. We will include the references provided.
18699	4	20	23	20	35	Not sure why this section will only be developed in the SOD? It promises to be a very useful section, from the described outline, but also one with ambitious coverage, hopefully it will be given sufficient space. Especially the developmental psychology literature on behaviour change is not being covered in any other chapter that I am aware of. In addition to exploring cognitive barriers to behavior change (including the adoption of individual mitigation and adaptation measures), the section should also address motivational barriers. This discussion can refer back to Chapter 2's Sections 2.2 and 2.4.	Noted. The behaviour section will make reference to the reviewer's points.
10425	4	20	36	21	10	Remove the 1st two paragraphs	Rejected. We acknowledge the need to be more concise in the starting of this section (as recognized as well for other parts of the chapter) but we advocate for the need to define the terms that we use in each section/sub-section.
12705	4	20	36		42	For the "rules of the game" you might also like to look at Ittner, H./Ohl, C. (2006), Playing Fair within Climate Protection Policy? – Bringing Together Psychological and Economic Methods, ICFAI Journal for Environmental Law (IJEL), V(1), 34-53.	Noted.
5472	4	20	37	21	33	Point of this discussion is that governance is defined in multiple ways - this leads into a discussion of how concepts of sustainability is integrated into governance- which is the primary point. Initial discussion of governance can be shortened and still convey critical point- many types of governance	Accepted. The section will be synthesized in the SOD.
5471	4	20	4			Very helpful and critical two paragraphs- sets up the link clearly and succinctly	Noted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
2919	4	20	23	20	35	Suggestion is Cultures as a subtitle. Suggestion is to illustrate the revisiting the collapse of Rapa Nui. Possibly it is feasible to refer to the contribution of Jan Boersema (revisiting the collapse of Rapa Nui) during the 8th international conference on easter island and the pasificin 2012?	Accepted. We will take into consideration the reviewer's comment when writing the behavioural section, as well as we will ensure to be consistent with Chapters 2 and 3.
2920	4	20	36	22	46	In my opinion this part 4.3.4 could be shortened.	Noted.
17338	4	20	23	20	35	Consider linking to the examples of Buen Vivir and Gross National Happiness introduced in Chapter 3.	Noted.
12706	4	20	7	20	8	Human capital can provide environment-related technologies but also lead to unsustainable technology path ways. Therefore the following phrasing might be more appropriate (and in line with p. 23, line 11): "Human capital can provide the basis..."	Noted.
18325	4	20				This section is very Foucauldian and does not do sufficient, in my view, to address issues of state capacity. See works by Lafferty and Meadowcroft, Janicke.	Accepted. We don't understand the "Foucauldian" reference, but we agree that the role of the State as an agent of governance and authority should be better emphasized.
13750	4	20		22		If I understand the context of this section right, the task is to review the current literature with regard to answering the question what determines, drives and hinders sustainable development and climate policies. Therefore, I would propose to strengthen this analytical focus in this particular section: What are these drivers and barriers? This section is in large part accurate and up to date, but mostly descriptive and little focused on the initial question. I would rather suggest to focus this section in the latter part more on individual drivers such as governmental decision making versus other actors.	Accepted. However, we don't agree that this point is relevant only for 4.3.4. In line with the co-chairs' view, we acknowledge that there is a need to strike a balance between framing and the literature review that highlights the role of each determinant as a driver or barrier to SD and equity, in the context of climate change.
2337	4	20				The decentralization should be more analyzed with process of localization. The decentralization is popular political term, but it has vague conceptualization. Thus, localization has to be discussed in environmental governance. The reason is that localization is an integral part of reduction of energy consumption in the case of sustainable consumption and production. Localizing socioeconomic systems, decentralizing governance lead to advance sustainable lifestyles and livelihoods with new social order of sustainable societies. Furthermore, localism is the focus on emerging across with the principles of devolution, of decentralization and of subsidiarity. The Manifesto on the Future of Food by the International Commission on the Future of Food and Agriculture (2006) argues how the localization will facilitate to the reduction of energy consumption. Under current export-oriented monoculture production and an explosion of the long-distance food trade directly cause to increase use of fossil fuel around the world. Obviously, this fossil fuel consumption for food transport damages the eco system and local agro-economic system. On the other hand, local poor farmers become poorer. Thus, localization of agricultural and consumption system has more advantage rather than having just economic advantage for multinational companies. Reference :- Manifesto on the Future of Food , International Commission on the Future of Food and Agriculture (2006) www.arsia.toscana.it/petizione/documents/cibo/cibo_ing.pdf □	Accepted. But we may locate this discussion elsewhere in the chapter.
14380	4	21	1			Here and elsewhere the chapter verges on positions that seem likely to serve as fodder for those who will critique the effort as an attempt to impose global governance	Rejected. We don't understand the comment.
7772	4	21	1	21	33	Introductory text book stuff on governance, not related to climate change, reduce to 3 sentences max	Noted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
3227	4	21	34	21	41	This statement is not simple to interpret, and it might be something that there is not consensus about.	Noted. We will delete the correspondent sentence.
7773	4	21	34	21	48	much superfluous text, reduce to 2 sentences summarising key points	Noted.
12709	4	21	44	21	44	Maybe it is helpful to use "intragenerational equity" instead of "equity" to avoid misunderstandings (See Comment 14)	Rejected. In text, equity refers to both intra and inter-generational concerns
9123	4	22	0			I think consumption of other goods should be included. Consumption is a sum of many things, but mainly proximity/availability, budget constraints and preferences define the choices. Cities may promote consumption-intensive lifestyles and thus densification may have a parallel negative impact. In addition, if GHG mitigation creates monetary savings, rebound effect takes place (e.g. Turner 2009, see first overall comment for details).	Noted.
8493	4	22	23		24	What exactly are the trends in global capitalism and political economy that are referred to here - being explicit will assist the validity of the message	Accepted. We agree that there is a need for more clarity in the text message.
3228	4	22	31	22	33	Consensus about this? Should not arguments in favor of market-based policy instruments to ration access to the atmosphere as a sink for carbon emissions be mentioned?	Accepted. We acknowledge the need to expand the references and perspectives on this theme.
7774	4	22	31	22	37	Nice use of examples to explain the point, it would be nice to see more of this evidence based synthesis	Noted.
2178	4	22	47	25	29	Technology section (4.3.5) seems to downplay if not ignore the role of mobile phone technologies in mainstreaming a wide range of sustainability/climate mitigation/adaptation activities in the developing world, particularly in many African countries. Renewal energy deployment in the developing world is not going to happen in the same way as in the OECD countries for many institutional factors and none of the complexity involved in this key difference is not reflected in this section.	Accepted. We will make sure to address the literature that the reviewer implicitly points towards.
9124	4	22	5	22	11	The overall impact of agglomeration economies, accumulation of affluence and proximity may cause a reverse GHG effect, even more if supported by rebound effect due to savings on transport and energy costs.	Accepted. The reviewer touches upon something that we will indeed address in the SOD. However, the point in text may be not the lines suggested.
8904	4	22	13	22	18	The role of government in sustainable world is very important as they are responsible of land attribution, utilisation and decision making for their communities or citizens.	Accepted. The role of the State should be further emphasized.
7775	4	23	12	23	23	I am not clear why you selected health and energy as the two sectors to look at. It would be helpful to explain why you think these are the sectors of interest re: STI	Accepted. We should make this choice more explicit or otherwise expand with other sectors.
7453	4	23	16	23	18	"2.7 billion people rely on traditionally high-polluting biomass cookstoves for household cooking and heating in 2009 and 1.3 billion do not have access to electricity."	Noted.
7454	4	23	16	23	18	This is a very emotive statement. Cookstoves are not polluting, it is the type of biomass that is used that creates the 'pollution'.	Noted.
7455	4	23	16	23	18	Dry unprocessed biomass and charcoal cause very little pollution. Cooking outside again quickly dissipates the smoke etc. There are simple solutions to reduce indoor air pollution and to improve the end use efficiency of the devices. Again, electricity is not a cooking fuel in developing countries because of cost and reliability. Providing electricity to the 1.3 billion without it is very desirable, but it will not be used for cooking!	Noted.
3229	4	23	17	23	17	Highly polluting in what sense? If biomass is not depleted, these are carbon-neutral.	Noted.
5734	4	23	19	23	20	The figure regarding undernourished people can be updated	Noted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
8803	4	23	4	23	7	Science and technology are regarded as key means to achieve sustainability, particularly if they contribute to maintain economic development whilst using environmental resources more efficiently and enhancing social development.' In a report by the IPCC I would have expect an explicit recognition that resources are unlikely to be the limit on sustainability especially a conventional economics can address these issues adequately albeit typically unfairly - rather stress to the Earth System is the more fundamental issue. von Weizsäcker et al. note that it may be 'the absorptive capacity of the earth for all the pollutants and wastes' (1998, 258) that is critical to unsustainable development. Faber Faber M, Proops J & Manstetten R (1998, 42-44, Ecological economics; concepts and methods, Cheltenham: Edward Elgar) also suggest it is waste and pollution problems that are more important than resource issues.	Accepted. We should incorporate this point into the text.
17339	4	23	47	23	50	A counter-example to the study by Winkler et al, (2007) may be emerging not with policies to introduce Electric Vehicles. Where for example in Denmark a skilled work force, public awareness and specific tax incentives have not helped a rapid uptake of this new technology. Recent studies already point to this, see Chapter 8.	Accepted. We take note of this comment and we will introduce the correspondent text and literature.
18326	4	23				This section could be toughened by making it refer more directly to the competing technological and financial demands of mitigation/adaptation actions.	Noted.
12711	4	23	36	23	36	Instead of (respectively in addition to) basing the argument for "supporting the poor" on the recommendation of some scholars it might be better to directly link the argument to politically more relevant documents (e.g., the spatial approach of sustainable development as defined by the Brundtland-Report dealt with on pp. 11-12 or article 3 UNFCCC which allows shifting the comment of Prahalad 2004 to the discussion of common but differentiated responsibilities).	Noted.
17340	4	24	11	24	15	Not only economic reasons, in the case of biomass also environmental issues (iLUC) have compromised the adoption of this option.	Noted.
8747	4	24	14	24	15	The development of carbon capture and storage technology is also constrained by scepticism/mistrust along with investment...	Noted.
5473	4	24	18			Comment on CDM technologies not being sustainable- not needed here- you are talking about information transfer and whether the transfer has been successful- not if the information transferred is appropriate	Noted. The text will be re-drafted.
14316	4	24	24	24	32	Would be interesting to also include consideration of the implications of climate impacts on the feasibility/sustainability of a massive scale-up of RETs. There is also a growing literature on the potential conflicts (including equity considerations) and competition between alternative uses in various sectors (water, energy, agriculture, tourism) of resources that become increasingly scarce due to the impacts of climate change.	Accepted. Literature on these fronts will be reviewed and commented upon.
11732	4	24	28	24	30	This kind of concern should be recognized.	Noted.
9531	4	24	28	24	30	A good example	Noted.
17640	4	24	33	24	37	For development of RETs, is it sure that it is required to extract fossil fuel and other minerals? The reviewer does not think it is closely linked with these extractions and RETs development.	Accepted. We note the reviewer's point and we will make sure to include updated references on the extraction of minerals for the production of different RETs. devices
5474	4	24	45			Discussion of RET should more clearly bring in the importance of social factors- education re adoption of decentralized systems- this is indirectly stated in text but needs to be a separate sentence- showing linkages of the range of perspectives for sustainability	Noted.
8749	4	25	15	25	15	It has been suggested (by whom?)	Accepted. More referencing is required.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
11733	4	25	2	25	4	This kind of concern should be recognized.	Noted.
9532	4	25	2	25	7	Good comment	Noted.
7776	4	25	35	25	47	all intersting text but not related to mitigation - delete	Accepted. We recognize the need for succinctness; however, we sustain the need for concept definition and framing of issues beyond climate change in the beginning of each sub-section.
8748	4	25	8	25	9	In particular contexts,such as ??	Accepted. We acknowledge the need to delete "in particular contexts", as these come later in text.
12713	4	25	29	25	29	When talking about technology and efficiency the "Rebound effect" matters, i.e., GHG emission reduction is not taking place because (1) material economic growth (over)compensates the savings of CO2 and/or (2) CO2-activities (e.g. fossill fuel-intensive production) are shifted to countries that do not participate in climate change agreements (Carbon Leakage). E.g., see Eichner, Thomas/Pething, Rüdiger, Carbon Leakage, the Green Paradox, and Perfect Future Markets, in: International Economic Review 2011, S. 767-805 (767). It might be worthwhile considering also this aspects when evaluating the potential of technical solutions for the tackling of climate change. (See also comment 21)	Accepted. The literature on the rebound effect will be carefully addressed.
12712	4	25	11	25	11	An additional study which might be interesting, heree: Toft, Schuitema, Thogersen, 2012; Abstract in the IAREP 2012 conference proceedings.	Noted.
18327	4	25				The legacy of development argument can be inserted with material on path dependency and 'lock-in'. It seems orphaned here and is disproportionately short given other subsections and the importance of this topic.	Accepted. This section will be moved to either the start of 4.3 or merged earlier into our introduction and conceptual framework.
14317	4	25	30			Perhaps this subsection should be moved. Its current position between Technology and Natural resources does not seem to accommodate the flow of the chapter.	Accepted. This section will be moved to either the start of 4.3 or merged earlier into our introduction and conceptual framework.
3231	4	26	16	26	17	Dematerialization and depopulation should not only be mentioned here.	Accepted. We acknowledge that the term "only" is misplaced here; it would be better to use "key" instead. However, we also recognize the need to improve referencing and re-consider the use of terms and concepts that may not be understood by our audience.
18328	4	26	24	26	33	This para seems to misunderstand the nature of CBDR, which is built on developing countries' insistence that the legacy of (mis)development be recognised and addressed. It seems gestural and adds little of substance. Delete?	Noted.
17088	4	26	24		33	the quotes are only from developed country authors. I would like to refer you to my peer reviewed papers in 'Climate Policy' and "Climate and Development" which you could also use as references.	Noted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
3232	4	26	26	26	28	This point might be important and should not only be mentioned here.	Accepted. we acknowledge that the issue of CBDR should be taken more centrally into consideration by the chapter, and its different interpretations be related to SD and equity.
5475	4	26	34			Section on natural resources- should be more clearly linked as a potential model for how sustainability considerations could be linked to diverse development models- this discussion shows a range of different outcomes for resource rich economies- likely included as critical to models based on sustainability. Say this directly in a few sentences- potentially include a chart with range of outcomes	Accepted. We recognize the need to provide a more explicit conceptualization between natural resource use, economic development models, and the impacts on SD and equity, and future pathways.
3230	4	26	7	26	11	Perhaps re-formulate; unclear what this sentence means.	Noted.
8905	4	26	34	26	50	Make the use of natural resource more sustainable. Nature can be one of the solution of sustainability (IUCN, 2009).	Noted.
14318	4	26	34			Some of the key links between natural resources and climate change are not pinpointed in the present draft version. One would e.g. expect to see more of a distinction between exhaustible and non-exhaustible/renewable resources, forestry/REDD/LULUCF issues, conflicts in resource use from a SD and climate perspective and so forth.	Accepted. The next version will try to make this differences more explicit.
8259	4	26	1	26	3	Some discussions as to what the development mechanism of China and India had been that helped them grow independently of the MDGs process, while other regions lagged behind. Some remarks on these issues would provide the readers a good understanding of the process of sustainable development.	Noted.
12717	4	28	41	28	41	Finance aspects of climate change are dealt with in chapter 16. So the aspects raised in this chapter could be shifted to chapter 16 in order to concentrate of the main characteristics of sustainability, here.	Rejected. However, we don't agree to take finance out of this chapter. Rather we prefer to emphasize its role as a determinant for SD and equity (both a barrier or driver) and exclude a detailed explanation of financial mechanisms, which is indeed done in policy chapters.
12196	4	29	41ff			The sentence "UNFCCC parties have established..." is not correct as the Adaptation Fund was established under the Kyoto Protocol, not the UNFCCC.	Noted.
11993	4	30	3	30	8	It is wrong that the fact that lowest hanging fruits are developed first suggest that the CDM cannot support improved energy access for poorest people or to achieve widespread sustainability. This is a question of demand i.e. The moment there is a demand for CERs from specific methodologies such as the water purification and cookstove methodologies in certain countries, the CDM is exactly the prime instrument to give these people access. It has proven that time and again. Please keep to the evidence and look at the wide research done under the High Level Policy Panel: The research is available on their dedicated webpage cdmpolicydialogue.org .	Accepted. We agree on the need to disentangle two points: 1) the fact that the CDM has so far targeted low hanging fruits; and b) the ability (or inability?) of the CDM to support other forms of technology.
13687	4	30	38	31	8	Update data and figures as per the latest UNEP Riso data by the time of finalization of AR 5. Byrne's data will be obsolete then.	Noted.
11055	4	30	38	30	38	Regarding the CDM success, the discription include contradiction comaparing chap.16	Accepted. We will ensure that there is coherence with Chapter 13 discussion.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
7365	4	30	38	31	8	I would question the inclusion of the CDM under the "finance" heading. The CDM serves as a means of supplementing developed countries' mitigation actions in order to meet their commitments. It would be inappropriate to "double count" the CDM as 'finance' as well as mitigation action from developed countries. Of relevance here may be the "share of proceeds" element of the CDM, rather than the CDM projects themselves.	Accepted. We agree with the reviewer's comment and we accept the need to re-consider how the CDM is treated in the overall chapter and particularly in section 4.3.8.
