



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



Special Report on Renewable Energy Sources and Climate Change Mitigation

Expert Review of the First Order Draft
Dec 14, 2009 – Feb 8, 2010

Chapter 2

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¹ see <<<http://ipcc.ch/pdf/ipcc-principles/ipcc-principles-appendix-a.pdf>>>, Section 4.1 and clarification in decision 8 on procedures taken at the 33rd Session of the Panel <<http://www.ipcc.ch/meetings/session33/ipcc_p33_decisions_taken_procedures.pdf>>

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Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
SCOWCROFT (EURELECTRIC)	2	0	-	-	-	-	-	-	The IPCC SRREN FOD particularly focuses on biomass liquefaction and gasification. Biomass gasification with CO2 capture, for example, is highlighted as the technological process with the highest potential for GHG emission reductions, but the report does not comment on neither the technical nor the economic facts. We point out that biomass is primarily to be used for the production of heat and electricity. The energy density of biomass can significantly be raised by pelletising and torrefaction, thus enabling the worldwide supply of also large-scale generation units. Its does not make any sense to produce oil from biomass for its later combustion in power plants. Due to significantly lower production costs and substantially higher rates of efficiency, coal or natural gas should be used as raw material for petrol and heavy fuel oil. We do not expect any competition with food production and supply (exception: sugar cane based ethanol). Concerning power generation from biomass using steam boilers, primary importance should be attached to efficiency improvements. In biomass-fired power plants or plants using co-firing, efficiency rates over 40% can be reached (in case of gasification, outcome values are lower while specific investment costs are even higher at the same time). Compared with combustion, the advantages of gasification are doubtful. The vision of global bioenergy trading implies the existence of a market for biomass commodities where pellets and biochar produced by torrefaction can be traded. We promote the establishment of accordant specifications, standards etc.	We will add more on biomass gasification.
Rybach (Geowatt AG)	2	0	-	-	-	-	-	-	This is the only Renewable Energy chapter that comments on chapter 10. On the other hand it does not address long-term deployment in the context of carbon mitigation, especially in terms of TPES and bioenergy share for the scenario categories I+II, III+IV and V+VI of IPCC AR4.	For the next draft feedbacks from Ch10 will be more discussed in Ch02.
Kammen (University of California, Berkeley)	2	1	-	-	-	-	-	-	An added focus is needed on the carbon impact and issues of international biofuel trading - of Biofuels and development. An important issue to consider focuses on the economic and policy framework under which biofuel/resource flows between developed and industrializing nations. As assessment of this in the case of biofuels is the recent paper of: Searchinger, T., Hamburg, S., Meilillo, J., Kammen, D. M., Lubowski, R., Oppenheimer, M., Robertson, G. P., Schlessinger, W., and Tilman, G. D. (2009) 'Fixing a critical climate accounting error', Science, 326, 527 □ 528 (23 October).	Biomass trade will be further discussed in subsections dealing with present (2.3) and future (2.6) logistics issues.
Kammen (University of California, Berkeley)	2	1	-	-	-	-	-	-	Comments throughout Chapter 2: there is generally insufficient attention to the issues of direct and indirect land use, not only on acreage, but also on water (both quantity and quality), biodiversity, and on the aggregation of farming/silviculture practices. Farming / management scales can have very different impacts on communities and human well-being.	LUC and ILUC, already discussed in the text, will be reviewed and the discussion will be enlarged.
Kammen (University of California, Berkeley)	2	1	-	-	-	-	-	-	Where is biomass co-firing with coal? It does not seem to appear in any detail in the report.	Biomass co-firing will be added in the technologies chapters.
