Expert and Government Review Comments on the IPCC WGIII AR5 Second Order Draft – Annex II

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31238	AnnexII					The LCA section has improved since the FOD. It would further improved by more clearly distinguishing attributional from consequential LCA, discussing the pros and cons of each approach for the central question for this volume: "How much climate change mitigation can be expected from using more of technology x?" As it stands, the section treats attributional LCA as "LCA" and characterizes consequential LCA as an immature, almost irrelevant framework warranting merely 2 sentences. This ignores the growing use of consequential LCA and suggests that since there is no consensus on CLCA, then ALCA should be used, as if these two methods were somehow interchangeable.	Rejected. The Annex represents the state of the art at the time of writing. There are only few studies that actually claim to conduct consequential LCA, and of those a significant frachtion merely use a system expansion approach for allocating co-products. The characterization as immature is based on a recent literature review in the International Journal of Life Cycle assessment (Zamagni et al. 2012). In general, this reviewer builds up a false dichotomy. There are many ways to define system models in LCA, depending on the purpose of the analysis, and not a dichotomous choice of cLCA vs aLCA. There are many LCAs that investigate the often marginal effect of specific choices, mostly supporting corporate decision making.
29010	AnnexII	12		13		Material flow analysis should be included in the glossary. The definition already in Annex II could be used: "Material flow analysis (MFA) – including substance flow analysis (SFA) – is a method for describing, 36 modeling (using socio-economic and technological drivers), simulating (scenario development), and 37 visualizing the socioeconomic stocks and flows of matter and energy in systems defined in space and 38 time to inform policies on resource and waste management and pollution control."	Accepted.
29365	AnnexII	12	12			Also in Ch. 1	Accepted. Ch.1 has been added to the list.
29366	AnnexII	12	15	12	34	I miss a brief description of the standard accounting method used by countries for official reporting to the UNFCCC of actual emissions from activities occuring within the country borders (cf. the IPCC GHG inventory guidelines) (with minor exceptions of road fuels sold in a country). I think Ch. 5 calls that "territorial" emissions.	Noted. It is not clear why this should be discussed in this introductory paragraph.
29008	AnnexII	12	23	12	23	Industrial ecology should be defined in the glossary. I suggest "Industrial ecology is the study of the flows of materials and energy in industrial and consumer activities, of the effects of these flows on the environment, and of the influences of economic, political, regulatory, and social factors on the flow, use, and transformation of resources." (from Allenby, B. and D. Richards. 1994. The Greening of Industrial Ecosystems. Washington, D.C.: National Academy Press.)	Accepted.
29511	AnnexII	13		16		Carbon footprinting is addresed entirely in the section on input/output analysis. In fact, carbon footprinting methods as developed by WRI , ISO and BSI are based on LCA. Therefore carbon foootrpinting shodul also be discussed in section A.II.4.3.	Accepted. Presentation changed.
29011	AnnexII	13	7	13	7	An important review of the application of MFA to urban systems should be referenced here:Kennedy, C., J. Cuddihy, and J. Engel-Yan. 2007. The changing metabolism of cities. Journal of Industrial Ecology 11(2): 43-59. DOI: 10.1162/jie.2007.1107	Accepted. Reference inserted.

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29512	AnnexII	14	15			presumably this should say consumption by rather than consumption of	Accepted
29514	AnnexII	14	23			" South->North directionality" could be interpreted literally in the geographic sense, but that is not the intended meaning. Reword to remove ambiguity.	Accepted.
29012	AnnexII	14	37	14	39	There are techniques for using input-output analysis at a finer level of granularity. See the widely-cited article: Joshi, S. 1999. Product environmental life-cycle assessment using input-output techniques. Journal of Industrial Ecology 3(2-3): 95-120. DOI: 10.1162/108819899569449	Taken into account. Please note that we have chosed to cite a more recent paper disaggregating a higher number of sectors.
29513	AnnexII	14	footnote			This statement may be true for the specific studies cited, and for any C footprint based on I/O data but it is incorrect to state that "only GHG emissions related to fossil fuel conbustion nad cement production are included in the carbon footprint". ISO, WRI and BSI methods all require direct C stock changes, and non-CO2 GHGs (N2O and CH4) to be included. Many published studies include these GHG sources.	Taken into account. Text changed. Some MRIOs in fact include all the Kyoto gases.