18329	4	30	40			The term 'significant bias' is ambiguous. 'Emphasis' may be a better term. The CDM embodies the contradictory impulses of SD and mitigation - where the expenditure on the emerging economies probably delivers greater mitigation outcomes and better results for future generations as a whole than if these resources were directed to LDCs. Moreover, the 'bias' is possibly appropriate given the preponderance of global population in these countries. This tension could be used as a powerful example in this chapter.	Noted. We need to consider phrasing carefully.
13686	4	30	41	30	41	Insert after "... Centre on Energy 2011": "The CDM has generated revenues of several billion Euro for project developers (see Michaelowa and Buen 2012 for a discussions of the strengths and weaknesses of the mechanism)." Reference: Michaelowa, A.; Buen, J. (2012): The CDM gold rush, in: Michaelowa, A. (ed): Carbon markets or climate finance?, Routledge, Abingdon, p. 1-38.	Noted. References will be introduced.
12197	4	30	9	30	10	"Meanwhile..." The formulation of this sentence is not clear. What means "unevenness"? Does this refer e.g. to the financial amounts or financing procedures? The term meanwhile suggests an implicit criticism and comparison of the two institutions. I suggest to describe the facts and leave the interpretation to the political debate. If you intend to provide the basis for a comparison, the number of projects funded under the AF is lacking and the adaptation related projects under the SCCF needed to be spelled out, for example.	Accepted. There is a need for greater clarity.
16937	4	31	1		6	I think this is correct but should not be surprising: another way of putting it is that a "Second Domain" instrument like the CDM, founded upon assumptions of optimising market instruments for price-led investments, cannot be expected to address "First Domain" phenomena (see chapters 2 and 7 of Grubb, Hourcade and Neuhoﬀ op.cit). Earlier empirical data relating to CDM performance, and analysis of sectoral performance, was published as M.Grubb and T. Laing, "Global carbon mechanisms: lessons and implications." Climatic Change, 2010.	Noted.
13032	4	31	3	31	6	The sentence beginning with "This suggests..." is a non-sequitur. Just because a technology is mature, does not mean that all people have access to it. The fact that CDM might favor more mature technologies does not mean that CDM cannot contribute to energy access, industrialization or sustainability. On the contrary, when more mature RE technologies are rolled out in more markets this actually increases the opportunity for increased energy access, industrialization and sustainable development.	To be taken into account.
8804	4	31	39	34	13	Good to see questioning of consumerism including 'The spread of consumerism or consumption-based lifestyles is arguably a "mega driver" of global environmental degradation – including global warming.'	Accepted.
14319	4	31	41	31	43	Perhaps relevant to include a range of estimates from various sources here?	I assume the comment refers to consequences of choice of scale and other boundary conditions of sustainability, and if so, I agree it would be useful to add some illustrative estimates in the text of that section (but not in the introduction on page 31).
10860	4	31	41			I presume that "global consumption" means GDP here? I would at least state as much, and what is the source of the GDP data?	Accepted. Will check the source and add the information.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
13688	4	31	6	31	8	Replace "For a .. Jover 2012" by "The contributions of CDM to sustainable development have been assessed by Sutter and Parreno (2007), Olsen (2007), Policy and Operations Evaluation Board (2008), and Corbera and Jover (2012)". References: Olsen, K. (2007): The clean development mechanism's contribution to sustainable development: a review of the literature, in: Climatic Change, 84, p. 59-73. Policy and Operations Evaluation Board, Ministry of Foreign Affairs (2008): Clean and sustainable? An evaluation of the contribution of the Clean Development Mechanism to sustainable development in host countries, IOB evaluations no. 310, The Hague; Sutter, C.; Parreño, J.C. (2007): Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects. In: Climatic Change, Vol. 84, pages 75-90. Reason: Corbera and Jover assess a minuscule project sample and are not representative of the rich literature on CDM and sustainable development.	To be taken into account.
13275	4	31	1	31	2	I suggest to add: "(...) tend to be the most attractive and the most profitable -in terms of CO2 equivalent reductions-, (...)"	Noted.
13276	4	31	14	31	18	I suggest to add: High transaction cost, very high requirements for additionality demonstration,	Noted.
16263	4	31	3	31	5	"This suggests that it is unlikely that the CDM can contribute meaningfully to development goals such as improving energy access amongst the world's poorest people and industrialization in the poorer countries, or to achieving widespread sustainability in the developing world." This statement seems to ignore the latest development in programmatic CDM with 372 programmes submitted for validation up to August 2012 (UNEP Risø CDM Pipeline). Particularly EE demand side, waste and solar projects are better represented in the programmatic approach and Africa gets a higher share of the PoAs (30%) compared to ordinary CDM projects (2.9%). The CMP-7 in Durban decided to highlight the SD co-benefits of CDM projects and activities and at its 69th meeting the CDM EB considered a tool to voluntarily declare the SD benefits and negative impacts of CDM projects and activities. Also, the suppressed demand methodology recently approved and made available to project developpers makes it attractive to pursue e.g. rural electrification projects in the poorest countries (LDCs). So, I do not find the above statement to be well grounded. Statements about the future of the CDM should take into consideration the research done by the CDM Policy Dialogue, which has just published its report in September 2012 including recommendations to be considered for COP-18 in Doha.	Accepted. We will make sure to include the latest literature on the CDM, drawing on chapter 13.
12718	4	31	5	31	5	Article 12 No. 2 of the Kyoto Protocol (KP) mentions explicitly the purpose of the Clean Development Mechanism (CDM). "The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under article 3." Within the wording of article 12 KP, the assistance of developing countries is explicitly subordinate to emission reductions. Thus the industrialization of poorer countries would only call for emission reductions if this would be sustainable. However industrialization might not always lead to sustainable progress (see comments 21, 38). Therefore, the industrialization of poorer countries can not be assumed to be sustainable per se and so, it cannot be seen as a binding aim of article 12 KP.	Rejected. We do not consider emission reductions subordinate to sustainable development in the CDM context. In any case, we provide insights on the CDM effects on host countries' sustainable development, and in forthcoming SOD we will provide cross-referencing to Chapter 13, where this question is further explored.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
18330	4	31				This is a great section - but the issue of waste is not really addressed. Perhaps drop from title? Also, it does not really pay much attention to the 'dematerialisation thesis' and its associated problems.	Accepted. Waste generation and - management will be specifically discussed, in relation to both 'sustainable production' and 'sustainable consumption'. The 'Dematerialisation thesis or myth, and its problems, will be discussed in Section 4.4.4 on 'sustainable production' specifically in the context of industrial symbiosis. Relevant references using the term dematerialisation include (Hond, 2000; Trainer, 2001; Rodrigues et al., 2005; Lawn, 2006; Tapio et al., 2007; Bleischwitz et al., 2009; Bruckmeier, 2009). The term is not widely used in recent scientific literature; it seems closely related to the concept of eco-efficiency.
15110	4	31	21	31	21	In the section 4.4 Production, trade, consumption and waste patterns, not are developed enough the aspects of trade and waste patterns that are very important for sustainable aspects.	Accepted. A sub-section will be written on sustainable production. Waste generation and - management will be specifically discussed, in relation to both 'sustainable production' and 'sustainable consumption'.
14321	4	31	21			Would it be relevant to link this section's discussion to section 4.5.2 and its discussion of the relationships between growth/income levels and emission levels of various GHG's? (e.g. the environmental Kuznets curve, etc)	Accepted. Will make links with section 4.5.2. "Differences between pathways with regard to emissions, where relevant.
10789	4	31	41	32	12	Please insert photos of consumption patterns of middle classes in different countries and cultures. The photographer Peter Menzel has published some startling photos of how families across the world purchase things Source: Peter Menzel, photographer. http://www.menzelphoto.com	Will make an attempt, but photos are usually not allowed in the report. The suggested website does not function.
9022	4	32		33		It is important to highlight that inequality among countries is the bigger driver of inequality than inequality within states. This is implied in the discussion in these pages but could be more explicitly stated in the interest of a comprehensive and accurate treatment of the subject.	Partly accepted. There are large income inequalities in very large countries such as the US, Brazil, and China, and within-country inequality in these and a range of other countries is rising. But so is between-country inequality.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
10864	4	32	1			This paper may have some useful indicators, such as emissions embodied in trade Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908.	Accepted. The discussion of emissions embodied in trade is taken in section 4.4.6.1, and the references fits best there, but this section may be moved and/or aligned with Chapter 5.
10862	4	32	13	32	25	A relevant study here is Hertwich, E.G., Peters, G.P., 2009. Carbon Footprint of Nations: A Global, Trade-Linked Analysis. Environmental Science and Technology 43, 6414-6420.	I assume the comment refers to the paragraph starting on line 19 - 31. If so, the suggested reference is used later in the 4.4.5.2 where the focus is on GHG emission impacts, while on page 32 the discussion refers to environmental impact overall. Perhaps need to consolidate and rearrange these sections?
8260	4	32	26	32	40	The paragraph should include examples to illustrate how, generally speaking, luxury goods are more emission intensive than subsistence goods.	Accepted. The point is made by several reviewers and will be dealt with.
12719	4	32	26	32	40	You may like to consider that luxury consumption may not be THG-intensive in any case.	Comment somewhat incomplete, references would have been helpful.
10863	4	32	26	32	40	It is not really started here that what is "subsistence" and what is "luxury" will change. If you use the definitions based on elasticities greater than 1 being luxuries, then you will find that a car is a "necessity" in developed countries but a "luxury" in developing countries. I am not sure of a good reference (other than my unpublished work), but at least raising the issue is important here. It is easy for a developed country to drive their cars and not let developing countries have luxury products!	Accepted. Will deal with it.
3234	4	32	27	32	29	There are also luxury goods that are not materially intensive, e.g. consumption of culture (if not dependent on travel).	Accepted. The point is made by several reviewers and will be dealt with.
9816	4	32	28			The concept of "considerate design" argues that luxury goods are more expensive and thus can be a trigger for sustainable development: people buy high quality for a high price and use the goods for a longer period of time.	Accepted. Would be helpful with some references.
3235	4	32	38	32	38	Whose priority is this, and how can it be implemented?	Accepted. Rephrase last part of sentence and elaborate point.
10861	4	32	4	32	12	I would be a little careful with this paragraph as it is a very western view of consumption. While all levels of incomes will suffer some degree of "consumerism" it is not really correct to imply that consumerism covers those in poverty.	Accepted. It was not intended to imply that, we will make that clear.
8261	4	32	43	33	2	It seems unclear what is the difference between inequality among countries and between-country inequality in terms of metrics used to compare inequalities - both seem to be using average per capita income.	Accepted. Will check how the difference can be made easier to understand.
12280	4	32	5	32	5	Please consider to replace the term "global warming" with "climate change". Rationale: Global warming is so linked to temperature, while changes happening affect many other parameters such as precipitation and the frequency and intensity of some extremes.	Accepted. Will change terminology from global warming to climate change, and throughout the Chapter.
2921	4	32	30	32	34	Please include references to support the judgement. Deserve this remark a more prominent position in this report	Accepted. Will do with assistance of Contributing authors Tim Jackson and John Thørgersen.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
8906	4	32	27	32	29	It's the issue of feed the world in a sustainable way.	I don't understand what is wrong with it. Will check it. Comment not very clear.
14320	4	32	41			Given the title of this section, consider to reorganise the subsections to introduce the relationship between income inequality and consumption inequality before going into the income inequality. It could also be considered to include 'income' in the title	Accepted. Will include income in the title and consider reorganisation of the section.
4349	4	33	26	33	28	Cultural and economical conditions may also influences.	Unclear what the comment refers to. Seems misplaced.
14381	4	33	5			Need to show relationship to causes of global warming. Otherwise too broad	Accepted. Will demonstrate that link more clearly, in a general way.
17145	4	33	5			Suggest inclusion of discussion on indigenous peoples as within country inequality - particularly as their consumption patterns differ greatly from dominant societies and thus their contribution to climate change differs greatly too.	Accepted. Given space limitations.
5476	4	33	7			Please define Gini coefficient	Accepted. Could be included in the Glossary.
12721	4	33	39	33	40	Why trends of consumption may not follow trends of income is not clearly stated. Give reason since it may have high relevance for matching life styles with sustainability pathes.	Accepted. Similar comments and reasons were given ealier. Agree to reorganize two paragraphs in better way.
4350	4	34				An arrow from materials to energy is important if we think harvest wood products. We can use waste material woods as energy source.	Unclear what the comment refers to. Seems misplaced.
5477	4	34	14			Major points of this section are that a minimum level of income is required for happiness and beyond that income inequality is responsible for unhappiness- this can be conveyed with much less discussion	Wil consider this as part of overall strategy to shorten the Chapter.
8805	4	34	14	35	31	The discussion of happiness and consumption here tends to make utilitarian ethical assumptions and misses a more profound category of literature. In philosophy virtue speaks more directly to happiness than its utilitarian complement or competitor. Aristotle argues that happiness comes through virtue including moderate (i.e. not too much or too little) consumption. Sandler R and Cafaro P (Eds. (2005) Environmental virtue ethics, Lanham, Md.: Rowman) relate virtue directly to consumption, happiness and environmental issues. Palmer M and Finaly V (2003, n.b. page xi, Faith in conservation: New approaches to religions and the environment, Washington DC: The World Bank, http://go.worldbank.org/3L9IDQNFO0 or http://www.arcworld.org/books_resources.asp . Accessed 9 May 2011); Engel JR & Engel JG (Eds. (1990) Ethics of environment and development: Global challenge, international response, London: Belhaven) suggests that more people in the world would start their ethical deliberations with virtue than with utility. Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) indicates that virtue is a more rational response to the limitations of climate science than consequential utilitarian approaches. My currently unpublished book manuscript is a more direct and in depth treatment of virtue, climate and happiness.	Accepted. We will briefly discuss virtue ethics, but we reject the idea that there are utilitarian assumptions in what we wrote - quite the contrary, in fact.
12281	4	34	15	34	16	Please consider to replace the term "global warming" with "climate change". Rationale: Global warming is so linked to temperature, while changes happening affect many other parameters such as precipitation and the frequency and intensity of some extremes.	Accepted. Will change terminology from global warming to climate change, and throughout the Chapter.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
14382	4	34	17			17 "Reducing the level of material consumption for affluent populations" – Very strange indeed that this could seemingly be endorsed by WGIII. Surely the objective is to change the composition of the inputs away from carbon while spreading more widely the high consumption standards of higher-income countries.	Accepted. We need to clarify and qualify several issues here. We need to distinguish between 'consumption' and 'material consumption' and think about what constitutes 'high consumption'. It also touches on the idea of 'dematerialisation' of life styles and the extent to which it can feasibly be realised.
8750	4	34	17	34	17	... for affluent populations- why only them? This should perhaps read .."for populations in both industrialised countries and emerging economies"	There are affluent populations in all countries, perhaps we should refer to 'affluent groups' rather than 'affluent populations' as the latter suggests the population of an entire country.
18700	4	34	5	35	13	Are the two studies cited the only ones on the topic? Not sure i understand what "consuming less for status seeking or upgrading" means. And not sure the Bradbury study on intrahousehold income inequality is particularly relevant to the topic of the section. But if kept, then it would be useful to find out what precisely the "significant impact on expenditure" was (at least indicate direction of effect).	Accepted. Will bring in more literature and improve clarity of text.
9254	4	34		35		There might be scope here to comment on the organic role of social media (recent but mushrooming technology) in altering perceptions on both consumption and well-being, and political influence once communities start to really fear the effects of climate change (eg due to increased extreme weather events).	Ok, but we also need to simplify and shorten the text. How actual/experienced climate change will change consumption and perceptions of well-being is an interesting question; will try and locate literature, but I doubt there will be much.
10426	4	34	15	35	31	This section is not related climate change or vulnerability to climate change and has to be removed	We will explain better the relevance to climate change, but will not agree to remove the section.
12723	4	35	22	35	23	Decoupling growth and well-being is not the main issue. What about GHG-emissions? The assumed relation between growth and emissions should be made transparent.	Whether decoupling growth and well-being is an issue depends on the extent to which it is possible to decouple growth and material consumption - i.e. the dematerialisation discussion or myth. So far we have not been able to do so, so what are the indications that it will be possible in the future. The chapter addresses sustainability at large, and not only GHG emissions. Regarding the link between growth and GHG emissions, then we will refer to relevant place in Chapter 5.3, page 18.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
12724	4	35	24	35	31	I miss the link to climate change issues.	Accepted. The relevance to climate change will be explained better in beginning of 4.4.1.4
16938	4	35	3		16	It might be interesting to try and link the "satiation" effects to the apparent disappearance of any systematic link between per-capita income and energy/emissions, which seems to occur at lower levels (\$10-15,000: see my comments on Chapters 5 and 14, Figure 14-2). However perhaps this is beyond scope of IPCC.	Noted, but it seems over complicated to make this discussion.