Kruger (South African Weather Service)	2	3	21	3	21	Contents	-	-	"Change this section to ""2.5.2 Environmental impacts related to climate change""."	Accepted
Rubiera (Instituto Nacional del Carbon (CSIC))	2	4	30	4	30	-	-	-	"Replace ""Chapter 2"" by ""Chapter 2"""	Accepted
de Campos Barbosa (Petrobras)	2	5	29	-	-	-	-	-	"Change expression ""right policy frameworks"" to ""positive policy frameworks"". ""Right policy"" is limiting policies to right or wrong categories, which isn't the case here."	We will use appropriate policies.
Visconti (Inter-American Development Bank)	2	5	37	5	46	-	-	-	"Delete the entire Impacts paragraph. The issue of impacts on biodiversity, water resources, etc□are already included in the precedent section, Future potential. The issue of ""regionality"" can be introduced in the para on Future potential, line 29. "	The Exec. Summary will be complete rewritten.
Schmall (Petrobras S.A.)	2	5	15	5	17	-	-	-	"It should add to the paragraph that: Brazil is a global benchmark in production of ethanol from sugar cane. See: SIMOES, R.B., Master Thesis, Universiteit Van Tiburg, Holand, Jul-2006, ""New Trends to the ethanol supply chain in Brasil"""	Ethanol program in Brazil is already mentioned in the Ch02 text.
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	5	3	78	4	-	-	-	"language should be improved; why Biomass is spelt with a capital letter?"	Accepted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Uusivuori (Finnish Forest Research Institute)	2	5	20	5	35	-	-	-	"The text here seems to adhere to technical and biological potentials. Policy constraints are posted only in reference to land-use governance and agricultural and livestock management. Yet, many other policy instruments - such as subsidies, tariffs and taxes - already currently have a decisive role in determining the competitive margins in land use between biomass production and other land uses."	Add subsidies, tariffs, taxes, mandates when discussing policies.
Titus (Natural Resources Canada, Canadian Forest Service)	2	5	4	-	-	-	-	-	"There is more than one 'society' therefore change to 'Since the dawn of time' or 'Since time immemorial'; better still, reduce clauses (throughout chapter): 'Biomass has been the most important renewable energy source since the dawn of time and currently provides about□'"	Accepted
TEIXEIRA COELHO (INSTITUTE OF ELETROTECHNICS AND ENERGY - USP)	2	5	11	-	-	-	-	-	"TO INCLUDE ""SUSTAINABLE"" WHEN TALKING ABOUT TREES"	Accepted
TEIXEIRA COELHO (INSTITUTE OF ELETROTECHNICS AND ENERGY - USP)	2	5	3	-	-	-	-	-	A BETTER DEFINITION OF TRADITIONAL AND MODERN BIOMASS IS NEEDED	A sentence on these definitions will be added.
Gorissen (Flemish Institute for Technological Research)	2	5	41	-	-	-	-	-	A reference dealing with synergies is Connections between MASLM and the Climate Change and Biodiversity Conventions Ch7 Volume II in □Understanding Desertification and Land Degradation Trends□, White Papers for the First UNCCD Scientific Conference, Buenos Aires, Argentina 22-24 September 2009. This paper is currently being revised for publication in a peer-reviewed journal,	The reference will be checked.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	5	4	-	-	-	-	-	Annual global bioenergy supply/demand: the figure (46 EJ) differs from page 8 line 5 (47.2 EJ)	We will cross-check the numbers.
de Campos Barbosa (Petrobras)	2	5	29	5	35	-	-	-	Assessment of potential isn't limited by policy enforcement, but actual implementation. Better rewrite as the potential with minimum or no risk.	We are not discussing policy enforcement. We are discussing several policies that may improve or decrease biomass technical potential.
Titus (Natural Resources Canada, Canadian Forest Service)	2	5	45	-	-	-	-	-	change to 'incorporate the agricultural and forestry sectors' ('livestock' are part of agricultural sector?)	Yes, Livestock is part of agricultural activity.
Verduzco (Chevron Corporation)	2	5	17	5	19	-	-	-	Corn ethanol in the US is also significant, and should be mentioned in the sentence (the way it is written)	Corn ethanol will be better discussed.