31228	AnnexII	15	19	15	22	Attributional LCA (ALCA) does not "estimate technical emissions reductions" offered by technologies. ALCA doesn't attempt to estimate the change in emissions from using a technology, it merely sums the average emissions along a supply chain for a product system. This sum is not necessarily related to the sum of the marginal emissions from the expanded use of a technology, as these two analyses have (by design) very different system boundaries. The relevant question for mitigation is "What is the change in (global) GHG emissions resulting from increased use of a given product system at scale?" ALCA isn't designed to answer this question.	Taken into account. The language has been changed to specify that LCA is used to compare different ways of producing the same functional unit.
29515	AnnexII	15	25			Traditionally LCA covers a range of environmental impacts; many LCA practitioners do not consider LCA confined to GHG to be LCA at all! Delete or reword.	Taken into account. Apparently the tex thas been misunderstood; this has been changed to say that now, metrics beyond the GWP are avaiable to characterize the climate impact of a wider range of interventions.
29516	AnnexII	15	25	26		This is an inaccurate description of the inclusion of time in LCA. Substitute: In conventional LCA the impact of timing of emissions and removals is not considered. They are summed over the entire life cycle of the product, or a limited (e.g. 100-year) assessment period. Recently this convention has been questioned, and methods have been proposed to quantify the effects of carbon sequestration and temporary carbon storage in LCA (Brandão M, Levasseur A, Kirschbaum MUF, Weidema BP, Cowie AL, Jørgensen SV, Hauschild MZ, Pennington DW & Chomkhamsri K 2013 Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. Int J Life Cycle Assess 18:230-240)	Accepted.
31229	AnnexII	15	32	15	33	For the reasons indicated in comment 1, it is incorrect to call these estimates an "upper bound". The consequences of actually using a system may be (much) greater than or less than the estimate made with ALCA. Even if that weren't so, there are as many different implementations of ALCA as there are analysts, so assuming you have an upper bound is inappropriate.	Taken into account. Please note that the text does not claim that consequences of actions are assessed; rather it is technologies.
31230	AnnexII	15	38	15	39	Hybrid LCAs may represent more completely all inputs to production, but this still does not answer the question about change from a baseline. It's merely a more complete answer to a different question.	Taken into account. No such claim is made in the text.
29517	AnnexII	15	41			Conflicts with lines 16-17. In fact LCA is utilised more broadly than for research. The issues mentioned in this paragraph are important caveats, that must be (and are) considered where LCA approaches are applied in communication to consumers (eg in development of ISO 14067), and in policy.	Rejected. There is no contradiction. Research is also conducted for policy or in industry.

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31231	AnnexII	15	41	15	44	The statement that LCA answers specific questions is critically important. Unfortunately, question identified ("what are the environmental impacts of product x") is not quite correct. The appropriate question is "what are the environmental impacts expected from increasing (or decreasing) use of product system X?" The point is that we're interested affecting the current GHG trajectory: to do this we need to estimate a change from a baseline, which includes the question of how much displacement actually can be expected. Among many papers making this point is this recent one: Zamagni, A., J. Guinée, R. Heijungs, P. Masoni, and A. Raggi, Lights and shadows in consequential LCA. The International Journal of Life Cycle Assessment, 2012. 17(7): p. 904-918. (Already cited on p. 16)	Rejected. Most LCAs answer the question about specific products or the average of the products produced. The average product use is precisely defined; the marginal one is not, and the question suggested here is too imprecise.
31232	AnnexII	15	45	15	47	The statement "modeling choices become part of an LCA" is unclear; a simpler statement would be "LCA results are sensitive to numerous subjective choices by the modeler." The implications of this are critically important for policymakers to understand. The statement that "LCA studies are not always comparable..." incorrectly implies that the studies usually are comparable. A more accurate statement would be: "LCA studies are generally incommensurable owing to differences in subjective choices made by modelers (e.g., spatial, technological, and temporal system boundaries; functional units; choices of proxies; cut-off decisions; method for handling co-products.) As a result of these differences, two LCA studies of the same nominal target frequently study what are effectively different targets." (This is in addition to the critique that ALCA answers the wrong question...)	Rejected. Modelling choices are not necessarily or generally arbitrary or subjective. Rather, sometimes LCA analysts are forced to make assumptions because the product system is not sufficiently defined. Ithere is also no evidence available to support the claim that the effect of subjective modelling choices, such as allocation, normally have a significant impact on the results.