8806	4	35	32	38	34	It is good to see discussion of sustainable consumption. Lack of concrete progress on sustainable consumption over the last 20 years is in part related to the factors discussed; however, a factor almost completely ignored in the literature - presumably rooted in ideologically assumptions of funding decisions is discussion of reducing or moderating consumption. Nearly all the literature focuses on technological changes to make products with a lower impact or on encouraging consumers to choose products claiming to have lower impacts. This is despite programs to address reduced excessive consumption being mandated in Agenda 21 (1992, 4.5). The previous comment outlines the logic of the consuming enough but not too much bringing happiness and indicates literature that suggests that this is better for societies and the Earth System. Consideration of obesity and anorexia should be sufficient to indicate the logic and that appropriate consumption has psychological and wisdom components. Chapman R (2002, 'The stag-goat and the sphinx: The place of the virtues in environmental ethics', Environmental Values, 11(2), 129-44) and IUCN/UNEP/WWF (1991, Caring for the Earth: A strategy for sustainable living, Gland: The World Conservation Union, United Nations Environment Programme, World Wide Fund For Nature, http://coombs.anu.edu.au/%7Eevern/caring/caring.html . Accessed 19 May 2011) are also relevant in specific discussion of temperance. Jackson T (2002, 'Consumer Culture as a Failure in Theodicy', in Consumption, Christianity and Creation - Proceedings from an Academic Seminar held on 5th July 2002, Sheffield: Centre for Sustainable Consumption) is far from irrelevant.	Response: Accepted. This comment related to the comment in line 77 on 'voluntary simplicity' and we will take up the discussion as far as space limitations allow. Suggested peer-reviewed literature has been located (I could not access the Chapman study), or more recent and formally published versions located: (Chapman, 2002; Jackson, 2005). (Kjellberg, 2008)
8746	4	36			44	As a suggestion for reducing the size, the session 4.4.3 Sustainable consumption and lifestyle (from page 36 to page 44) could be consolidated, and hence save space.	Will consider the suggestion in the overall strategy to shorten the Chapter.
5478	4	36	20	37	38	Are there instances where sustainability based consumption has preempted the consumer culture? This discussion is compromised as the authors are trying to evaluate the success of sustainability based consumption within a framework of consumer based consumption	Accepted. There are several instances of such changes in pre-industrial societies, e.g. the 'cargo culture', but I am not sure a discussion of these instances will be very helpful to policy (?)
18701	4	36	39			Useful to spell out what the three pillars of SD are	Ok, but briefly as they are already explained in start of Chapter 4.
18702	4	36	41	36	46	It may be useful in this section to refer back to relevant sections in Chapters 2 (e.g., Section 2.2) and 3 that distinguish between classical economic assumptions of rationality in expectations and preferences as guiding consumption and other decisions, in contrast to the assumption of behavioural economics and behavioural decision research that expectations can be biased and self-serving and that preferences are often constructed (rather than preexisting) and thus open to contextual factors (see, e.g., Weber, E. U. & Johnson, E. J. (2009). Mindful judgment and decision making. Annual Review of Psychology, 60, 53-86). The research on sustainable consumption summarized here seems to support the latter set of assumptions.	Response. Accepted. The suggested study has been located and added to Zotero.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
12726	4	36	11	36	12	A mere increase of the demand for sustainable goods and production technologies is not sufficient (see comment 38 referring to the problem of carbon leakage and comment 21 referring to material growth limits). Sustainable goods must rather replace unsustainable goods. This could be stated more clearly even if the European Commission seems to include the positive aspects of "green growth" only, especially because without a substitution of fossil technologies and of material growth paths depending on scarce resources the effect for sustainability respectively for climate protection may only be marginal.	Accepted.
13277	4	36	41	37	9	Something must be said in this paragraph about marketing and consumption. Not in vain, big companies use an enormous amount of money to convince consumers about the convenience of buying their products. A reference is given in the next page (37, 21) about marketing and prices, but this reference does not capture the complexity of marketing that involves sociological, psychological and even neurophysiological aspects of human behavior.	Accepted. There is a huge literature on marketing and its consumption impacts, and we need to be selective due to space limitations. One reference is Kjellberg 2008.
18703	4	37	1	37	14	Competing goals and selective accessibility of different and oftentimes competing goals as a function of individual and group differences as well as situational context, which can influence the outcomes of decisions (if conceptualized as a multiattribute tradeoff) is one of the implicit themes in this section, which it might be useful to spell out more explicitly. The Weber & Johnson (2009) review article in Comment 4 has a discussion of multiple competing goals and the effects of goal accessibility.	Suggested article added to Zotero. Included in section 4.4.3.1 [JT]
10427	4	37	16	37	32	Remove this paragraph	Not accepted. No reason is given for why we should do so.
14383	4	37	32			Where is the role of tax signals in all of this? Affect consumption profiles by taxes that impose a cost on emissions	Taxes and other policy instruments related to SC will be briefly discussed in Section 4.4.3.2, while avoiding overlap with policy chapters (13 and 15). The section was condensed. This point might be discussed in section 4.4.2 [JT].
12728	4	37	27	37	27	You may like to add that individual decisions are not always rational (refer to Chap.3).	Accepted. To be elaborated by John. The section was condensed [JT]
17341	4	37	33	37	38	unsustainable lifestyles are reproduced also by the media, which perpetuates the carbon intensive lifestyles of a middle class family in western nations with glamour and great attractiveness. The widespread availability of these images in the media can be considered at minimum here as having a powerful persuasive influence on consumers' attitudes, to say the least. The power of commercialization of the most intimate aspects of the life-style of the rich and middle class is important to consumption patterns globally. This needs to be highlighted here.	Accepted. To be elaborated by John. Media influences mentioned in section 4.4.3.2 instead [JT]
14020	4	38	27		34	Important to stress the importance of social and material contexts, so that consumption is not reduced to individual behaviors and efficient technologies. Literature to consider: the work by Elizabeth Shove and others, including Shove, E. (2005) Changing human behaviour and lifestyle: a challenge for sustainable consumption? In: Consumption - Perspectives from ecological economics. Elgar, Cheltenham, pp. 111-132;	Accepted. Reference is difficult to locate, and somewhat dated. Can we find a more recent reference?
17342	4	38	4	38	26	How information influences behavior is explained in Chapter 2 (System 1 and System 2 type of reaction) please make a cross-reference here.	Accepted. Done [JT]
18704	4	38	4			Weber, E.U. & Johnson, E.J. (2012). Psychology and Behavioral Economics Lessons for the Design of a Green Growth Strategy. White Paper for Green Growth Knowledge Platform (OECD, UNEP, World Bank).	Accepted. Reference stored in Zotero. Peer reviewed literature is preferred. Included [JT]

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
18705	4	38	4			Here and below it may be useful to make the point that metrics like the carbon footprint of products help to create new goals (e.g. to reduce CO2 emissions) and to attract and keep attention on those goals, in the competition between goals that i mentioned in comment 5. The reference in Comment 6 discusses this point on its p. 10.	Accepted. Will make that point and use the reference (but which one, the comments are not numbered). Done [JT]
18706	4	38	4	38	26	This discussion is useful, but also very developed-world focused. It may be useful to address what these topics mean in a developing world context, including the ideas of a hierarchy of needs (e.g., Maslow, 1954), where concerns with product carbon footprints might be seen as a luxury concern that only developed countries can afford. This is especially true in light of the fact that this chapter also covers equity as a topic.	Accepted. I agree, but exporters in developing countries are nevertheless often compelled to document and reduce the carbon footprint of their products. Mentioned [JT]
12729	4	38	4	38	26	Sundarakani, Balan; Souza, Robert de; Goh, Mark; Wagner, Stephan M.; Manikandan, Sushmera (2010): Modeling Carbon Footprints across the Supply Chain. In: International Journal of Production Economics 128 (1), p. 43–50; p.43) provide further information on the Carbon Foot Print within the supply chain.	Accepted. Although this comment and refernece seems to refer to Section 4.4.4. The suggested study has been located and added to Zotero (Sundarakani et al., 2010).
16246	4	39	1	39	3	I would not call "industrial symbiosis" a sub-discipline, but a concept explored in industrial ecology. So is design for environment. LCA is not a field as an alternative to industrial ecology, but a tool within the field of industrial ecology. Relevant tools within industrial ecology not mentioned here are Material Flow Analysis (MFA) and environmentally-extended input-output analysis (EE-IO).	Accepted. To be elaborated by Michael
5479	4	39	11			this is being attempted by the state of Oregon - http://www.deq.state.or.us/lq/sw/materialsmgmtplan.htm	Ok. Find studies reporting on this activity, if they exist.
17642	4	39	26	39	38	Such as systematic concept is better approache for monitoring and evaluation, it is important to define "unit" and "boundary" with representativeness heuristic for regionals and countries, etc.	The comment is difficult to understand.
10865	4	39	26			Define "CO2 equivalents". I am sure you use GWP100, but this should be stated. This choice is not unique, and should point to the relevant section of WGI Ch8. In the case of food, using CO2-eq based on GTP will give a quite different result.	Accepted. Will make a note to that effect. What is GTP?
5480	4	39	39	40	29	Here the authors go from very big picture- changing basic assumptions on how LCA can be used to estimate GHG emissions to very small picture of different levels of accounting for this- It would be helpful to add additional information on how the broader perspective changes overall understanding of emissions- one or two examples could be used and to limit discussion on the smaller accounting issues	Accepted. Wil have to give this comment more thought, it is not crystal clear what she wants us to do.
10866	4	39	42			For the first point, appropriate references here include Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908. and the model comparison, Figure 1 (and references), in Peters, G.P., Davis, S.J., Andrew, R., 2012. A synthesis of carbon in international trade. Biogeosciences 9, 3247-3276.	Accepted. Comment refers to 'choice of accounting method', item 1 about reduction in emissions by nations. The suggested references (Glen P. Peters et al., 2011b; G. P. Peters et al., 2012) have been located and will be considered, given space limitations.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
5229	4	39	45			The inclusion of new references will add some information. 1. Soimakallio, S., Kiviluoma, J., Saikku, L. 2011. The complexity and challenges of determining GHG emissions from grid electricity consumption and conservation in LCA - A methodological review. Energy 36, 6705–6713. 2. PINGOUD, K., EKHOLM, T., SAVOLAINEN, I. Global Warming Potential (GWP) factors and warming payback time as climate indicators of forest biomass use". Mitigation and Adaptation of Strategies for Global Change (3 November 2011), pp. 1-18. DOI 10.1007/s11027-011-9331-9. 3. Helin, T., Sokka, L., Soimakallio, S., Pingoud, K., Pajula, T. 2012. Approaches for inclusion of forest carbon cycle in life cycle assessment – A review. GCB Bioenergy (in press).	Accepted. The suggested references (Pingoud et al., 2011; Soimakallio et al., 2011; Helin et al., 2012) have been located and added to Zotero and will be considered, given space limitations.
2922	4	39	34	39	34	attempts' - does it suggest the definition is not useful?	Accepted. No, I think I was using the author's own wording. "Attempt to" deleted [JT]
12731	4	39	9	39	10	Labour rights might be important in international politics as democracy and human rights in general (comment 12, 19). But it is no conditio sine qua non for sustainable development. Sustainable production in the sense of the Brundtland Definition of sustainability (pp. 11-12) rather depends on durability (temporary level of sustainability) and the potential to spread a production pattern worldwide (spatial level of sustainability). Even if low labour standards are morally controversial the durability of the use of resources would not depend on its amelioration. In this context also see the inclusion of labour rights within the spatial context of sustainability as included in the contraction and convergence principle (p. 70, line 38).	Accepted. We will qualify the statement. It depends on your conception of SD, i.e. whether the social aspects of sustainability is considered and deemed important. See early part of Chapter.
16939	4	39				If this is the place where AR5 addresses consumption vs production accounting, it might be interesting to try and produce a graphic correlating to Figure 14-2 but showing how it would change on a consumption basis? Or this may be a task for Chapter 5.	Will consider this.
8807	4	39	11	43	28	Carbon accounting is largely based on assumptions falsified by Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) and section 4.4.5 would be a good candidate to be trimmed leaving the references by indicating the literature but less of the detail, in my opinion.	We will adopt a more critical perspective on carbon accounting and LCA in general, using Charlesworth & Okereke (2010) among other references. Carbon accounting, irrespective of its problems, is a strong trend in both private companies, NGOs and governments, so it is important to discuss it thoroughly. We agree that some trimming of 4.4.5 is warranted.
10273	4	39		39		T. Homma et al., "Quantitative evaluation of time-series GHG emissions by sector and region using consumption-based accounting", Energy Policy (forthcoming) will also provide consumption emissions by region including non-CO2 GHG, and additional information on the consumption CO2 emission pattern.	Accepted. The reference (Homma et al., 2012) has been located in added to Zotero. More detailed discussion of regional emissions is found in Chapter 14.
7843	4	4	1	7	44	This executive summary of chapter 5 is an example how an executive summary should not be written. It is too long, it does not include references to the underlying subchapters and it does not include information on the level of uncertainty of the findings. All this indicates that this executive summary does not really reflect the findings of the assessment of the literature but has more the nature of an introduction.	Will take into account.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
3277	4	40	13	40	13	Multi-regional input-output models are not a class of hybrid LCA-EIO methods. Multi-regional input-output models are a type of EIO model in which the imports to a region are modelled using the technology of the region of origin, whereas simpler EIO models generally assume that imports are produced using the domestic technology of the destination (consuming) region.	Accepted. Will make the text more accurate/precise.
10867	4	40	14			Accounting systems are a human construct is a better way to put this, Caldeira, K., Davis, S.J., 2011. Accounting for carbon dioxide emissions: A matter of time. Proceedings of the National Academy of Sciences 108, 8533-8534.	Accepted. Will consider the suggested reference (Caldeira and Steven J. Davis, 2011) which has been added to Zotero.
7303	4	40	30	43	28	Propose to merge sections on various carbon footprints in one, to reduce the entire length of the chapter.	Will consider this as part of the overall strategy to trim Chapter 4.
5735	4	40	40	40	40	What is the source? However this is consistent with FAO's rough calculation of 22% (+ around 15% due to land use): http://www.fao.org/docrep/014/i2454e/i2454e00.pdf	The source is given in the beginning of the sentence - Hertwich and Peters (2009).
4570	4	40	15	40	17	Add: Rajamani, Lavanya. 2012. "The Changing Fortunes of Differential Treatment in the Evolution of International Environmental Law." International Affairs 88 (3): 605-623.	Noted.
7332	4	41	25	41	28	Uncertainty of consumption-based emissions is discussed in Lenzen et al (2010). DOI: 10.1080/09535311003661226	Response: Accepted. Will consider the suggested reference (Lenzen et al., 2010) for inclusion.
10869	4	41	25	41	26	What is the relevance of the "complexities and uncertainties". There are complexities and uncertainties in current emission accounting, but they are still used. And the complexities and uncertainties are only relevant in some cases. If my policy is a nudge, then the complexity and uncertainty may be irrelevant, however, if my policy is a BTA, then it is a different situation.	It is probably a fair point, but it needs clarification; it is important to be very explicit about uncertainty regardless of the type of accounting adopted, and we should probably make a stronger point about this, including the observation by another reviewer that accounting systems are human constructs (negotiated, influenced by political and economic interests) and so should not be seen as objective. The last part of the argument is not very clear.
16905	4	41	31	41	33	How to combine production-based and consumption-based approaches? Would like to see more elaboration and references.	Accepted. Will make an attempt, depending on availability of literature (see references in comment in Line 531). Should it rather be addressed in Chapter 5?
13691	4	41	31	41	31	Add after "... source)": "Furthermore, countries exporting goods benefit from export revenues, with costs related to greenhouse gas emissions as well as any other negative impacts of production of those goods priced in (Steckel et al. 2010, p. 781)". Reference: Steckel, J.; Kalkuhl, M.; Marschinski, R. (2010): Should carbon-exporting countries strive for consumption-based accounting in a global cap-and-trade regime?, in: Climatic Change, 100, p. 779-786	Accepted. Will consider the argument made and the suggested reference (Steckel et al., 2010) for inclusion.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
10870	4	41	32			There are lots of references for this point, eg, Lenzen, M., Murray, J., Sack, F., Wiedmann, T., 2007. Shared producer and consumer responsibility - Theory and practice. Ecological Economics 61, 27-42.; Andrew, R., Forgie, V., 2008. A three-perspective view of greenhouse gas emission responsibilities in New Zealand. Ecological Economics 68, 194-204.; Davis, S.J., Peters, G.P., Caldeira, K., 2011. The supply chain of CO2 emissions. Proceedings of the National Academy of Sciences 108, 18554-18559.; etc	Response: Accepted. Will consider the suggested references (Lenzen et al., 2007; Robbie Andrew and Forgie, 2008; Steven J. Davis et al., 2011) for inclusion, in view of space limitations.
7331	4	41	4	41	33	Chapter 14 (14.2.4) discussed more technical difference of consumption-based emissions. Peters (2008) and Kanemoto et al. (2012) discuss the difference between territorial and consumption-based emissions. http://dx.doi.org/10.1016/j.ecolecon.2007.10.014 http://dx.doi.org/10.1021/es202239t	Accepted. Will coordinate with the relevant authors of Chapter 14 (14.2.4), and consider the two suggested references (Glen P. Peters, 2008; Kanemoto et al., 2012) given space limitations.