SCOWCROFT (EURELECTRIC)	2	5	-	-	-	-	-	-	Electricity costs from 5 to 20 \$US/GJ = 12 to 50 Euros/MWh (1.45 \$US/Euro) too low. Heat costs from 1 to 5 \$US/GJ = 2.5 to 12 Euros/MWh very low. We have not had access to sufficient data to cross-check cited worldwide potentials and current use in EJ.	All cost figures will be checked.
Vahrenholt (RWE Innogy GmbH)	2	5	0	-	-	-	-	-	Electricity costs from 5 to 20 \$US/GJ = 12 to 50 Euros/MWh (1.45 \$US/Euro) too low. Heat costs from 1 to 5 \$US/GJ = 2.5 to 12 Euros/MWh very low. We have not had access to sufficient data to cross-check cited worldwide potentials and current use in EJ.	We will review all cost data.
Gorissen (Flemish Institute for Technological Research)	2	5	29	-	-	-	-	-	Further expansion of biomass use might also possibly affect important ecosystem services, disturbing the essential cycles and networks of life (such as nutrient cycling, pollination, disease regulation, etc.)	We are taking into account several constraints when evaluating biomass technical potential. We are checking ways to make more transparent the final ch02 conclusion on this figure.
Kaup (Potsdam Institute for Climate Impact Research)	2	5	19	5	19	-	-	-	Jatropha maybe used as a crops for small-scale production of biofuel and thereby giving positive impacts. A lot of the projects in Africa are large-scale and cultivated on food-crop areas. Therefore it is quite controversial. I wouldnt mention Jatropha explicitly in that context.	Jatropha importance will not be highlighted. It is a developing crop and not a commercial crop.
Verduzco (Chevron Corporation)	2	5	13	5	15	-	-	-	Is this for feedstock only? Or is the price adjusted by the conversion efficiencies of each end use. Not clear.*	These prices are for the technologies and includes conversion efficiencies.
Gorissen (Flemish Institute for Technological Research)	2	5	37	-	-	-	-	-	It would greatly add to this statement if a graph visualising the impact of bioenergy on the biophysical and social level would be included. A recent paper of Rockström et al. 2009. (A safe operating space for humanity, Nature 461/24) describes the planetary boundaries that must not be transgressed to prevent unacceptable environmental change.	The reference will be checked.
Kessels (International Energy Agency Clean Coal Centre)	2	5	3	5	13	-	-	-	Needs to reference the numbers used in the introduction	Such numbers are already referenced in Ch02. No references in Exec. Summary.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	5	29	-	-	-	-	-	REFERENCES ARE MISSING	More references will be added.
Verduzco (Chevron Corporation)	2	5	41	5	44	-	-	-	Rephrase these sentences.	Accepted
Kaup (Potsdam Institute for Climate Impact Research)	2	5	26	5	26	-	-	-	The 400 EJ is as pointed out various times in the chapter are quite optimistic scenario. Maybe that should be stated more clearly.	We will add more evidences to support the 400EJ value.
Schmall (Petrobras S.A.)	2	5	29	5	35	-	-	-	The development of aquatic biomass can change the scenario completely	Not enough evidence yet.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	5	38	-	-	-	-	-	TO INCLUDE WATER USE	The Exec. Summary will be complete rewritten.