29006	AnnexII	16		16		The definition of life cycle assessment in the glossary includes the statement "The results of LCA studies are very strongly dependent on the system boundaries within which they are conducted. The technique is intended for relative comparison of two similar means to complete a product, but often misused." The criticisms are well founded, but not appropriate to a glossary where similar critical commentary is not provided for other entries.	Taken into account.
31234	AnnexII	16	11	16	15	Comparing the "established methods and common practice" of ALCA to the "net yet established" status of CLCA creates the impression that these are two alternative means to the same end. They are not, as suggested by the following sentence about investigating larger sustainability questions--including the GHG mitigation potential of changing energy technologies or agricultural and forestry systems. Please clearly state the implications of this finding, i.e., that the product focus is insufficient for the very question of mitigation potential addressed throughout this report.	Rejected. It is not clear what the reviewer intends. He does not seem to disagree with the text except for a potential misunderstanding of the purpose of consequential vs. Attributional analysis. Such a misunderstanding is pre-empted by the text before the statement.
31235	AnnexII	16	21	16	21	"Understanding these contributions" in a static supply chain has some value, but it is much less valuable to the question at hand than would be understanding how energy and materials change as a result of using the product system.	Noted. However, such an ideal method does not yet exist, and it is pointless to discuss non-existing methods in this annex.
31236	AnnexII	16	22	16	23	"Impacts per unit" seems to imply scale-independence, and thus static (ALCA) analysis rather than change-based (CLCA) analysis, which is scale-dependent. An ALCA does not preduct how impacts are likely to change. It doesn't even attempt to answer that question.	Taken into account. Please note that scale-dependence can be modelled in LCA and it often is; see some of the references cited in section 7..8.1

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31237	AnnexII	16	24	16	37	This paragraph seems to imply that by wrapping a product chain analysis in a macro level scenario model, one can understand the behavioral responses and thus mitigation effects of using a technology. This is not correct: the difference between a change-based analysis and a static supply-chain analysis is not merely the response to the final product (captured in the discussion of direct and indirect rebound effects). As noted in the LCA literature, a change-based analysis involves a different life cycle inventory since it may leave out supply chain components that do not change, and includes effects outside the supply chain that do change. This difference cannot be bridged by examining scenarios. These are two fundamentally different analyses.	Rejected. This is not suggested here. Rather, the text states that sometimes, behavioral responses are analysed in LCAs, and examples for that are provided. Further, it is pointed out that effects that the reviewer identified in earlier review comments are taken into account in other climate mitigation analysis, such as that carried out by IAMs. Since LCAs have no methods to address these effects and other methods exist, the text suggests to rather take IAMs to analyse these effects than LCAs.
31233	AnnexII	16	3	16	5	Coupling ALCA with material flow data does not convert a static model of average effects into a dynamic model of marginal effects, which is what is required to understand mitigation potential. Thus, in my view, this statement is incorrect.	Rejected. Precisely such modelling can be obtained as described in the text.

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32565	AnnexII	1723				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Accepted. References were partly included into LCA section.

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32566	AnnexII	1742				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Accepted. References were partly included into LCA section.

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32567	AnnexII	1759				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Accepted. References were partly included into LCA section.

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32568	AnnexII	1769				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Accepted. References were partly included into LCA section.

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32569	AnnexII	1772				The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Accepted. References were partly included into LCA section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32570	AnnexII	1784		1792		The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardused by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are: -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkhamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy	Accepted. References were partly included into LCA section.
21426	AnnexII	19	31	19	39	In the main text of the chapters, ASIA seems referring to developing countries (although it was not explicitly stated). In this Annex, ASIA includes Macao, Hong Kong, Singapore, Taiwan and South Korea, which may belong to the category of developed countries/regions.	ASIA includes all Asian countries with the exception of those that are in OECD1990 (only Japan).