10868	4	41	4	41	24	There could be a broader list of references on these issues. Davis, S.J., Peters, G.P., Caldeira, K., 2011. The supply chain of CO2 emissions. Proceedings of the National Academy of Sciences 108, 18554-18559.; Davis, S.J., Caldeira, K., 2010. Consumption-based Accounting of CO2 Emissions. Proceedings of the National Academy of Sciences 107, 5687-5692.; Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407.; Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908.; etc	Accepted. Will consider the suggested references (Glen P. Peters and Hertwich, 2008; Steven J. Davis and Caldeira, 2010; Glen P. Peters et al., 2011a; Steven J. Davis et al., 2011) for inclusion, while also considering space limitations and the possibility that some of these references address very similar questions and report on very similar model results. Some of the suggested references have been cited elsewhere in Section 4.4. In general, select as high quality sources as possible; the basic source of evidence rather than a review article referencing the source (in general). [JT]
3278	4	41	43	41	43	Move the word "average" to earlier in the sentence, as follows 'The growth in average CO2 household emissions was 15% on between 1990 and 2004.....'	Accepted.
3279	4	41	45	41	56	Replace "and since 1996, increased household energy use" with "with only slight relative decoupling between expenditures and CO2 emissions occurring since 1996".	Accepted. Check the wording in the cited paper.
4572	4	41	29	41	33	Add: Shue, Henry. 2013. "Climate Hope: Implementing the Exit Strategy." Chicago Journal of International Law 13(2).	Noted.
10871	4	42	1			The following review should at least be mentioned Hertwich, E.G., 2011. THE LIFE CYCLE ENVIRONMENTAL IMPACTS OF CONSUMPTION. Economic Systems Research 23, 27-47.	Accepted. Will consider the suggested reference (Hertwich, 2011) for inclusion, in view of space limitations.
5481	4	42	3			Graph should include some basic information on characteristics of households for example m2 per household, vehicles per household	Accepted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
4574	4	42	28	42	28	The report to President Lyndon Johnson was by Roger Revelle, not the Jasons, and was in 1965. The report by the Jasons was to President Jimmy Carter, and was in 1977. Oreskes, Naomi, and Erik M. Conway. 2010. Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco to Global Warming. Bloomsbury Press, New York. 170-172.	Noted.
10873	4	43	34	44	15	There are several articles on the temporal dimensions, Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908.; Peters, G.P., Davis, S.J., Andrew, R., 2012. A synthesis of carbon in international trade. Biogeosciences 9, 3247-3276.	Accepted. Will discuss temporal dimensions also, subject to space limitation, and in this regard consider inclusion of the suggested references (Glen P. Peters et al., 2011b; G. P. Peters et al., 2012) (these two are already mentioned in other comments).
10872	4	43	42			Nothing agains the Carbon Trust report (it was my data), but there are a multitude of peer reviewed articles that can be referenced here. Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407.; Davis, S.J., Caldeira, K., 2010. Consumption-based Accounting of CO2 Emissions. Proceedings of the National Academy of Sciences 107, 5687-5692.; Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908.; and many others	Response: Accepted. Will consider inclusion of the suggested references (Glen P. Peters and Hertwich, 2008; Steven J. Davis and Caldeira, 2010; Glen P. Peters et al., 2011) (they are all are mentioned in other comments).
3280	4	43	7	43	7	PAS 2050 was updated in 2011.	Accepted.
10428	4	43	31	44	15	Remove the section: The spatial divide between consumption and production, very little value-add to the chapter	The comment is not well substantiated. The section will be improved upon, cf response to other review comments. We maintain that the increasing dislocation of production and consumption activities have significant implications for sustainability, equity and sustainable development, and in particular concerning climate change.
17343	4	43	34	43	45	Please consider coordinating here in this session with Chapter 8 and Chapter 12 at least cross-referencing and reading their take on this spatial aspects.	Accepted. Will do that.
17344	4	44	16	44	23	again seek to coordinate with Chapter 8 please for content and cross-referencing	Link with Ch.8 to be explored
2561	4	44	22	44	22	Not only biofuels. All fuels. See SRREN Ch9	ok
11568	4	44		52		The relevance of the section should be made clearer. Maybe the section can be shortened.	Noted
8808	4	44	24	53	33	Including a development pathway where widespread moderation of consumption by the global middle class and those with higher wealth still would appear a useful addition.	Accepted, provided there is literature
3290	4	44	35	47	33	This portion of the section should be deleted - or at least significantly shortened - because of overlap and there should be a reference to chapter 6, Assessing Transformation Pathways.	Section useful in Ch.4 flow but overlap w/Ch.6 (and 5) to be addressed. Section will have to be shortened anyway. Reference to Ch.6 to be added.
15111	4	44	16	44	22	I propose to delete this paragraph because don't exist consensus neither their definition nor their clear application and results	We do not understand what the consensus is about. Page 44 lines 16 to 22 are in section 4.4. and not in section 4.5

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
4571	4	44	6	44	8	Add: Shue, Henry. 2011. Human Rights, Climate Change, and the Trillionth Ton. In: The Ethics of Global Climate Change, ed. Denis G. Arnold. Oxford University Press, United Kingdom. 292-314.	Noted.
2923	4	44	26	46	22	Possibility to be shortened	Accepted
5482	4	46	16	46	22	More information on green growth would be helpful	Noted, provided there is space
17345	4	46	26	46	35	Make a crossreference to chapter 8 here.	Noted
6322	4	46	16	46	22	A recent collection of articles arose from two international conferences on "The Natural City," where Robert F. Kennedy Jr., Dr. Jane Goodall and former Vice-President Al Gore were keynote speakers. The book may be useful to be referenced here. Co-edited by Ingrid Leman Stefanovic and Stephen Scharper, THE NATURAL CITY: RE-ENVISIONING THE BUILT ENVIRONMENT (Canada: University of Toronto Press, 2012.) It is a collection of chapters that summarize and address many "green growth" concepts.	Noted, will review reference
12732	4	46	19	46	20	See comment 1.	Unclear
12734	4	46		48		This section should refer more to climate change and the general explanations could be shortened.	Accepted
14322	4	46	24			This section would benefit from the inclusion of more references. In the present version, the level of detail in which Page (2006) is discussed is very high and there are relatively few additional references.	Accepted
12733	4	46	25	47	16	The sentence in p. 46, line 16f. makes point so the passages before can be shortened.	Unclear
10429	4	46	2	46	22	The forward looking development paths have to be clearly specified. The section as such does not specify it properly. Applications related to growth, poverty in developing countries are necessary	Accepted. Box 4.1 to be revised
8262	4	47	11	47	11	There probably need more explanation to the statement, "the level (and type) of consumption is almost completely driven by cultural norm", are these the consumptions referred to as luxury consumption?	In fact, refers to Section 4.4 and not 4.5
18331	4	47	16			This sentence is opaque to most readers... simplify?	Noted, will review sentence
3291	4	47	34	50	9	Keep this portion of the section because it is nicely focused on key issues.	Thank you
17346	4	48	13	48	15	Make a crossreference to chapter 8 here.	Accepted
3613	4	48	24	48	24	Please add as citation for the Environmental Kuznets Curve itself "(Grossman and Krueger, 1991; Grossman and Krueger, 1995)". Please cite as Grossmann, G.; Krueger, A.: (1991). Environmental Impacts of a North American Free Trade Arrangement. Discussion Papers in Economics, No. 158. Woodrow Wilson School of Public and International Affairs, Princeton. Grossmann, G.; Krueger, A.: (1995). Economic growth and the Environment. Quarterly Journal of Economics 110 (2), 352-377.	Reference to be reviewed
3614	4	48	27	48	27	Please make the references to the econometric work here.	Noted, but some econometric work already included
18332	4	48	28	48	37	This is a critical para. It would be even more powerful if it were integrated with the argument about population growth and changes in wealth and demographics.	Noted, will see overlaps with Ch.5
10874	4	48	3			The following should at least be referenced in this section , Steinberger, J.K., Timmons Roberts, J., Peters, G.P., Baiocchi, G., 2012. Pathways of human development and carbon emissions embodied in trade. Nature Clim. Change 2, 81-85.	Noted, reference to be reviewed
5483	4	48	4	48	21	How does infrastructure relate here? It would seem that infrastructure choices re multiple variables including transport, waste management, energy are critical to this but are not mentioned directly	Accepted. Will include discussion on infrastructure.
12735	4	48	1	48	1	"providing more information" in the brackets might be better replaced by a reference.	Accepted
12736	4	48	22	48	27	Different result in Tucker, Michael (1995): Carbon Dioxide Emissions and Global GDP. In: Ecological Economics 15 (3), S. 215–223: positive relationship between CO2 emissions and GDP; it should be mentioned that there are different findings.	Noted, reference to be reviewed
15112	4	48	4	48	4	I propose to delete this paragraph or pass to another Chapter because not is directed related with sustainable development	Rejected. Link to sustainable development development to be added.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
3615	4	49	17	49	17	Please add "For China, Li and Oberheitmann (2008) found that the country is still on the left hand rising part of the Environmental Kuznets Curve. The four year period of negative income elasticities of emissions between 1997 and 2000 which temporarily that lead to an Environmental Kuznets Curve like shape with a decreasing right hand part of the inverted U-type shape was only a structural break." Please cite as: Li, Y. and Oberheitmann, A. (2008). Main factors of decoupling China's energy related emissions from its economic growth – Where is China on the Environmental Kuznets Curve? ASIEN, 106, 7-23.	Noted, reference to be reviewed
12737	4	49		49		A figure of an environmental cuznets curve might have more explanatory power than this figure. Furthermore, Canada, US, Germany can not be distinguished, also World is problematic to identify.	Noted, Figure to be revised
14311	4	5	1	7	44	The executive summary would benefit	Noted.
8794	4	5	11	5	14	The 'definitions' of sustainability all make more consumerist and utilitarian ethical assumptions than does Brundtland or the Rio Declaration. Literature such as Dobson and Jacobs would help broaden and crystalize the authors understanding of sustainable development and sustainability.	Rejected. There is no consumerist or utilitarian assumption in the text.
3943	4	5	11	5	11	Who determines what conception will prevail, and what is the fate of those who disagree?	Collective discussions of objectives are the essence of democracy.
6092	4	5	11	5	15	Is this the definition by Chapter 4 members or citation from other literature? Please make it clear.	OK.
4752	4	5	14	5	15	I don't agree with the sentence "ensuring sustainable development is less ambitious but more consensual than seeking a socially optimal pathway". Could you please explain are argue how you have reached this statement?	Noted. Will clarify.
3942	4	5	15	5	15	Who determines what is the socially optimal pathway and what is the fate of those who disagree?	Collective discussions of objectives are the essence of democracy.
4753	4	5	16	5	23	"First" is mentioned but there is no "second", "third", etc. Change the sentence.	Not relevant.
4751	4	5	2	5	10	Please provide an IPCC definition of the "sustainable development"	Will check IPCC Glossary (Yoke Ling)
2248	4	5	2	82	8	Sustainable development is impossible. There are only two directions, forward and backward. The climate and everything in it evolves, and we should try to take advantage of its course. To try and stop it leads to disaster. Futire generations will not be grateful if we make decisions on their behalf. They will make their own decisions and they are certain to be different and even diametrically opposite from what we want to wish on them. We should have greater concern for the state of our own affairs.. The future generations are going to have to cope with the mess we are making and the likelihood is that they will hate us for it. Currently we are imposing mass unemployment on the next generation. Since ther is no evidence that greenhouse gases are harming the climate the Chapter as a whole is irrelevant	Will shorten chapter.
3205	4	5	20	5	20	"it appears" How?	Not relevant.
2935	4	5	22	5	23	This line refers to "the need for an ..operational ..meaning of equity", but without any reference to p7 lines 17-27 which would appear to point towards an answer to this question.	Noted.
3944	4	5	24	5	24	Who determines which approach to SD and equity will prevail, and what is the fate of those who disagree?	Collective discussions of objectives are the essence of democracy.
14004	4	5	33		34	The IPAT model is a narrow and outdated explanation of environmental impacts. The social sciences has shown that it is about much more, including access to resources, power relations, social vulnerability, etc.	Agree. This is quantitative decomposition with no explanatory value. Must discuss (4.3.1)

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

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7752	4	5	33	5	35	I was a little concerned to see the use and support of the IPAT explanation of transition to SD in the Exec Summary. There is a significant critique of IPAT, and this should be cited. Many authors disregard IPAT as it is only useful in limited contexts. E.g. empirical tests show different types of impacts (e.g. CO2 or SO2) relate differently to changes in population, affluence and technology, i.e. the relationship does not always hold. Further the simple multiplicative relationship among the main factors generally does not hold, e.g. doubling population does not necessarily lead to a doubling of impact. This critique must be recognised.	Agree. This is quantitative decomposition with no explanatory value. Must discuss (4.3.1)
3945	4	5	33	5	3	Who considers these to be the key factors and who disagrees? (Niall Ferguson's Reith Lecture series this year is saying that institutional quality is a key factor in the advancement of nations.)	Choice of drivers needs further discussion (4.3)
3946	4	5	33	5	35	Is this saying that there is high agreement that greater prosperity makes a cleaner environment more affordable, or is this saying the opposite?	The opposite.
10856	4	5	36	5	41	Wouldnt governance also be quite important in shaping these issues?	Sure,this is just said in the following paragraph.
18296	4	5	37			The word 'income' is too narrow, and could be replaced by 'well being and material standards of living'.	Accepted.
13999	4	5	37			What about humans as agents of change? Limiting this discussion to human capital and the role humans have in production will leave out the discussion about how humans can foster change and the individual and systems level.	Accepted.
3204	4	5	4	5	4	Is the existence of co-benefits of climate action for SD and equity an empirical fact, so that its place at the beginning of the executive summary is warranted?	To be clarified (Sivan).
4518	4	5	46	6	6	Increases in global affluence which is described in this paragraph as “consumption of goods and services” has also driven vast improvements in public health, human environments, and in many cases natural environments (improvement of criteria air pollutants). The one-sided description of the ills of affluence is not balanced by the obvious benefits or the aspirations to seek affluence. Suggest that this paragraph include descriptions of improved conditions (e.g. life expectancy) over the past few decades.	Will take into account.
10857	4	5	46			If you are talking about "global consumption" then it is the same as "global production", and thus your argument is equally applicable to consumption and production	Agreed.
14000	4	5	47			Suggest "...and is a key driver of environmental CHANGE AND degradation,	Rejected.
3947	4	5	47	5	47	Who is the authority for this statement and is there a good reason for not acknowledging alternative views - eg see the literature reviewed by Lomborg, the Skeptical Environmentalist, chapter 1?	See comment 149
12277	4	5	1			Please ensure that the executive summary focus on the key findings in the chapter in line with the current practise of IPCC reports. A lot of the text in the FOD of the Summary is of a descriptive nature, hence the summary can be shortened by omitting this. You might consider to move parts of the descriptive text from the summary and use it instead of the too long text in the body of the chapter, where appropriate. The executive summary in the FOD is in my opinion too long, and should be reduced by at least one page.	Accepted.
15099	4	5	17	5	17	To include: "Development RIGHT, the elimination of poverty,"	Rejected.
15100	4	5	46	5	47	To include: "The global consumption of goods and services has increased dramatically over the last decades, in both absolute and per capita terms, JUST AS UNSUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS, ARE key driverS of environmental degradation, including global warming "	Rejected.
2909	4	5	46	5	46	proposal is to remove 'dramaticly', in stead for instance enormously?	Accepted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
12676	4	5	12	5	13	An equal development of the three pillars might be impossible insofar that they limit each other (in this context also see e.g. Norman, Wayne/MacDonald, Chris, Getting to the Bottom of "Triple Bottom Line", in: Business Ethics Quarterly 2004, pp. 243-262). Another argument to refuse an equal importance of each pillar is provided by the limited possibility of substitution of natural resources (cf. IPCC Draft, Chapter 4, Section 4.2.1, p. 12, line 28; see also Constanza, Robert et al., The value of the world's ecosystem services and natural, in: Nature 1997, p. 253-260). A reasonable exception (where socio-economic concerns prevail) might be the subsistence level respectively a very low level of "welfare" that might be intouchable when weighing the interests between today's and future generations (Constanza et al., p. 257). Hence, with regard to avoiding contradictions the Brundtland definition of SD seems superior to the "Triple Bottom Line" (IPCC Draft, Chapter 4, Section 4.2.1., pp. 11-12 and Section 4.2.2, p. 13, lines 25-26; see also infra comment 21).	Helpful points (for 4.2.1)
12677	4	5	36	5	40	The increase of income and economic returns, the acquisition of skills and the accumulation of knowledge are not aimed within sustainable development per se only if they are in line with a durable development path (cf. comment 1).	Noted.
3292	4	50	10	53	33	Delete these materials, including Fig. 4.2, in view of the need to shorten the chapter because they are a bit general.	Rejected, see response to comment 5484
10430	4	50	28	50	29	Remove this line	Noted, line to be made clearer
5484	4	50				Section 4.5.3.1- this discussion is carried out too much in a vacuum. The authors are trying to apply pre existing models to a structure or range of structures that are at present very poorly defined. As the authors have stated in previous sections- use of a sustainable model likely involves a transition from the existing consumerist model. The value of the Solow growth model may be limited with a new mindset. For me, the most valuable portion of this section lines 38-46 on sequential decision making and inertia- this seems the most applicable and helpful	Noted, 4.5.3.1 provides framing for the tools to analyze transitions. To be revised (see also response to comment 18333)
18333	4	50				Good discussion - but it needs a comment that this economic transition modelling fails to account for social and political institutional factors which can offer either profound unanticipated barriers to - or catalysts for - change. As a consequence, the projections are often weakly predictive. An example relates to section 4.5.3.2. The failure of social acceptance of nuclear power led to its economic unviability in most Western countries. Cars were initially also rejected - and if the toll of injury and death associated with them were more forcefully recognised and considered, the successful acceptance and use of the car as a form of mass transport may have taken another path (at least in terms of design). This element is considered where this chapter talks about 'actors losing faith in the regime'... this is almost the only point in this chapter where social institutions are given prominence.	Noted, 4.5.3.1 to include a broader review of model limitations.