Titus (Natural Resources Canada, Canadian Forest Service)	2	5	30	-	-	-	-	-	water resources' to 'soil and water resources'	Accepted
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	5	25	5	27	1	-	-	"I do not understand why this text focuses on ""the upper bound of the biomass resource potential"" despite the fact that this figure is probably quite meaningless, as most high potential estimates do not adequately take into account limitations resulting, e.g. from feeding livestock, or include bioenergy options that would not achieve significant, or in fact any, GHG emission reductions"	The figures quoted for the technical potential are extracted from the literature and some of the reported values are quite high due the use of appropriate policies and expected technological improvements in agricultural practices. IPCC has to report all reasonable literature results. Technical potential takes into account several constraints but not all results include all the same constraints.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	5	3	-	-	1	-	-	"I propose to change the order to ""food, fodder, fibre and energy"" to reflect the fact that food is indispensable, whereas several options exist to provide energy services to humans"	Accepted
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	5	27	5	28	1	-	-	Newer studies suggest that around 100-150 EJ/yr bioenergy may already be an optimistic figure, so I very much doubt whether IPCC would really like to subscribe to the view that around 400 EJ/yr could be a realistic target	There are many evaluations and we have to report all of them. Nevertheless, we are checking ways to make more transparent the final ch02 conclusion on the figure.
Schmall (Petrobras S.A.)	2	5	15	5	17	1	-	-	The report should mention that the best exaple of this kind of application is found in Brazil who as the pioneer in the world with the PROALCOOL Program iniciative.Brazilian Policy has been contributing since the seventy□s with the adition of 20% of bioethanol to gasoline.	Ethanol program in Brazil is already mentioned in the Ch02 text.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	5	34	5	35	1	-	-	While I agree that it is highly important to introduce the best possible policy frameworks, I believe that around 100-150 EJ/yr may be an optimistic-realistic target that can be achieved with the best policies, not a low figure that will result from bad policies	We are taking into account several constraints when evaluating biomass technical potential. We are checking ways to make more transparent the final ch02 conclusion on the 400 EJ figure.
Verduzco (Chevron Corporation)	2	5	22	5	23	ES	-	-	Large scale biomass deployment doesn't necessarily depend on the sustainable development of the resource base. Non-sustainable crops/practices are currently being used to produce bioenergy. Example - In the US, the Renewable Fuel Standard 1 encourages production of biofuels from 1st Gen feedstocks such as corn, which may have life cycle GHG emissions higher than gasoline throughout their value chain.	Accepted
Verduzco (Chevron Corporation)	2	5	26	5	26	ES	-	-	Rephrase to improve clarity	Accepted
Verduzco (Chevron Corporation)	2	5	26	5	26	ES	-	-	Spell out SRES	Accepted
Jack (Scion (New Zealand Forest Research Institute))	2	5	3	5	4	Exec sum mary	-	-	"Should read: ""Since the dawn of society biomass has been the most□"". There are a number of other errors in this executive summary. It needs to be proof read by a native english speaker"	The final draft will be professionally edited.

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Jack (Scion (New Zealand Forest Research Institute))	2	5	3	6	41	Executive Summary	-	-	"There is a key point about bioenergy that I think need emphasis in the executive summary and also needs to be clearly discussed in this chapter. This is the differences between different types of feedstocks. This is especially in relation to ""biofuel crops"", where an uninformed reader would be misled into thinking that one can lump all ""biofuel crops"" into the same category. In a related issue, the use of the words ""biofuel crops"" through out this chapter suggest agricultural crops but actually seems also to refer to forestry. The second difference that is not emphasised is the difference between modern and traditional bioenergy. This is mentioned in the executive summary but the fact that the policies, implementation strategies, issues etc of these two different aspects of bioenergy are completely different is not really emphasised enough. This could lead to misunderstandings. "	Accepted
Kahiluoto (MTT Agrifood Research Finland)	2	6	45	-	-	-	-	-	""agricultural and livestock residues, □"" : Classification misleading here and later - livestock residues such as manure belong to the agricultural residues. "	classification will be checked
Marbán (Instituto Nacional del Carbón (CSIC))	2	6	17	-	-	-	-	-	"CHP means ""combined heat and power"" and therefore saying ""CHP and heat production"" is redundant"	We are referring to CHP and only heat production.