19431	AnnexII	19	27	19	27	to change Palestinian Territory to: Palestine, after having a non member state in UN General Assembly.	All instances that read 'Palestinian Territory' have been changed to 'Palestine' according to UN convention.
24005	AnnexII	20	6			Actually Annex 1 -- Definition of geoengineering must include permanent carbon dioxide storage which is a daunting issue.	The Glossary Annex is not formally reviewed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19432	AnnexII	20	30	20	30	to change Palestinian Territory to: Palestine, after having a non member state in UN General Assembly.	All instances that read 'Palestinian Territory' have been changed to 'Palestine' according to UN convention.
38873	AnnexII	21	1	21	6	The GCF is wholly separate from the $100bn mobilization pledge. The pledge to mobilize $100bn acknowledges that a large portion will come from the private sector, and also that many different types and channels of public sector finance will be necessary. There is no agreement and small likelihood that a significant portion of public finance, let alone the full $100bn, will be channeled through the GCF. The reference to $100bn should be removed from this definition as the GCF is not formally linked to this pledge.	The Glossary Annex is not formally reviewed.
19988	AnnexII	21	8	21	8	In the definition of DC-G20, Hong Kong and Taiwan are both regarded as countries. Suggest to change "developing countries" into "developing countries and regions"	Noted. ECON5 country aggregation was changed in final draft.
19433	AnnexII	21	26	21	26	to change Palestinian Territory to: Palestine, after having a non member state in UN General Assembly.	All instances that read 'Palestinian Territory' have been changed to 'Palestine' according to UN convention.
19721	AnnexII	23	31	23	32	Carbon Dioxide Removal (CDR) is one of approaches of “geo-engineering”.	The Glossary Annex is not formally reviewed.
29727	AnnexII	23 of 39	29		32	THIS COMMENT IS ABOUT ANNEX 1 (GLOSSARY), BUT THIS WAS NOT A CHOICE IN THE CHAPTER DROP DOWN MENU: This definition of iron fertilization does not reflect the speculative nature of ocean iron fertilization (OIF) or the absence of demonstrated efficacy. It has not been proven that OIF "can sequester" carbon dioxide; in fact, scientic evidence suggests that it does NOT do this. If there is need for scientfic opinion on OIF, please see, for example: A. Strong, J. Cullen, and S. W. Chisholm. (2009) Ocean Fertilization: Science, Policy, and Commerce, in Oceanography: Vol. 22, No. 3, 236-261 and Strong et al., "Ocean fertilization: time to move on," Nature 461, 347-348 (17 September 2009) | doi:10.1038/461347a, published online 16 September 2009 and CBD Technical Series 45, "Scientific Synthesis of the Impacts of Ocean Fertilization on Marine Biodiversity," 2009. Because of possible negative impacts and the lack of scientific justification for pursuing OIF as a climate change response, iron and other forms of ocean fertilization have been subject to a de facto moratorium in the Convention on Biological Diversity since 2008; the moratorium was strengthened in 2010 and reaffirmed at the Rio+20 UNCSD 2012 conference. See Rio+20 outcome document, "The Future We Want," 2012, para 168: "We stress our concern about the potential environmental impacts of ocean fertilization. In this regard, we recall the decisions related to ocean fertilization adopted by the relevant intergovernmental bodies, and resolve to continue addressing with utmost caution ocean fertilization, consistent with the precautionary approach." [online]	The Glossary Annex is not formally reviewed.
38874	AnnexII	25	7	25	8	The acronym "LCOE" should be included next to levelized cost of energy. This term should be defined since it is the basis for comparing the cradle to grave cost on a levelized playing filed for all forms of conventional and nonconventional energy. Referring to "cost" does not define this term.	The Glossary Annex is not formally reviewed.
38875	AnnexII	26	30	26	30	After "public sector" the authors should consider adding "(both in developed and developing countries)"	Not clear what this refers to.
38876	AnnexII	26	30	26	30	After "public sector" the authors should consider adding "(both in developed and developing countries)"	Not clear what this refers to.