16940	4	51	3		12	This is potentially a crucially important paragraph that in my view misses the fundamental point. Rigidities of all sorts characterise short-term options and constraints, and this paragraph correctly implies that this is about far more than just capital stock, but has a lot to do with behaviour, expectations, habits etc; classic First Domain characteristics. Keynes' General theory can be interpreted as illustrating what these rigidities of "First Domain" characteristics do to classical economic expectations; in that sense Solow's acknowledgement was spot on. However, concluding that neoclassical assumptions are appropriate to "very long times scales" misses the equivalent phenomena at the other end of timescales. Neoclassical (Second Domain) assumptions assuming constant supply and demand curves ie. constant (or exogenously defined trends in) technology, preferences, infrastructure etc. For timescales beyond a decade or two, evolutionary effects, path-dependence, endogenous change etc, start to dominate. This paragraph really needs to expand from the Two to the Three domains to make the core points, that different decision and economic processes dominate at different timescales, and neoclassical is a reasonable approximation to the middle domain. for details see Chapter 2 in Grubb, Hourcade and Neuhoff, Planetary Economics.	Noted, very important comment, to be included in revision of section 4.5.3.1

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
10432	4	51	42	51	42	Please look up Gillig, McCarl and Sands 'Integrating agricultural and forestry GHG mitigation responses to general economic frameworks' MITI 9 (3) (2004) 241-259	Noted, reference to be reviewed
5485	4	52				Section 4.5.3.2- is there any information or literature on alterations of the socio-technical landscape in light of the rapid information transfer through social media or innovations that don't require extensive infrastructure?	Noted, will review literature
12738	4	52		52		To which institutional theory does the figure refer to? Should not there be arrows from 2., 3., 4. point to 1.? The arrows could also be displayed in a different colour in order to improve the visualisation of the "evolution". Please note "shits" in the brackets under 3.	Noted, will improve figure
12740	4	52	23			A reference should be made why new technologies are often less efficient. Is not it a question of time?	Noted, will clarify
14022	4	52	7	53	33	On technological transitions literature that is highly relevant includes: Berkhout, F. 2002. Technological regimes, path dependency and the environment. Global Env. Ch., 12(1): 1-4; Berkhout, F., Marcotullio, P. and Hanaoka, T. Understanding energy transitions. Sustainability Science [Special Issue: Socio-technical transitions towards sustainable energy and climate stabilization F. Berkhout, P. Marcotullio and T. Hanaoka (eds)] vol 7(2) 2012: 109-111; Adrian Smith, Andy Stirling, Frans Berkhout, 2005. The governance of sustainable socio-technical transitions. Research Policy 34, pp. 1491-1510; Rohracher, H. 2008. Energy systems in transition: contributions from social sciences. International Journal of Environmental Technology and Management, 9 (2-3), 144-161; Rohracher, H. 2008. Energy systems in transition: contributions from social sciences. International Journal of Environmental Technology and Management, 9 (2-3), 144-161.	Noted, reference to be reviewed
7777	4	53		55		There is some confusion throughout this section between mitigation and mitigative capacity, and adaptation vs adaptive capacity. While these concepts are really clearly laid out in the second para of this section, these definitions are then not used in section 4.6.1.2 'differences between mitigative and adaptive capacities'	now clarified in 4.6.1.2
14021	4	53	34	57	23	The discussion about mitigative capacity and mitigation, and link to adaptive capacity and adaptation is somewhat misplaced also in section 4.5. It is an important section as it has the potential to bridge the gap between adaptation and mitigation, and argue why these two needs to be considered together in a sustainability context.	this section is being moved into 4.5. It is unclear what gap between mitigative and adaptive capacities needs to be bridged. Reference?
3293	4	53	34	56	21	This proposed section is ok, except Box 4.2, which should not be included because it is too cryptic and confusing.	Agreed
15113	4	53	44	53	44	This subsection "Mitigative capacity, adaptive capacity and response capacity" would be deleted or pass to another Chapter because it isn't written in analysis with sustainable development.	This section will be moved to 4.5. A new sentence in intro makes the connection to sustainable development.
12200	4	54	3ff			You write about the 'abilities of a society' and 'factors that contribute to adaptive and mitigative capacity' – what are these?	True, we mention broad characteristics rather than specific institutions, and so this section can be made a little more specific, but will it then work as a general framing chapter?
14023	4	54	1		5	Are these common factors (shaping both adaptive and mitigative capacity) also described up front? It would be useful, as it very much forms the basis for discussing adaptation and mitigation in one chapter.	not sure what "up front" means, perhaps we can bring this out in intro to chapter
14025	4	54	11		24	Why there is a gap between response capacity and actual actions, has been widely studied and it would probably include not only literature that points to lack of political will, but also literature pointing at social practices (see work by Elizabeth Shove, John Urry, Hal Wilhite, etc.)	Social practices is now included.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
7780	4	54	13	54	14	delete sentence starting 'Some have thus viewed..' as it repeats previous sentence	The best of these two will be combined into one.
7781	4	54	18	54	18	delete 'Caring enhances political willingness', there are many cases where this is not the case, e.g. UK love of animals and hatred of animal testing, yet we still have animal testing	This will be handled in a more nuanced way.
14026	4	54	28		40	Start out with presenting the multiple factors, processes and structures that affect response capacity (as opposed to starting out with a narrow focus on economic and technological resources), including education, health, institutions, knowledge and technology, social factors such as human capital and governance structures, social capital, social networks, values, perceptions, customs, traditions and levels of cognition, inequality in the distribution of income, and high access to information.	Not clear why starting point is important. Many of these factors are highly correlated. List will be made more complete to reflect a more cultural perspective.
12201	4	54	29-30			You write that there is a strong correlation between the capacity to develop sustainably and climate response capacity. What is "climate response capacity"? Is there a common definition in the scientific literature? Does this include the field of adaptive capacities? What about the trade-offs between mitigation and adaptation policies? In chapter 15.10.2 the authors write that "mitigative and adaptive capacities are fundamentally disjoint" - how does this logically fit together?	Definitions of mitigative and adaptive capacity are all pretty vague, as are the definitions of the capacity to develop sustainably. As authors become more specific, the directions of their arguments can diverge. With respect to 15.10.2, XXXXXX
8263	4	54	3	54	3	A specific definition of mitigative capacity can be inserted here.	We have blended multiple sources here into a definition.
7778	4	54	3	54	3	Make reference to adaptive capacity section in WGII	Agree, and will be done.
7782	4	54	34	54	40	Many references to response capacity, start with IPCC (2001), Tompkins and Adger (2005) and then more...it would be interesting to track the trajectory of this idea.	It would indeed, especially since some scholars oppose combining them, but it would be a longer story. Tompkins and Adger will be cited earlier, the trajectory is evident in the cites themselves.
14027	4	54	39			Suggest adding: "...effective, EQUITABLE AND SUSTAINABLE responses."	OK
7779	4	54	6	54	6	Apologies for referencing my own work, but these ideas about response capacity have been around for some time e.g. see: Tompkins EL, and Adger WN. 2005. Defining response capacity to enhance climate change policy. Environmental Science and Policy 8(6):562-571, this paper has been cited about 40 times, and several of these papers also build on this conceptualisation of response capacity.	We cite Yohe, 2001 who first made the argument but we can include Tompkins and Adger, 2005
14024	4	54	8		10	First of all, the effects of mitigation and adapting are different because they aim towards different goals; one to reduce emissions and the other to reduce vulnerability and enhance resilience. Unclear how the statement that mitigation is a public good informs the discussion on capacity. Furthermore, it maintains a narrow view of what adaptation is about. Also there are moral obligations related to both mitigation and adaptation.	First, this section is about both capacity and the use of capacity. Adaptation surely entails moral responsibilities too, and this will be included.
12203	4	55	12			I doubt that adaptation only benefits the "adapters" (does this word exist?). If climate change impacts can lead to migration or a climate-related disaster in a country, for example, does any external intervention then only benefit the recipient country or community? What about avoided effects on neighbouring countries for example?	again, the word "tend" is in the text to cover this.
13693	4	55	12	55	12	Replace "While...adapters" by "While some forms of adaptation only generate benefits for those that finance them," Reasons: see comment on p. 55, line 2	see above comment and response
14029	4	55	19		22	Would be good to consult WG I and WGII on the geographical scale issue, both that mitigation only truly is a global concern (what about black carbon? (Report to Congress on Black Carbon, EPA, 2012)), and that adaptation only has a local dimension (this conclusion probably comes with framing adaptation as purely a technical issue). See also comment #35.	we used the term "largely" to modify a global concern here, not "only"

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
13692	4	55	2	55	4	Replace "A fundamental ... private good" by: "Whereas mitigation is generally a global public good, some forms of adaptation are club goods (e.g. a dike protecting a certain region) or even pure private goods (strengthening of one's house to withstand stronger storms). Aakre and Rübhelke (2010) describe the public good properties of many adaptation measures." Reference: Aakre, S.; Rübhelke, D. (2010): Objectives of public economic policy and the adaptation to climate change, in: Journal of Environmental Planning and Management, 53, p. 767-791	The term "private god" is not in FOD. We already specify that the benefits of mitigation are "essentially" a public good and that the benefits of adaptation "tend" to accrue to the individual, local, or national actor undertaking the action". This wording encompasses the fact that some adaptation goes to groups without burdening the reader with the jargon of "club good". Similarly, roads are built and maintained by national and regional actors because they have national and regional benefits, but hardly global.
14028	4	55	2		11	As commented upon before, this framing is too narrow, also wondering how this informs the difference in mitigative and adaptive capacity. There cannot be many adaptation measures that do not have wider societal consequences. As stressed in various chapters in WGII, adverse impacts from climate change are likely to set back development, hinder sustainable development, threaten human security, etc. . This also holds for impacts experienced by individuals and communities. So arguing that adaptation is not something that has wider societal implications is too narrow. Within sectors one can say the same: take adaptation in the road building sector for example. This adaptation is initiated to reduce costs associated with adverse climate change and it will benefit the sector, but a well adapted road sector will benefit other sectors and society at large.	See response to the same comment above. Not sure these reviewers are looking at FOD.
7783	4	55	2	22	18	this section confuses adaptation with adaptive capacity, and mitigation with mitigative capacity, They are not the same (as explained earlier in this chapter, yet they appear to be used synonymously in this section. The starting point for this chapter would be Yohe 2001	Text will be modified to note that capacities are developed and maintained for different reasons, not that the capacities themselves are different. This relates to the issue of whether "willingness" should be included as a capacity, but thus far we have not made this step.
7784	4	55	27	55	36	The previous literature on response capacity argues that this capacity is about: availability of technology and ability and willingness of society to act. The aspect of willingness is missing from this section	This is a definitional issue. There is a literature on willingness that we are trying to bring out here. Clearly we could call willingness a capacity too.
9533	4	55	45			Please, delete however due to duplication.	OK
12741	4	55		55		Mitigation may be a means to reach sustainability so that there could be a positive relationship between mitigation and sustainability. In contrast, the connection between adaptation and sustainability is not so obvious.	Once in the Anthropocene, and it will be a long time before the greenhouse effect of existing greenhouse species goes away, adaptation is clearly necessary for sustainability.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
6893	4	55	23	55	24	Please consider revising the sentence "This is true, say, for sea level rise, in which case a few meters difference in elevation can make a major difference". "A few meters difference in elevation" could easily be misinterpreted as "a few meters in SLR", i.e., an elevation in Sea Level of a few meters. Suggest to clarify that you are referring to an elevation above sea level of a specific location here.	Will clarify
3294	4	56	56			Do not include this box. See above comments on section 4.6.	Noted.
14323	4	56	1			This could be expanded to include other issues of costs and financing issues, technical and institutional capacities, short-term and longer term considerations, etc.	Noted.
12742	4	56	23	56	40	You may like to mention that there is a discussion about the definition of adaptation and mitigation as complements or substitutes (Ingham, Alan/Ma, Jie/Ulph, Alstair M, Can adaptation and mitigation be complements?, Tyndall Centre for Climate Change Research Working Paper 79, 2005, http://www.tyndall.ac.uk/sites/default/files/wp79.pdf (13.09.2012).	Noted.
14324	4	57				This figure does not immediately seem to provide an interesting illustration of the relationship between socio-economic adaptation and mitigation challenges.	figure illustrates alternative pathways, not challenges
3295	4	57	1	57	23	Delete figure and the associated discussion. They are too general.	Will consider when shortening.
12743	4	57	19	57	21	Maybe you like to add some more details, here.	Noted.
17095	4	57	25	59	10	You need to make a reference to ICSU along with the reference to Weizsacker. According to recent scientific consensus arising from an international consultative process the social and biophysical sub-systems are intertwined such that the system's conditions and responses to external forcing are based on the synergy of the two sub-systems. Consequently, the full global system has to be studied rather than its independent components, as none of the challenges can be fully addressed without addressing the other challenges (ICSU, 2010). The key scientific insight is that in actions for achieving global sustainability environmental change and social transformations are tightly intertwined, impacting on our understanding of trends and drivers of global change.....ICSU, 2010, Earth System Science for Global Sustainability: The Grand Challenges, International Social Sciences Council, Paris, Oct 2010 □	Yes, but we are writing one section in one chapter of one volume of a three volume report, so "whole system" thinking, though clearly correct, calls out to communication limits.
8264	4	57	3	57	3	To edit: "Figure Error! No text of specified style in document"	Noted.
14325	4	57	24			It is unclear why at least parts of this section is not integrated into the previous sections on the same topics (equity, indicators, consumption-based emissions, and so forth). As it presently stands, the (interesting) section seems to re-introduce and discuss the same topics covered in earlier sections of the chapter.	Agreed, but this was an imposed structure (bullet points-sections)
2926	4	57	25	77	7	Is it feasible to shorten this part?	Accepted.
8809	4	58	1	58	11	Both CBA and cost-effectiveness approaches are called into question by Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) with forms of precaution being the most widely recognised option that remains logically viable.	This paper will be quoted in another part of the chapter.
12744	4	58	37	59	10	A concretization of risks and examples should be added: irreversible damage, tipping points (see also comment 9). Furthermore, the incidence rate and the amount of damage should consequently structure this risk section. There might be a difference in the perception of risks of individuals concerning this two aspects, especially if they are not acting rationally. For some cases, the incidence rate, for others the amount of damage might be decisive (See infra, comment 23).	Noted. See also Ch 2.
15114	4	59		81		The subsections 4.7.1.3, 4.7.2, 4.7.3, and 4.8 have many similarities and repetitions in relation with subsection 4.2, I propose to revise and shorten, the Chapter will reduce a lot of contents.	Accepted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
8810	4	59	22	59	29	Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) suggests that predictions of regional climate changes are sufficiently problematic that any complacency about climate impacts by any group are 'misplaced' to say the least.	Noted.
12745	4	59	22	59	36	The statements seem a bit suggestive to me (e.g. call for less information in order to...). You may also like to consider that the fairness motive could also counterbalance the risk effects (as is e.g. suggested in line 48)	Agreed. Revise.
8811	4	59	37	62	6	Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) calls into question all consequential approaches to policy including refinements of conventional utilitarian economic approaches as consequences cannot be robustly be predicted in any meaningful way. These refinements may be useful to move policy in the right direction where economics is typically imposed; however as well as being irrational they are arguable undemocratic as discussed above so a better approach may be to challenge the use of consequential approaches to policy.	This is a very extreme viewpoint which does not seem very constructive. What should be done if consequences cannot be assessed?
4573	4	59	9	59	10	Order of authors is reversed. Correct is: Oreskes, Naomi, and Erik. M. Conway	This probably refers to another chapter.
12278	4	6	1	6	1	Please consider to replace the term "global warming" with "climate change". Rationale: Global warming is so linked to temperature, while changes happening affect many other parameters such as precipitation and the frequency and intensity of some extremes.	Accepted.
17082	4	6	15			(and other such references), why use the term "development"? The correct term would be "economic growth" as it applies to both developed and developing countries and also better captures the activities leading to concentration of GHG's	To be clarified.
14001	4	6	15		17	The wording chosen for this part leaves one with the impression that yes, development paths chosen will impact emissions, but that it is ambiguous. Could you elaborate on the reasons for the ambiguity? (Is it because we are not sure if it has an impact, or because we don't know the direction of the impacts?). Consider changing the wording to get across that there is a complex relationship that is not yet fully understood.	Will clarify
17083	4	6	18		20	(and other such references), why use the term "development"? The correct term would be "economic growth" as it applies to both developed and developing countries and also better captures the activities leading to concentration of GHG's	See 166.
17084	4	6	21			the words "path dependence" need to be clarified, and includes both technology and lifestyles. Must be spelled out!	Accepted.