Kahiluoto (MTT Agrifood Research Finland)	2	6	36	6	38	-	-	-	"I would add use of wastes and by-flows, e.g.: ""□and the immediate efficient utilisation of the full potential of wastes, by-products and by-flows does drive bioenergy to more sustainable direction. "" "	Accepted
QUILES (Ministerio de Agricultura, Ganadería y Pesca)	2	6	22	6	24	-	-	-	"In United States Optimistic projections for algae commercialization is 2-3 years, and the Conservative projection is 10 years. Source: ""Draft Regulatory Impact Analysis: Changes to Renewable Fuel Standard Program"" EPA - USA Point 1.1.3.5.4 Algae Timeline EPA-420-D-09-001 May 2009"	Reference will be checked. The final regulation was issued. The timeline for commercialization of microalgae technologies is more likely to be ten years than 3 because of the issues of scaleup. Many companies are attempting to do it and for certain markets (Department of Defense) and specialty areas, the commercialization will be faster for a higher cost product. For high volume applications the time to commercialization will be longer. See http://www.nrel.gov/docs/fy09osti/45609.pdf ;
Schmall (Petrobras S.A.)	2	6	30	6	35	-	-	-	"Recent Study ""Aquecimento Global e a Nova Geografia da Produçã Agrícolã no Brasil""indicate that the Potential Area for Sugar Cana in Brasil can be twice than actual with the global Warming"	Reference will be checked.
de Campos Barbosa (Petrobras)	2	6	26	6	27	-	-	-	"Remove: ""provided resources are developed sustainable and"". Bioenergy has significant GHG mitigation potential even if not sustainable (social aspects, at least). Not desirable, but true."	Not enough evidence in the literature. If extreme conditions for planting biomass are selected bioenergy isn't sustainable, at least for the next 100 yrs.
Kheshgi (ExxonMobil Research and Engineering Company)	2	6	2	6	6	-	-	-	"Suggest that gas price assumptions be stated when comparing bioenergy to natural gas. "	We are talking about possible regions of the world and not everywhere.
Titus (Natural Resources Canada, Canadian Forest Service)	2	6	35	-	-	-	-	-	Add similar sentence for forestry re: improved forest management to increase biomass production in some ecosystems	Accepted
Titus (Natural Resources Canada, Canadian Forest Service)	2	6	25	6	41	-	-	-	Any comment on temporal time-frames for renewability of C over lifecycle of crop? Annual and some perennial crops renew C in one year, short-rotation woody crops in 5 to 15 years, and managed forests in 30 or 40 to perhaps as long as 100 or 120 years □ how do these differences factor into reductions in atmospheric C?	This issue is already discussed. Nevertheless, it will be expanded.
Titus (Natural Resources Canada, Canadian Forest Service)	2	6	10	-	-	-	-	-	Check with nationals, but 'Nordic countries' may be a better term than 'Scandinavia'	Accepted
Schmall (Petrobras S.A.)	2	6	12	6	15	-	-	-	Clarify better the concept of first and second generation. .There no concensus on this statement. The references must be include.	Accepted
QUILES (Ministerio de Agricultura, Ganadería y Pesca)	2	6	20	-	-	-	-	-	Definition of Bio-CCS = Biological Carbon Capture Storage or Biological Sequestration of CO2. Source: CSIRO □National Research FLAGSHIPS□ report August 2009 Australie	A list of acronyms will be added to SRREN

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Londo (Energy research Centre of the Netherlands)	2	6	7	6	11	-	-	-	I'd suggest adding the remark that different bioenergy technologies differ substantially in their maturity, and therefore in their expected cost reductions in the coming time (even with comparable progress ratios)	Accepted
Vahrenholt (RWE Innogy GmbH)	2	6	-	-	-	-	-	-	In case of carbon taxes of some 20 to 30 \$US/t = 13 to 20 Euros/t biomass is NOT competitive with coal based power generation. Data for biofuel have not been cross-checked - beyond focus of RWE Innogy Cogen.	we have made a comprehensive analysis. However, numbers will be checked again, some applications are competitive without subsidies
SCOWCROFT (EURELECTRIC)	2	6	0	-	-	-	-	-	In case of carbon taxes of some 20 to 30 \$US/t = 13 to 20 Euros/t biomass is NOT competitive with coal based power generation. Data for biofuel have not been cross-checked.	We will select a higher C tax value.