38877	AnnexII	27	34	27	40	What about private banks (investors, but not international institutions)?	Not clear what this refers to.
38878	AnnexII	27	35	27	35	The authors should consider deleting the word "public" towards the end of the line	Not clear what this refers to.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
38879	AnnexII	28	1	28	9	This definition needs to align with the UNFCCC definiton, which could be added as a first sentence here. The UNFCCC defintion is; - those countries that are not listed in Annex I of the Convention, which reflects countries that were members of the OECD in 1990. It would also be helpful to add to the end of the current first sentence that this includes all Least Developed COuntries as well as emerging economies and several current OECD countries like Korea and Mexico.	The Glossary Annex is not formally reviewed.
38881	AnnexII	29	16	29	16	What does the word "size" refer to? Size of project?	Not clear what this refers to.
38880	AnnexII	29	9	29	9	What is this compared to? Or is this subtotal of climate finance? not clear from the sentence structure.	Not clear what this refers to.
33862	AnnexII	3	13			I miss that as default (i.e. unless otherwise stated) all values in CO2-eq emissions mentioned in the AR5 WGIII report were calculated using the GWP-100 values of the SAR (i.e. for current UNFCCC/Kyoto reporting). Perhaps a separate table with the GWP values used for the most common gases in this section is recommended.	Accepted. A foonote has been added to Table A.II.1 that defines the 100 year SAR GWPs as the default for the report.
29367	AnnexII	3	13			I miss that as default (i.e. unless otherwise stated) all values in CO2-eq emissions mentioned in the AR5 WGIII report were calculated using the GWP-100 values of the SAR (i.e. for current UNFCCC/Kyoto reporting). Perhaps a separate table with the GWP values used for the most common gases in this section is recommended.	Accepted. A foonote has been added to Table A.II.1 that defines the 100 year SAR GWPs as the default for the report.
26388	AnnexII	30	18	30	18	SPECIFIC COMMENT. I suggest to update the IEA and NEA reference, from the 2005 edition to the 2010 edition. REFERENCE. OECD-IEA-NEA “Projected Costs of Generating Electricity”, 2010 Edition, <http://www.oecdbookshop.org/oecd/display.asp?lang=EN&sf1=identifiers&st1=978-92-64-08430-8 > or <http://www.debateco.fr/sites/default/files/2010%20IEA%2BOECD%20on%20Costs%20Electricity%20.pdf>.	Accepted. Reference has been added.
38882	AnnexII	31	12	31	12	Before the citation, the authors should add some examples eg. "such as favorable policies or public finance."	Not clear what this refers to.
38883	AnnexII	31	28	31	34	The authors should consider using a uniform currency in this para	Not clear what this refers to.
38884	AnnexII	33	21	33	21	After "grant finance" the authors should add "or loan financing from MDB"	Not clear what this refers to.
38885	AnnexII	34	14	34	14	The authors should consider replacing "approaches" with "government experiments with equity"	Not clear what this refers to.
38886	AnnexII	35	22	35	22	The authors should consider adding "strong" between "Through" and "institutions"	Not clear what this refers to.
38887	AnnexII	35	39	35	39	This should track more precisely with agreed UNFCCC language, which says "In the context of meaningful mitigation actions and transparency on implementation, developed countries commit to a goal of mobilizing jointly USD 100 billion dollars a year by 2020 to address the needs of developing countries."	Not clear what this refers to.
29728	AnnexII	35 of 39	16		19	THIS COMMENT IS ABOUT ANNEX 1 (GLOSSARY), BUT THIS WAS NOT A CHOICE IN THE CHAPTER DROP DOWN MENU: We suggest the following edits to the definition of SRM:" SRM refers to the intentional modification of the Earth’s shortwave radiative budget with the aim of reducing an effect of climate change according to a given metric (e.g., surface temperature). Artificial injection of stratospheric aerosols and boundary layer cloud brighteningare two examples of proposed SRM techniques."	The Glossary Annex is not formally reviewed.
23070	AnnexII	5				(This line intentionally left blank because this row does not seem to accept multi-line text.)	No action necessary.