17085	4	6	25			"technology transitions" refers only to production patterns, and a section on "lifestyles" should be added with reference to consumption patterns.	See 4.4.3
17086	4	6	25			the words "a number of determinants can be considered drivers or barriers" is not clear. The entire section 4.3 titled "Determinants, drivers and barriers" needs to be reviewed, because, as page 5 line 33 states "population, affluence and technology" are key, and these three elements should be considered in this section, along with a section on 'patterns of natural resource use, under these titles. References to human capital, education, behaviors, values, culture, governance, legacy of development – what is this – natural resources, finance are not based on scientific evidence of these elements as significant and not included in the other four elements.	See 4.3: Will add clarification about the choice of drivers to focus on. Will make consistent with Exec Sum.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
3949	4	6	25	6	30	Why the adjective 'scientific'? To understand why governments take the decisions they take requires a positive theory of the state, as distinct from a normative theory. If the policy adviser does not have a positive theory of the state, how can he or she hope to understand why governments behave in the way they do behave? The idea that a model can scientifically predict how state power will be used or abused in the future is a novel one.	Will clarify use of term model, and its role in providing "understanding".
4754	4	6	31	6	38	It is also important to match financial and social requirements	Noted.
7753	4	6	31	6	31	Check for consistency in the use of 'adaptation' vs 'adaption' throughout	Accepted.
3950	4	6	32	6	33	Is the idea that the state would 'guide individual action' an elitist conception of democracy? If so, what fate is envisaged for those who refuse to be so guided?	It is in part a coordination problem, in part a prisoner's dilemma. Both situations can be improved by collective organization (which can be democratic).
14005	4	6	33			"Response capacity, the ability to foresee, PREPARE FOR, effectively respond to..."	Accepted.
3206	4	6	35	6	38	What about economic challenges? To give incentives that internalize the external effects that underlie the climate change problem.	Agreed.
18297	4	6	36			It would be preferable to use 'social' or 'socio-political' rather than 'political', as the latter is usually regarded as referring narrowly to formal political institutions and activity and therefore fails to include legal and other social institutional elements.	Will take into account.
17078	4	6	37			replace "project" with policies and strategies, as projects are not being considered here, and the concern is with policy	Accepted.
3207	4	6	39	6	40	I do not understand this sentence.	Will clarify.
17079	4	6	39		43	is a key statement and must be retained	Accepted.
14002	4	6	39		40	There is a link between SD and climate change, even without anthropogenic climate change, due to social and biophysical vulnerability; adverse weather and climate change can have negative effects on societies, which can influence sustainability.	Accepted.
6093	4	6	39	6	43	It may be better to make it clear that there exist trade offs and synergies between pursuing SD and climate change (Ref. Page 5 lines 23-25 of Chapter 6)	Will clarify.
16936	4	6	4		6	I find this surprising. In terms of major energy end-use categories, industry is around 30% of energy and 40% of global fossil fuel CO2 emissions (including process emissions). I appreciate that industry is mostly producing products for other end-uses so in their some of this could be assigned downstream, but it hard to see how this can all be assigned to mobility or housing (let alone agriculture). I would also question the use of trying such a total downstream "ultimate use" allocation; surely industrial energy consumption, as the biggest end-use emissions sector, should at least be in the list? The structuring and breakdown, along with both energy and CO2 data, that I have found most useful is set out in Grubb, Hourcade and Neuhoff, Planetary Economics: the three domains of sustainable development, Taylor and Francis forthcoming : Chapter 3, "Energy systems and technologies".	Will check (Simon)
3208	4	6	42	6	43	As long as sustainability has not been defined, it is hard to agree or disagree with this statement.	Not relevant.
7754	4	6	42	6	43	I am not convinced by the argument in the exec sum, or the chapter, that making development pathways more sustainable can go a long way to mitigation, adaptation, and adaptive/mitigative capacity. I do not think this argument is made in this chapter. I would reconsider including this conclusion here.	Important point. We must caveat, unpacking out relationship betw SD and CC.
17080	4	6	45	7	2	the paragraph is not clear and should be deleted	Will clarify.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
3951	4	6	47	6	47	What evidence is there that pessimism is receding and why would it be important if it was when no one has been able to put forward a social welfare function capable of commanding universal support? Once again the question posed for anyone to wanting to exercise the coercive powers of the state is 'what will be the fate of those who disagree with the proposed interpersonal utility comparisons'?	The social welfare function is not a dictatorial machine, just a tool for democratic discussion of policy consequences (different people can refer to different social welfare functions)
17081	4	6	8			why mix production and consumption patterns? The impacts are different and occur at different stages of development and in different countries	Noted.
3948	4	6	9	6	10	Is this positing that there is a trade-off between economic growth and sustainable development? If so, should not views to the contrary be acknowledged and discussed - the famous Simon–Ehrlich wager illustrates the debate.	Either engage this comment directly, or present weaker statement that posits this decoupling as "a way to reduce impacts".
13271	4	6	39	6	43	SD and climate change are also linked in the way climate change is currently affecting people's wellbeing (for instance, how different climate patterns make sustainable or unsustainable important human activities). A paragraph about this relationship could be included just after line 43. (in fact, stated in 4.1.2, pag 10 of the chapter)	Will bring into ES.
15103	4	6	1	6	3	Add: "This trend involves the spread of high consumption life-styles in some countries and subregions, in many cases INFLUENCED BY PROPAGANDA FOR CONSUMPTION, while in other parts of the world MAINLY IN DEVELOPING COUNTRIES, large populations continue to live in poverty.	Rejected.
15101	4	6	2	6	3	Add: " while in other parts of the world; MAINLY IN DEVELOPING COUNTRIES, large populations continue to live in poverty. "	Accepted.
2911	4	6	20	6	30	proposal is to have less detailed information in executive summary, for instance remove 'of particular ... well being'.	Accepted.
15104	4	6	31	6	31	Change adaption by ADAPTATION	Accepted.
15105	4	6	37	6	38	Add: and financial (who should pay for projects with diverse effects) challenges, AS FINANCIAL ASSISTANCE FOR DEVELOPING COUNTRIES .	Accepted.
2910	4	6	4	6	4	insert probably ('are probably responsible'), remove medium agreement, medium evidence (general remark)	Not relevant.
15102	4	6	5	6	6	Mobility, PRODUCTION OF food IN EXCESS WHERE ONE PART FINALIZE CONVERTED IN GARBAGE, and housing are responsible for about three quarters of consumption-related environmental impacts in industrialized countries	Rejected.
12678	4	6	10	6	10	It seems reasonable to enlarge this remark: "from unsustainable economic growth" because growth does not per se menace the climate change even if in many cases it does (see infra, comment 21).	Accepted.
3236	4	60	12	60	12	Biodiversity can also be included in an anthropocentric analysis, by taking into account the future effects of lack of biodiversity. In addition, biodiversity cannot maintained without protecting insentient beings.	Yes, this is written in the previous sentence.
12749	4	60	12			It should be made clear who delivers the values.	Anybody is free to put ideas on the table. We should not be afraid of democratic debate.
12747	4	60	3	60	7	On p. 58 reference is made to a second best world (cost-effectiveness). So it should be made clear in which sense a social welfare function matters, here.	Good point. Change the wording and specify the articulation.
3956	4	60	43	60	43	Is there any authority that can be cited in support of the assertion that Arrows theorem does not point to a radical impossibility? Similarly can any authority be cited that rebuts Hayek's arguments that centralised determinations whose efficacy depends on being able to harness widely dispersed information of a specific and detailed nature will fail to work well if they contain no mechanism for allowing that information to be harnessed at a lower enough cost? See http://www.econlib.org/library/Essays/hykKnw1.html	Yes, cite Sen 1999 and Fleurbaey-Maniquet 2011.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
12746	4	60	11	60	12	Not to hurt sentient beings is not exactly the same as the (broader) biodiversity question. The anthropocentric approach dominates the social sciences. If the IPCC integrates an ecocentric point of view in its consideration this should be explained and marked as a contrast to the elsewhere anthropocentric point of view. Anyway, the surrogate representation of sentient beings might be a rather difficult task for humans because they only are able to represent their own perspective. Hence, if the sentient beings should be integrated into a utility function, a non-human perspective would be hard to quantify. Thus, it seems more reasonable that humans are only able to represent their own interests. Anyway, biodiversity can be an indirect human interest or right because it can be a material prerequisite to human existence and human utility, too. Biodiversity or a stable climate are part of environmental stability and balance. They are constitutive for human life. So from the human point of view there is a big protection interest already. Sentient beings can be protected as (positivistic) preferences of humans or even as humans' aesthetic interests (see IPCC Draft, Chapter 4, Section 4.8.3.1, p. 80, line 43).	We simply think it is worth mentioning the nonanthropocentric view as it exists and is not so marginal.
5486	4	60	13			Section 4.7.2.2- if you want to edit text- much discussion on well being which is difficult to define and difficult to build metrics around. Instead could you substitute metrics like access to fresh water and sanitation, sufficient food and education. Previous discussion has indicated a relationship between these and happiness- these are easier to quantify	Capabilities cover these aspects. Don't interpret well-being in a narrow sense.
12748	4	60	40	60	40	There should be at least one reference when referring to "many practitioners".	OK, like Stern and Nordhaus.
12751	4	60	47	61	5	The monetization of policies could be explained in more detail. If sustainability questions should be examined by measures of monetarization at least some concepts should be mentioned respectively cross reference be made. Above that the question of how to cope with uncertainties could also be raised in this context. Especially because of uncertain natural science-based causalities (tipping points, irreversible damage, substitutability of natural resources) the quantification of costs and benefits may be too vague. So uncertainty should be made transparent and some ideas given how to cope with (e.g. by a qualitative balancing process that includes uncertainty in a transparent way or by normative borders as e.g. given by the precautionary principle when high risks are at issue).	This is already explained in quite some detail but will be taken into account.
3237	4	61	1	61	2	Are the implicit distributional preferences shared by the actual decision-makers? What should be done if not?	This comment misses the problem which is: What methods are available to decision-makers? Obviously they cannot be forced to use such methods.
12752	4	61	23	61	25	Would not this also hold in case of a "piecemeal" approach?	Not clear.
5487	4	61	37			Don't participatory strategies require a certain level of education and if so, is it possible to differentiate the benefits associated with education and the benefits associated with a participatory strategy?	Participation does not "require" education but it does work better when education is there. Education without participation would not make sense in the context discussed here.
12753	4	61	24	61	25	See comment 72.	Not trackable.
16908	4	62		73		Overall, section 4.7.3 gives a fairly good overview of the context and various framework regarding equity and burden sharing.	Thank you
3238	4	62	17	62	20	It is justified by the benefits of reduced climate change when also the benefits for everyone else is taken into account!	The point here is that it is the benefits OF OTHERS' MITIGATION to ONESELF that can justify action.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
8812	4	62	7	63	15	Unquestioned utilitarian assumptions limit the imagination of this discussion of 'commons'.	Clarify, make clear that "rational" is only limited positive descriptive value. Exceptions arise. However, see comment 642!
8089	4	62	37	63	15	Please note the following, which repeats for chapter 4 a comment made on chapter 13: This reviewer wishes to suggest that what is mentioned in these two lines be more explicitly connected with what is said in lines 37-40 and 45-47 of p. 62 of chapter 4: the transfers discussed here (in chapter 13) do have a fundamental role in making the Paretian approach (discussed in chapter 4) a feasible one in terms of voluntary agreements. Astonishingly, both here in chapter 13, and there (throughout chapter 4), the inescapable necessity of a voluntary character of any international agreement is pretty much ignored, the authors seeming to be dominated by the quest for equity. But on this subject, undermining the voluntary dimension is a severe lack of realism. NB : in referring to p. 62 of chapter 4, I ignore lines 41-44, because they are an extreme, and actually, as stated, incorrect implication of paretianism. There are better things to say on Pareto improvements in international affairs.	Will address this. Is voluntary nature undermined by equity?
3240	4	63	17	63	27	Does this facilitate the avoidance of climate change?	Remains to be seen.
15652	4	63	17		27	There is some overlap between this paragraph and Box 3.3 - suggest cross-referencing and either shortening here or removing box 3.3.	Accepted, linkage improved.
3239	4	63	3	63	5	Adding fairness may increase the cost of some parties to participate, and therefore increase the risk of defection.	Discuss with paretianism discussion.
17087	4	63	3			should read 'Right to Sustainable development' based on the UNFCCC and the Cancun decision	Will ensure consistency with references
15653	4	63	30		37	Could condense reference to Rio Declaration by simply highlighting that Principle 7 links CBDR to sustainable development more broadly.	Will shorten while overall shortening.
12754	4	63	3	63	5	This statement is not evident for different perceptions of fairness.	Reference
12755	4	63	38	63	47	It should be made transparent if the reference is the need principle, here.	Not clear.
3241	4	64	1	64	3	See: Lange, Andreas, Andreas Löschel, Carsten Vogt and Andreas Ziegler, "On the Self-Serving Use of Equity Principles in International Climate Negotiations", European Economic Review 54, 2010, 359-375.	Helpful reference.
12756	4	64	1	64	15	The considerations, here, are convincing but I expected to find these issues in Chap.3.	Noted, this has been coordinated with Chapter 3.
15654	4	64	1		3	Sentence re self-serving interpretations could refer to Lange, A., A. Löschel, C. Vogt, and A. Ziegler. 2010. On the Self-Interested Use of Equity in International Climate Negotiations. European Economic Review 54 (3):359-75.	Helpful reference.
12757	4	64	25			In the documents referred to there is nothing said about "equality". So, where is the link and how does "equality" fit with e.g. CBDR?	See p. 67
5488	4	64	28	65	36	this has been discussed elsewhere- can mostly be edited out with only summary points retained to take it to the current topic	Noted. Text has been revised.
2566	4	64	31	64	40	Extremely important item, poorly referenced. The principle of common but differentiated responsibilities should not be used as it is by diplomats, evading commitments and overlooking the closing opportunities to stabilize global temperatures at safe levels, ie the ultimate goal of the UNFCCC. A reference: http://jed.sagepub.com/content/19/3/335.abstract	Add references

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
15656	4	64	36		37	The distinction could usefully be drawn here between _retrospective_ understandings of responsibility (i.e. for contributing to a problem) as opposed to _prospective_ understandings of responsibility (i.e. for fixing a problem). These have been elaborated extensively in the philosophical literature. See for example Miller, D. 2001. Distributing Responsibilities. Journal of Political Philosophy 9 (4):453-71. This distinction is best elaborated further in Chapter 3 in the discussion on historical responsibility.	Agreed. Helpful reference
15657	4	64	44		46	The existence of a "no-harm rule" in international law is contested. See for example Birnie et al (2009) who argue that existing rules of customary international law do not prohibit transboundary harm per se, and that therefore 'it is erroneous to refer to a "no harm" rule in this context' (Birnie, P., A. Boyle, and C. Redgwell. 2009. International Law and the Environment. 3rd ed. Oxford: Oxford University Press, p.137.	Will elaborate.
15655	4	64				There is considerable overlap between this section and section 3.7.3. The latter section contains some important material, but it seems best to integrate it into chapter 4 (in the more applied chapter) rather than in chapter 3.	Noted, this has been coordinated with Chapter 3.
11569	4	64		68		The section may belong to chapter 3.	Noted, this has been coordinated with Chapter 3.
12758	4	65	17	65	21	You may like to emphasize that this implies a double burden for the current generation.	Taken into account, this will be clarified.
16907	4	65	22	65	36	it should also be pointed out that projections of future emissions should not be used as an excuse to negate historical emissions and the consequent responsibility.	not in this discussion.
11056	4	65	28	65	28	In the context of supporting these studies , we analyzed accumulative CO2 and found developing countries would match the 1990 level of developed country in 2013 using Nordhaus(1994) CO2 absorption formula and CDIAC and SRES scenario data (estimated by AIM) . Miki YANAGI, Yosuke MUNESUE, Shuzo NISHIOKA (1999) "An Equity Evaluation for Burden Sharing in the Mitigation Process of Climate Change," Paper presented at annual conference of Society for Environmental Economics and Policy Studies, 1999.	Helpful reference.
11570	4	65	37	66	14	Some of this is covered elsewhere.	Noted.
16906	4	65	4	65	5	Some more recent references and calculations regarding historical emissions should be added here, for example, http://www.pnas.org/content/109/32/12911	Helpful reference.
10953	4	65	3	65	36	Confer: Rive, Torvanger, Fuglestad (2006), Climate agreements based on responsibility for global warming: Periodic updating, policy choices, and regional costs, Global Environmental Change, 16, 182-194. (See comment 1.)	Helpful reference.
6894	4	65	6	65	8	Please revise to be more precise. One of the major factors controlling CC is certainly the atmospheric GHG concentration, but CC is also influenced by orbital parameters, aerosols, volcanic eruptions etc.	Taken into account, this will be clarified.
8497	4	66		67		Capacity - note there is a large literature that deals with this concept, but it tends to view it in a limited way (as is the case here) At a minimum, one could focus on two dimensions of community capacity (decisionmaking and implementation) but must also consider the generally undisputed assumption that increasing capacity will result in improved outcomes. We are increasingly aware that there are often exogenous factors which limit or intervene with this assumption	See "Response Capacity".
15658	4	66	19	66	32	It would also be useful to mention as a possible starting date 1990, being the date of publication of the first IPCC report. This date has been proposed by several theorists, including Steve Vanderheiden (2008). Atmospheric Justice: A Political Theory of Climate Change.	Not necessary to make point.
6895	4	66	34	66	39	WGI AR5 should not serve as a reference for "Some would argue that..." -- please adjust sentence; Please be more specific in citing WGI AR5 Chapter 6 here.	Add reference. (Note IPCC WGI is ref to ocean acidification.)

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
12759	4	66	45	66	48	The definition of declining marginal utility of income is confusing, here. You may consider: The more income a person has the smaller is the additional utility which he or she gains from more income. And then mention that poorer people lose accordingly more utility when their income decreases, thus they have a greater level of sacrifice.	Taken into account, this will be clarified.
12760	4	67	29	67	35	See Comment 6.	Cannot access.
12761	4	68	18	68	18	It may be worthwhile to consider additions, whether within a contraction and convergence approach (see p. 70, line 38), developing countries might continue a developing path based on fossil fuels etc. This would mean to exclude developing countries from binding reduction targets until they reach a certain wealth level. Only when achieving a wealth level comparable to developed countries they should have to reduce green house gases. Another approach would try to integrate developing countries into the climate regime as early as possible, at least through negative reduction aims as we know it from the European "bubble system" (article 4 of the Kyoto Protocol). This second approach changes the path of unsustainable development early and therefore could minimize transaction costs for the developing countries in comparison to a later turn (see Section 4.5). As developing countries did not cause the existing climate change problem financial transfers should be integrated into this second mitigation concept (cf. Chapter 16).	See CDC. Perhaps this is talked about as distinction between "delayed participation" meaning no mitigation, versus meaning mitigation with support.
5489	4	68	22	68	28	Important points and paragraph- could be expanded	Noted. Will elaborate.
6323	4	68	3	68	28	It may be useful to note here that there are difficulties that have arisen in the field of environmental ethics in attempting to use traditional rights-based language when dealing with issues of sustainable development. For instance, regarding future generations, it is difficult to accord rights to non-existent people. Similarly, it becomes awkward to talk about the "rights" of ecosystems or plants (and perhaps even animals), so the rights-based approach, while appropriate in some areas, is difficult to apply generally to all discussions of sustainability. This point is raised in chapter 3 of the IPCC draft report.	Noted. Will elaborate.
7304	4	69				Please, feel the Table 4.1, otherwise exclude it from the Chapter 4.	Will fill.
6896	4	69	10	69	12	This sentence is mixing GHG sink capacity with global carbon budget, both of which can't be aimed at with ethical principles directly...	Taken into account, this will be clarified.
5490	4	69	4			Section 4.7.3.3- this list is likely included as it provides a potential framework or basis for evaluating the sustainability frameworks that are discussed immediately after this. However- it is long, takes up room and could likely be replaced by a table that summarizes the different accounting methods with only a few described in detail in the text	Agreed. Will present in synthesis.
13660	4	69	4	72	46	The categorization of the approaches is according to the framework followed by the approach -i.e. 'effort sharing' or 'resource sharing'. This however may be an incorrect way to categorize the approaches as the resource sharing approach also in effect places a burden on some countries to limit their emissions within a budget specified by agreed climate goals. On the other hand, effort sharing goals are almost always based on 'flows of emissions' as opposed to stocks of emissions. So the categories of flow based vs. stock based approaches may be more suitable. In specifying target emissions in specific years, flow based approaches cannot account for the total cumulative emissions of a country between the target years, which is the parameter that is most important to check climate change, whereas stock based approaches can do so.	Taken into account, this will be clarified.
3953	4	7	11	4	11	This sentence is unclear. Does it refer to a voluntary cooperative solution or a solution enforced on all using the coercive powers of the state? The distinction is critical from a moral perspective.	Not relevant. Both are possible.
3209	4	7	12	7	14	Equity has been reflected in international agreements that produce statements on how to address climate change in the future. Has there been any effective (in the sense of reducing GHG emissions) international agreement, and are future ones likely to reflect equity?	This is a positive statement about existing agreements.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
3954	4	7	15	7	16	What needs to be discussed here is the morality of forcing a political minority to bow to the will of a political majority. The entire executive summary seems to be turning a blind eye to the elephant in the room - the propriety of using the power of the state to over-ride dissenting viewpoints.	Dissenting viewpoints must be respected, but for "public good" issues (i.e., one cannot have a different climate policy for different people) some decision must be made at the end of the day.
3210	4	7	17	7	27	The structure of this paragraph is unclear.	Taken into account, this will be clarified.
18298	4	7	18			This section on principles and norms is too brief and misses some of the important nuances about and associations between the terms used. It therefore becomes confusing when it mixes rights with principles relating to responsibilities. Perhaps put the 'rights' first, as these are generally regarded as the drivers. It can be argued that sustainable development can be achieved without equity. In other words, there is a slide underway here, which is introducing a specific version of SD (which I support). This slide is made evident by the way that 'equitable development' and 'sustainable development' are offered separately in the par beginning line 33. 'Capacity' is not a principle but rather a means... Is this 'Beneficiary pays'? There are also other principles of considerable importance here - for instance relating to 'harm avoidance', 'representation and participation' 'preservation of biodiversity - which need to be introduced in relation to 'equity'.	<ol style="list-style-type: none"> 1. Clarify relationship between equity and SD. 2. Clarify rights vs principles 3. Capacity as "ability to pay" 4. rep and Part: procedural equity 5. Harm avoidance: link to PPP?
17075	4	7	18			the statement "responsibility for GHG emissions" is not scientifically correct, and it should read "responsibility for concentrations of GHGs". Climate change is caused by the concentration of GHG's.	See 4.7.3 on responsibility for emissions
10858	4	7	23			"sinks, as they are common resources"! Not sure many sovereign nations would agree with that. Sure, this could be applied to oceans, but certainly not the land sink. If a "sink" is a common resource, then so is the forest that makes the sink and thus everyone would have equal right to harvest the forest?	This is a misunderstanding. A sink is a common resource for all who emits...! Not that they do what they want with the sink itself (they can only put CO2 in it).
17076	4	7	24			the statement "equal right to the natural carbon sinks, as they are a common resource, and thus an equal right to emit" is not correct. As an equal right to the carbon sinks does not equal to an equal right to emit, it confuses stocks and flows and is mathematically incorrect. The words "and thus an equal right to emit" should be deleted, and if a clarification is needed, the words "equal right to the global carbon budget" be added	Agreed.
18299	4	7	28			It can be argued - strongly - that in the current context of deepening ecological crisis, sustainability concerns bear on the short term as much as the long term. The dissociation from the present context and the sense that SD embodies long term goals is, arguably, what is making SD so hard to realise. Discussion of the work on 'overshooting' (Meadows et al) is critical in for injecting a sense of urgency and focus here. Moreover, as the chapter later acknowledges - intragenerational equity is a SD consideration. Perhaps 'bear on both the long and short term'.	Important point. Need to assess ES (and chapter) for "long-term bias". Perhaps even more important for Ch 6
3955	4	7	28	4	7	A key problem for the policy advisers is that politicians have to concentrate on the very short term - winning the next election. What is the use of developing a long-term policy if there is no mechanism for making it in the interests of politicians to adopt it? The executive summary also seems to be ignoring the problem of political incentives.	Discuss in 4.3.4, and political economy section?
14003	4	7	3		7	Is this not contested? Framing climate change as an externality and a commons problem has large implications on how climate change is dealt with, both practically and politically, and some argues that it is a barrier to social change and transformation.	Not relevant. That it is a commons problem is a fact, not a judgment or a framing strategy.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
3211	4	7	31	7	31	What about the feasibility of such a direct assessment?	It is always possible to make a forecast. At any rate, standard indicators require at least as much if applied properly.
18300	4	7	33	7	35	The growing scientific emphasis on 'the critical decade' for action suggests that the line about 'effective, robust and long term response' - while acknowledging that we will need to respond for centuries, perhaps millenia, fails to consider the importance of rapidity of action for effectiveness - with substantial challenges for political and social legitimacy, and technical capacity. Suggest delete 'long-term', to read: 'effective and robust'	Accepted.
2936	4	7	33	7	44	I agree strongly with this key conclusion about the link between adaptation, mitigation and SD.	Noted.
18301	4	7	35	7	37	The comment that both mitigation and adaptation rely to a 'profound extent' (etc...) is an unsubstantiated assertion. Effective global mitigation may occur without equity or SD principles being met in the short or even longer term. This point is made later on (Sect 4.2). The unilateral use of geoengineering is one example. Collusion between the 20 major national emitters is another. Adaptation is quite another matter - and this does depend on equity principles being realised. This chapter unconvincingly overstates the necessary links between CC action and SD. 'Can' does not equal 'must'. The moral case needs to be made more robustly.	To be taken into account.
3212	4	7	36	7	36	On the contrary, one can argue that adaptive capacity is defense against climate change by the strongest, for the strongest, which does not lead to equitable development.	That is not adaptation for all.
3213	4	7	38	7	44	Paragraph is unclear. Also, typo: "... measures and measures ..."	copy edit
3952	4	7	4	7	7	This sentence sets up a straw argument. What we are observing instead is a great deal of spontaneous cooperative action (eg NGOs) that is not based on the posited self-centred individualist thinking. This should surely be acknowledged and its implications considered.	Not relevant.
17637	4	7	40	7	41	Regarding of alternative framework for implication of measures, "well-being" is categorized one of "social capitals." Please discuss the classification of this framework	This is a misunderstanding.
17077	4	7	40			the statement "equal right to the natural carbon sinks, as they are a common resource, and thus an equal right to emit" is not correct. As an equal right to the carbon sinks does not equal to an equal right to emit, it confuses stocks and flows and is mathematically incorrect. The words "and thus an equal right to emit" should be deleted, and if a clarification is needed, the words "equal right to the global carbon budget" be added	Accepted.
4756	4	7	41	7	42	"As risk is a central aspect of sustainability". Could you please explain this statement?	Accepted.
14007	4	7	42		42	Suggest adding "...the analysis of mitigation measures and ADAPTATION measures should not..."	Accepted.
14006	4	7	42		44	Not clear what is meant by "...examine likelihood of potential impacts". Assume that this refers to the consequences of climate change responses and that these has impacts, but what impacts are we talking about beyond those for SD and equity (which would cover consequences across time and space).	Just that indeed (SD and equity). Will rephrase.
7755	4	7	42	7	44	This sentence does not read clearly, I am not sure what is meant	See 217.
4755	4	7	9	7	9	I think that "inter-generational nature of the problem" is also very important	This was a typo.
12679	4	7	12	7	13	The definition of equity mentioned in this line does not include sovereignty. According to the definition of equity as a proportional distribution (see Ringius, Lasse; Torvanger, Asbjorn; Underdal, Arild (2002): Burden Sharing and Fairness Principles in International Climate Policy. In: International Environmental Agreements: Politics, Law and Economics (2), pp. 1–22; p. 6), the sovereignty principle is a special case of equity (see Kverndokk, Snorre; Rose, Adam (2008): Equity and Justice in Global Warming Policy (2), p.149f).	Refer and clarify relationship between equity and sovereignty.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
15106	4	7	22	7	24	In these lines "In one perspective, this moral equality is interpreted to imply an equal right to the natural carbon sinks, as they are a common resource, and thus an equal right to emit.", the ideas are very confusing taking into account the national sovereignty over natural resources in one sense, and the equal right to emit maybe suppose one spiral of increment of GHG emissions, I suggest the convenient clarification.	Taken into account, this will be clarified.
12681	4	7	26	7	27	This passage or line only mentions burden-sharing but not benefit sharing. The differentiation between burden sharing and benefit sharing depends on the question whether there is a right to be protected or a right to pollute. This distinction can also be found in Kverndokk, Snorre; Rose, Adam (2008, Equity and Justice in Global Warming Policy (2), p.150) or in Ringius, Lasse; Torvanger, Asbjorn; Underdal, Arild (2002; Burden Sharing and Fairness Principles in International Climate Policy. In: International Environmental Agreements: Politics, Law and Economics (2), pp. 1–22; p. 5). You may like to check at which places in the chapter this distinction is important.	Taken into account, this will be clarified and sources assessed.
2912	4	7	33	7	37	probably as a first sentence 'Chapter 4 focus on...'?	copy edit
15107	4	7	38	7	38	In: " Likewise, mitigate and adaptation measures can strongly affect broader SD and equity objectives," I propose to change any words as: " Likewise, mitigate and adaptation measures can HAVE BROAD INFLUENCES OVER SD and equity objectives,"	Accepted.
12680	4	7	20	7	20	"A right to sustainable development" is not the same as the sustainability principle. To create a right to sustainable development must be discussed in jurisprudential terms. Here, a right is considered to be more concretized than a principle. A right must have a sufficiently concrete consequence while a principle depends on a weighing process in order to find the optimal balance between several rights that the principle includes. Šušnjar describes the difference between rights and principles as follows: "Principles are defined as optimization commands that only make prima facie prescriptions in contrast to rules, which are definite in nature," Šušnjar, Davor, Proportionality, Fundamental Rights, and Balance of Powers, Leiden/Boston 2010, p. 75; see also Alexy, Robert, Constitutional Rights, Balancing and Rationality, in: Ratio Juris 2003, pp. 131-140. The jurisprudential definition leads to the conclusion that the "sustainability principle" is the better word here.	This is not a legal right, it is defended as a moral right.
13690	4	70	37	70	37	Better use peer reviewed reference Meyer, A. (2004): Briefing: contraction and convergence, in: Engineering Sustainability, 157, p. 189–192	Will add references.
3274	4	71		72		Effort sharing approaches picked up here seem not be fully covered. For example, "equal MAC" and "cost per GDP" can be important approaches as discussed den Elzen (2010) and Wada (2012). Furthermore, this section is overlapped with 13.4.1.2. It seems that this issue fits international cooperation, rather sustainable development. den Elzen, Höhne, Niklas, Hagemann, Markus, Vliet, Jasper and Vuuren, Detlef, (2010), Sharing developed countries' post-2012 greenhouse gas emission reductions based on comparable efforts, Mitigation and Adaptation Strategies for Global Change, 15, issue 5, p. 433-465 Kenichi Wada, Fuminori Sano, Keigo Akimoto, Takashi Homma, Assessment of Copenhagen pledges with long-term implications, Energy Economics, Available online 13 January 2012, ISSN 0140-9883, 10.1016/j.eneco.2012.01.001.	Noted, this has been coordinated with Chapter 13. Will also discuss equal MAC and equal % GEP
3616	4	71	21	71	21	Please add "Oberheitmann (2010)". Cite: Oberheitmann, A. (2010). A new post-Kyoto climate regime based on per-capita cumulative CO2-emission rights—rationale, architecture and quantitative assessment of the implication for the CO2-emissions from China, India and the Annex-I countries by 2050. Mitigation and Adaptation Strategies for Global Change 15, 137-168. DOI: 10.1007/s11027-009-9207-4	Will add references.
11571	4	71	41			Discussions of effort sharing should also refer to the literature on collective responsibility.	Will examine literature on collective responsibility.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
13662	4	71	43	71	44	Resource sharing approaches can also theoretically take into consideration 'capacity to pay' by weighting the equity parameters with GDP or some other income indicator. It is not a methodological constraint of the resource sharing approaches as implied by the statement	Noted.
13661	4	71	11	71	19	One billion high emitters – Also penalizes countries progressively as the number of people with higher incomes within the country increase (penalizes fast developing countries for increasing incomes)	Noted.
15659	4	71	29		31	Ideas of "carbon debt" and "ecological debt" are not conceptually necessary components of cumulative carbon budget approaches. The risk of implying a direct link between these ideas is that those who find ideas of carbon debt unacceptable will therefore tend to reject the idea of a carbon budget as well. See Pickering, J., and C. Barry. (forthcoming, 2012). On the Concept of Climate Debt: Its Moral and Political Value. Critical Review of International Social and Political Philosophy. Better therefore to say that "some theorists have linked the idea of negative allocation to the concept of "carbon debt" or "climate debt" etc.	Agreed.
12762	4	72	8	72	8	Which principles are meant with "above principles"?	Line immediately above.
15660	4	72	14		18	The discussion of the Brazilian Proposal could refer to other findings in the literature that suggest that an approach based primarily or solely on historical responsibility (i.e. in the absence of ability to pay) is likely to be inequitable. See Müller, B., N. Höhne, and C. Ellerman. 2009. Differentiating (Historic) Responsibilities for Climate Change. Climate Policy 9 (6):593-611, p.608.	Will add references.
9534	4	73	21	73	30	Please, delete here due to duplication of Chapter 3 page 64-65.	Noted. This will be coordinated with Chapter 3.
9817	4	73	39			This paragraph should be sounded with the corresponding paragraph in chapter 3.	Noted. This will be coordinated with Chapter 3.
4685	4	73	39	75	34	The text is well written within a limited space; however, most of the descriptions point out limitations (weaknesses) of the sustainability indicators. Descriptions of their usefulness should be explained in more detail in the text. For example, please see: - Atkinson, Dietz, & Neumayer (2007) Edward Elgar - Lawn (2006) Edward Elgar	Not fair, the attraction of GS is not described, with relevant references.
15124	4	73	26	73	29	There is similarity with the Latin American "BuenVivir" or "Vivir bien" approaches that pursues the goal of material, social and spiritual satisfaction among all members of a society, but not at the cost of the other living beings or natural resources. BuenVivir has been adopted in the constitution of Ecuador (2008) and Vivir bien in Bolivia (2009) and Peru (I'm not sure on Peru please check it).	Noted.
5491	4	73				Section 4.7.4- 4.8 this is the heart of the chapter- this is the section that provides the clearest discussion of sustainability as well as interactions between sustainable practices and climate change. Different methodologies for measuring sustainability are also described. For this reader- as the above comments indicate, much of the preceding discussion can be edited and shortened. This section can use expansion and clarification. Some discussion of how LCA or the triple bottom line approach could be integrated into this system or has provided a more manageable approach would be appreciated. Some discussion on how expanding accounting of emissions using a full life assessment could also be applied to sustainability indicators would be helpful as well	Noted.