29724	AnnexII	5 of 39	32		37	THIS COMMENT IS ABOUT ANNEX 1 (GLOSSARY), BUT THIS WAS NOT A CHOICE IN THE CHAPTER DROP DOWN MENU: Grammatical errors notwithstanding, this is a biased assessment of biochar's benefits -- not a definition. Biochar is charcoal created by pyrolysis of biomass, which is added to soils. For a review of scientific assessments of biochar, see Biofuelwatch's Factsheet on Biochar, 2011, available here: http://www.biofuelwatch.org.uk/2011/biochar-3pager/.	The Glossary Annex is not formally reviewed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26387	AnnexII	6	21	6	21	SPECIFIC COMMENT. I suggest to update the IEA and NEA reference, from the 2005 edition to the 2010 edition. REFERENCE. OECD-IEA-NEA “Projected Costs of Generating Electricity”, 2010 Edition, <http://www.oecdbookshop.org/oecd/display.asp?lang=EN&sf1=identifiers&st1=978-92-64-08430-8 > or <http://www.debateco.fr/sites/default/files/2010%20IEA%2BOECD%20on%20Costs%20Electricity%20.pdf>.	Accepted. Reference has been added.
38871	AnnexII	6	9	6	9	Suggest revising "to reduce net greenhouse gas emissions or to enhance resilience" to "to reduce net greenhouse gas emissions and/or to enhance resilience." This would make the definition consistent with the concept discussed at the end of the chapter about integrating mitigation and adaptation finance.	The Glossary Annex is not formally reviewed.
29726	AnnexII	6 of 39	25		25	THIS COMMENT IS ABOUT ANNEX 1 (GLOSSARY), BUT THIS WAS NOT A CHOICE IN THE CHAPTER DROP DOWN MENU: The Biofuel definition should note that SYNTHETIC BIOLOGY is the main "advanced process" referred to for the production of second- and third-generation biofuels.	The Glossary Annex is not formally reviewed.
29725	AnnexII	6 of 39	4		8	THIS COMMENT IS ABOUT ANNEX 1 (GLOSSARY), BUT THIS WAS NOT A CHOICE IN THE CHAPTER DROP DOWN MENU: After line 7, INSERT: The production of bioenergy can require more fossil fuels than it replaces, as it has been the case with first generation biofuels. There is also an obvious contradiction/infeasability, which should be prominent in the WGIII contribution, of removing biomass for bioenergy at the same time as attempting to increase sequestration in ‘living biomass.'	The Glossary Annex is not formally reviewed.
38872	AnnexII	7	21	7	27	This description of the Cancun Agreement leaves out one of the most important elements of the agreements - the commitments by Parties to implement specific national mitigation targets and actions listed in the Agreement. This must be added to the definition as one of the first elements on the list.	The Glossary Annex is not formally reviewed.
19420	AnnexII	9	14	9	15	The most important distinction regarding technological change treatment in the models is overlooked here. Exogenous or induced, what matters much more to energy use forecasts is whether or not modelers have included technological change for non-energy factors. By my review of the models you have used, only 3 of the models consider this, and even so, they all assume neutral technology gains, a very specific assumption not borne out by the data. The criticality of considering technological change for non-energy factors is clearly revealed in Saunders (1992), and further developed in Saunders (2013). Stern and Kander (2012) show the importance of this. Sorrell (2007, already cited in your report) emphasizes its importance. Technology gains for non-energy factors have a MUCH larger influence on energy consumption than do energy-specific technology gains, irrespective of whether they are "induced" or not. IMHO, this is a major oversight in these models. Ignoring them is tantamount to admitting that energy forecasts under-estimate future energy use by a large margin. C'mon, folks. Let's get this one right. Let us not choke on a gnat but swallow a camel. Saunders, H.D. (1992). “The Khazzoom-Brookes postulate and neoclassical growth.” The Energy Journal 13(4): 131 148. Saunders, H.D. (in press, 2013). “Historical evidence for energy consumption rebound in 30 US sectors and a toolkit for rebound analysts.” Technological Forecasting and Social Change http://dx.doi.org/10.1016/j.techfore.2012.12.007. Stern, D.I. and A. Kander (2012). “The role of energy in the industrial revolution and modern economic growth.” The Energy Journal 33(3):125-152.	Not clear what this refers to.