12763	4	73	17	73	30	This is also part of Chap.3. So you might like to shorten.	Noted. This will be coordinated with Chapter 3.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
8813	4	73	39	77	7	This section although recognising the difficulties associated with indicators does not question whether indicators are an appropriate tool for climate change and sustainable development; the section also tends to make simplistic normative ethical utilitarian assumptions. Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) calls into question numerical approaches to aiming at, measuring or determining policy - numbers (e.g. ppm CO2e) can inform policy but anything beyond this makes gross unwarranted assumptions.	This again seems to rely on a narrow reading of the approaches described here.
4686	4	74	11	74	40	The authors stressed the limitations of Genuine Saving by referring to Fleurbaey (2009) and Pezzey (2004), but do not mention the useful nature of Genuine Savings. Indeed, it could be considered to be the best among the indicators for sustainable development. Its usefulness should be described in more detail by referring to Dasgupta (2001).	A message of this section is that belief in GS is partly based on a lack of understanding of its shortcomings.
3243	4	74	23	74	26	Note that this interesting possibility is not compatible with discounted utilitarianism.	Not clear. The marginal utility or productivity of a dwindling stock can become infinite.
4687	4	74	27	74	40	Although the authors described the qualifications of GS, which is regarded as the best indicator of sustainable development, among those belong to the weak sustainability. GS can provide information that consumption and utility cannot. It is useful for improving the methodology to measure GS, which the authors criticize. For example, reductions from Gross Saving to Genuine Saving in 10 world regions up to the year 2100 is indicated by environmental impacts and by resources under an optimal run in SRES-B2 and by using an integrated assessment model that incorporates various mineral resources and environmental impacts (Tokimatsu et al., Env.Dev.Sustain 13(2011)703-725. Such analyses cannot be carried out by using consumption as well as utility. Tokimatsu et al. Env.Dev.Sustain 2012 (in Print) measured the future path of GS using endogenously obtained shadow prices from the model, without using market prices. This attempt can be appreciated as an improved methodology to measure GS, referring from Arrow (2010). The paper provides future paths under the cases of optimal and CO2 constraints in SRES-B2 and B1.	Add references.
3244	4	74	28	74	30	The results here hold under DU, not necessarily otherwise.	Taken into account, will be noted.
3242	4	74	3	74	5	Comparing the current level of consumption to the level of adjusted (or green) net national product is identical to the genuine savings indicator. This connection should be pointed out.	This is done as they are in the same paragraph. Note that "is identical" is incorrect.
3245	4	74	30	74	31	... nor does it guarantee that it is feasible to do so.	Taken into account, will be noted.
3246	4	74	35	74	37	In a perfectly managed economy GS measures the PV of future changes in consumption. But GS does not perfectly indicate sustainability even then, unless sustainability is a goal for the management.	Not so relevant. We have short space and focus on realistic situations.
3247	4	76		76		The statement in footnote 17 is Pezzey's (2004) main result under DU. Asheim et al (2003) show that along efficient paths, which may not be DU optimal, GS can be positive and current wellbeing unsustainable (as an answer to the second question), and GS can be negative and current wellbeing sustainable (as an answer to the second question).	Good, the footnote will be corrected.
12764	4	76		76		The numbers in the figure lack a basis in the text. If it is only illustrative this should be mentioned in the caption.	Noted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
4688	4	76	15	76	29	Although the authors propose a method to measure future paths of well-being directly with probability, they do not include a concrete methodology for the measurement. Such proposals are useless for climate policy if the methodology cannot be described clearly. It could be that future paths of Genuine Savings with mitigations for climate change are more useful and practical in policy making for climate change than the authors' proposal, because no one knows how to measure well-being in the present day.	The problem is that GS requires more information, not less (which is often misunderstood).
12766	4	77		77		The figure lacks a basis in the text.	Noted.
3248	4	77	10	77	12	This sentence is unclear; what does it really say; what is its content and message?	Taken into account, will be clarified.
12765	4	77	12			It should be made clear in which sense you focus on equity and sustainability, here.	Should be clear from chapter context.
3249	4	77	13	77	15	The question posed in this sentence has not been answered.	Must sharpen (and redefine?) narrative.
3250	4	77	15	77	17	This is a claim, which has not been supported empirically or otherwise in this chapter.	Must sharpen (and redefine?) narrative.
3251	4	77	22	77	24	Should not the converse be the focus here. The issue is avoiding climate change, and the question is whether aiming for sustainability at the same time is helpful or counterproductive.	Must sharpen (and redefine?) narrative.
9818	4	77	27			As mentioned above time is an important issue and should be considered in this and thus in subsequent chapter. In many of the chapters infrastructure plays an important role, causing lock-in effects and path dependencies.	Noted. Urgency to be discussed further.
14326	4	77	8			This section seems to be more of a summary than in pointing out implications for subsequent chapters.	Noted
10434	4	77	27	79	13	I question the relevance of this section	Not relevant
12767	4	77	30	78	2	The attention should not only be drawn to biodiversity in the environmental sphere since the review is on climate change. Maybe it should also be mentioned here that the three pillar model is only one model. If the basis of sustainability would be the Brundtland report (pp. 11-12, see also comment 1, 21) prerequisites of sustainable development would be superior to economic and social concerns.	Discuss in 4.2 relation between 3 pillars and Brundtland?
12768	4	78	1	78	2	The focus should not be on biodiversity only, respectively, there should at least be made the link to climate change.	OK, add explicit mention of climate.
16009	4	78	34	79	13	The methodology described do not reflect the complexity of sustainability and in addition to follow the three pillar concept is easy but in praxis has problems within implementation. For example it is in real projects very difficult to discuss the "economically sustainable solution" against the "ecologically sustainable solution" against the "social sustainable solution". To avoid this there is the methodology of the "Integrative Concept of Sustainable Development" developed and used in various projects (Kopfmüller, J.; Barton, J.; Salas, A. How sustainable is Santiago? In: Heinrichs, D.; Krellenberg, K.; Hansjürgens, B.; Martinez, F. (Hrsg.): Risk Habitat Megacity. Heidelberg, Dordrecht, London, New York: Springer 2012, S. 305-326; Kopfmüller, J. The integrative sustainability concept of the Helmholtz Association. The "Risk Habitat Megacity" Project as a case of application. In: Banse, G.; Nelson, G. L.; Parodi, O. (Hrsg.): Sustainable development - The cultural perspective. Concepts - aspects - examples. Berlin: edition sigma 2011, S. 137-149).	Thank you for these useful references.
3252	4	78	46	79	13	The structure here does not take into account earlier parts of the chapter. Valuing the different kinds of capital depends on their effect on wellbeing (or on other objectives that the evaluator considers important).	Discuss: these are presented as orthogonal approaches (pillars, capacities, well-being) but an alternative is to present as complementary, and discuss how they are used to evaluated each other.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
8814	4	78	1	78	2	This description of environmental sustainability barely includes climate change which is surprising given the nature of the report. This indicates the paucity of the definition and the tendency of much work on sustainable development to put industrial and economic output ahead of the natural basis of industry and economic growth. This is the flavour of much of section 4.8.	Certainly not the intent. Must clarify.
12769	4	78	25	78	26	The utility of non-human beings does not belong to the anthropocentric perspective. If the IPCC wants to depart from the anthropocentric perspective and turn to an ecocentric perspective this should be made explicitly clear at this place. (cf. comment 72)	The IPCC has neither an anthropocentric nor an ecocentric perspective. It can mention the various views.
17915	4	78	31	78	33	In the context of AR5, this assessment of relative priorities could be based on the co-benefit/co-cost discussions in chapters 3, 5-12 and 15. To inform this assessment with the important SD context, please liaise with the relevant chapters in the cross-cutting meeting to determine a viable labor division and synthesis of results with respect to the co-benefits/co-cost assessment across chapters.	OK, refer to cobenefits here.
12770	4	78	33	78	33	An overall well-being aim is not equal to the sustainability aim for it may not be bearable in the long-run nor may it be transmittable to all countries worldwide (p. 78, line 41; cf. comments 1, 21).	Misunderstanding? Sustaining well-being over time is SD (in one view of it).
17347	4	79	18	79	31	There is a specific take of sustainable development that has evolved for transport in particular. This discussion needs to acknowledge this. It appears to dismiss this possibility. Please coordinate with chapter's definition or use of sustainable development. At least Chapter 8.	Accepted (new table).
12774	4	79	34			Is not well-being referring to all the pillars? I do not understand why well-being and the three pillars are separated here.	These are different approaches. Well-being is more synthetic, 3 pillars looks at subdomains.
12773	4	79	8			Where is the climate issue?	Everywhere! The point here is to put it in the broader context of policymakers' objectives.
12772	4	79	4	79	13	It might be worthwhile to consider merging "well being" with the economic performance pillar (at least if the three pillar model should be the guiding model).	This would be a big mistake. The whole point of the well-being perspective is to encompass all dimensions of life that matter to people, including the most spiritual.
12771	4	79	4	79	8	See comments 1, 21, 96.	Not clear.
9296	4	79	18	79	22	Toward sustainable development, the cement sector developed several sustainability indicators (so called key performance indicators) linking to local society. Main areas are alternative fuels, biodiversity, employment safety, water as well as climate. (http://wbcscement.org/pdf/csi_progress_report_2005.pdf and http://www.csiprogress2012.org/CSI_ProgressReport_FullReport.pdf)	Discuss: We must decide whether we are supposed to list/discuss/evaluate a set of indicators. See TSU letter.
5462	4	8	8			Sentence 'While FAR... can be deleted- prior sentence '... climate policy, squarely and explicitly placing the imminent...' Much of this paragraph can be similarly edited- as can remainder of this discussion Key paragraphs are summary of SRES and SRREN- other paragraphs while describing outcomes of the reports primarily focus on language to differentiate or tie SD from equitable development-	See 219.
2913	4	8	1	9	43	to much in detail? - proposal is to start in 2011 and to describe in less detail from 2007 - 1995 report	Will shorten as part of overall shortening.
7302	4	8	1	9	44	To reduce the length of Chapter 4, it is proposed to drop Section 4.1, because key messages from the previous reports are well known to scientific community and general public.	See 219.
14312	4	8	2			Good summary of previous IPCC report SD messages	Noted (thank you).

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
6889	4	8	2			Specific references to WG reports and even Chapters is encouraged; Section leaves out the SREX, which had a dedicated Chapter on Sustainable Development.	Accepted.
15661	4	80	19		20	Here's a reference for progressivity of an airline levy: see Hepburn, C., and B. Müller. 2010. International Air Travel and Greenhouse Gas Emissions: A Proposal for an Adaptation Levy. World Economy 33 (6):830-49.	Helpful reference.
8934	4	80	26	80	31	For a quantitative discussion of this topic see B. J. van Ruijven, J. Schers, D. P. van Vuuren, Model-based scenarios for rural electrification in developing countries. Energy 38, 386 (2012).	Helpful reference.
2562	4	80	32	80	33	Needs balance - in special to avoid problems in the Plenary. For instance, unconventional fossil fuels extraction may contaminate water and degrade land (fracking, tar sands, deepwater drilling). Disputes for oil escalate military expenditures	Will not appear in SPM. Also, the purpose is not perfect balance, but selective illustrative examples.
12775	4	80	37	80	38	The role of women is unclear. Under which circumstances are women key agents? (see also comment 20)	Not to be elaborated here, but more discussion of gender is needed.
12162	4	80	9	80	40	I think that it's not necessary to maintain the section 4.8.3.1. It's not a so relevant information.	Will shorten while overall shortening.
4757	4	80	12	80	15	The sentence "Habitat loss induced by hydropower dams" is too restrictive and doesn't address the whole hydropower cases.	It is not intended to.
3253	4	81	16	81	18	Where explained? What does the sentence means? ("the speed ... is important to assess ...")	Must clarify.
3254	4	81	24	81	25	Should not avoiding climate change be the focus? And then ask whether avoiding climate change is necessary and sufficient for sustainability.	That is indeed the idea. No change seems needed.
3255	4	81	28	81	28	Elsewhere in the chapter it is argued that sustainable development is necessary for avoiding climate change, which is equivalent to avoiding climate change is sufficient for sustainable development.	Will sharpen this issue.
3256	4	81	31	81	31	"... fits the general outlook." What is meant?	Noted. Will be clarified.
3257	4	81	31	81	33	What is the time horizon for such a move?	Noted. Will be clarified.
3258	4	81	34	81	44	So what is the answer to the responsibility question and what is the relevance for the topic of this chapter.	Address earlier (4.7.3) and recap here.
12163	4	81	6	81	19	I think that it's not necessary to maintain the section 4.8.3.2. It's not a so relevant information.	Not agreed.
17348	4	81	6	81	19	Democratic transition. This issue is coming too loosely in the end, it needs to be better tight with the concept of procedural justice for example in chapter 3. With people's lack of acceptance that trade offs are necessary as explained in Chapter 2. When values are incommensurable for example Chapter 3. There are many fundamental reasons presented in previous chapters why democratic engagement needs to be at the center of the transition. So, this session even if short could cross-reference to those key factors and this will make it stronger.	Agreed. Section should be strengthened and more consistently carried through chapter.
7756	4	9			31	While this section is an interesting read about the history of sustainable development, the legacy of colonialism, and sustainability indicators, it is: i) far too long; ii) not directly relevant to mitigation. I now make various suggestions below how to address issues within this section.	Noted.
7758	4	9			31	2. the main suggestion is to try to reduce these 24 pages into 9. I assume that this chapter should be 25 pages long (or thereabouts), that leaves about 3 pages per sub section. I think that this can be easily done, and this is the focus of most of my comments below.	Will take into account.
7769	4	9			31	No focus on mitigation in these pages, which I think, significantly weakens this section. Also it results in a lot of superfluous text. Much of this section could be deleted and replaced with many of the comprehensive reviews of sustainable development, or e.g. population change	Will shorten
12682	4	9	26			Please proof "due to higher risk aversion" by literature.	Review and clarify.
7757	4	9	44	10	24	1. start the section with an explanation of what is low carbon climate resilient development and immediately equate this with sustainability, e.g. links with production, consumption, population and demography etc..	Noted.

Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter 4

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
7760	4	9	44	10	24	This section has no punch, and could really do with setting out the big points early on, at present you lose the reader, there is no clear focus on the big themes running through this chapter - what are they? There is mention of Rockstrom's work but little else - is this the only big theme?	Define narrative more clearly.
3214	4	9	46	9	47	What is the meaning of "It recognizes that climate change is in fact inextricably linked with sustainable development and equity". Does it point to an empirical fact?	Noted. Will be clarified.
17638	4	9	46	9	47	"It recognizes that climate change is in fact inextricably linked with sustainable development and equity." - from which perspective this situation is recognized, from scientific perspective, from social science perspective, or other perspectives?	See 230.
7759	4	9	47	9	49	Final sentence doesn't say anything - delete	Accepted.
14008	4	9	48			Suggest replacing "...promising responses to climate change." with "...sustainable and equitable responses to climate change." Consider defining what is meant by responses to climate change in this chapter.	Accepted. We should be more precise and also distinguish between mitigation and adaptation responses
17089	4	9	6		9	<p>factually incorrect on two counts. First, "global emissions peaking by 2020" is the EU position and not a global consensus. The global consensus, as you have acknowledged, is that this goal has to be seen in conjunction with ensuring equitable access to sustainable development, as agreed at Cancun, to which reference must be made.</p> <p>Second, how do you say that the "most promising response is "requiring humanity to think like a society of people, and not like a collection of individual states". This is a reference to a paper written in 1998, and has been overtaken by recent science. The most promising response in the context of this chapter could well be equal rights to the global commons or carbon budget – see my peer reviewed articles in 'Climate and Development'.</p> <p>Recent analyses are now arguing that what really matters is the total greenhouse gas budget we allow ourselves because of the scientific uncertainty associated with emission rates and concentration targets*, which cannot be accurately inferred from quantities we can observe. The United Kingdom already has legislation establishing a national carbon budget, and the National Academy of Sciences of the United States concludes that the "policy goal must be stated as a quantitative limit on domestic GHG emissions over a specified time period – in other words a GHG emissions budget national shares of global emissions need to be agreed at the multilateral level as the basis for developing and assessing domestic strategies". The scientific analysis notes that its efforts are "based on 'global least cost' economic efficiency criteria for allocating global emissions among countries, and using other criteria, different budget numbers could be suggested; for instance, based on global 'fairness' concerns, a more aggressive U.S. emission reduction effort is warranted – and this is what equity is all about.</p>	<p>This refers to page 11:6-9 and not page 9. It is a matter of taste what to cite at this very general level. The quote from Victor is indeed a bit old but it is general enough that I consider it still valid today. We clearly have to make sure we differentiate between the EU goals and the globally agreed goals.</p>
6472	4	9	14	9	27	Cost-benefit analyses as a prescriptive tool for climate change policy formation not only neglects equity arguments but also often conflicts with rights and deontologically based claims about justice and fairness, including distributive, procedural justice claims and human rights based articulations of duties and responsibilities. This section should be modified to say on line 19. Cost-benefit analyses based policy prescriptions often ignore duties entailed by human rights and deontological arguments.	Will take into account, but the comment assumes a narrow understanding of CBA.
6890	4	9	40	9	42	IPCC SREX and the Chapter on Sustainable Developments is missing here.	Accepted.