Schmall (Petrobras S.A.)	2	6	45	7	2	-	-	-	Include algae	algae is included
Schmall (Petrobras S.A.)	2	6	27	6	29	-	-	-	Include semi-perennial crops. Sugar cane are planted each 5 or 6 years.	We will do that for sugar cane.
Dunn (GE Energy)	2	6	5	-	-	-	-	-	Is biomass competitive with coal at a \$20-30/ton carbon price? Is this consistent with Chapter 10? Why denote carbon 'tax'?	We will select a higher C tax value.
Titus (Natural Resources Canada, Canadian Forest Service)	2	6	33	6	35	-	-	-	new (perennial) cropping' to 'new (perennial) agricultural cropping'	Accepted
Smith (PNNL)	2	6	43	7	6	-	-	-	No literature citations for these sweeping statements. There is research literature addressing all of these points.	Refs to these general statements are given later in the chapter
Treber (Germanwatch)	2	6	26	6	29	-	-	-	Please add: current drivers can lead (and have lead) to negative GHG effects (particularly by direct and indirect landuse change, and to a lesser extent through emissions from high intensity cropping systems)!	This isn't true for all bioenergy crops. Note the case of sugar cane in Brazil.
Schmall (Petrobras S.A.)	2	6	27	6	29	-	-	-	Reference missing.	No references i Exec. Summary.
Schmall (Petrobras S.A.)	2	6	31	6	33	-	-	-	Reference missing.	No references i Exec. Summary.
Kessels (International Energy Agency Clean Coal Centre)	2	6	5	6	5	-	-	-	Reference where is biomass competitive with coal what study stated the carbon tax at \$20-30?	We will add references but probably will select a higher C tax value.
Londo (Energy research Centre of the Netherlands)	2	6	5	6	6	-	-	-	The remark 'when CCS would be deployed' probably refers to coal, not to biomass. May be 'when CCS would be required in coal-based production' is a clearer way of expressing the condition.	.
TEIXEIRA COELHO (INSTITUTE OF ELETROTECHNICS AND ENERGY - USP)	2	6	6	-	-	-	-	-	TO COMENT THAT COMBINING BIOENERGY WITH CCS WE CAN HAVE NEGATIVE CARBON EMISSIONS	Already discussed in text and further material will be added to support this statement in Exec. Summary.
TEIXEIRA COELHO (INSTITUTE OF ELETROTECHNICS AND ENERGY - USP)	2	6	12	-	-	-	-	-	TO COMMENT RESULTS FROM CIEMAT, SPAIN, BIOTOP PROJECT	Only peer reviewed literature in IPCC.
Gorissen (Flemish Institute for Technological Research)	2	6	30	6	41	-	-	-	When it comes to the interconnections of climate change and bioenergy, resilience of the land under use will be key. Please incorporate in text.	Accepted
Kessels (International Energy Agency Clean Coal Centre)	2	6	-	6	-	-	-	-	Why is co-firing biomass with coal not mentioned anywhere in the executive summary? Seems odd as several large companies such as DRAX in the UK are moving forward co-firing?	will be added
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	6	29	-	-	1	-	-	Citing only the good cases (perennials, residues/wastes) creates a wrong impression. Indeed we know that many bioenergy options, above all 1st gen liquid fuels, can even have worse GHG emissions than fossil-based fuels, in particular if iLUC is taken into account. GHG emissions might also increase if one aims to exploit a higher level of bioenergy, e.g. if forests are cleared in order to create area for bioenergy crop cultivation. i.e. emissions are not independent of the potential. This should be stated here, in my view	Many, but not all. Note the case of sugar cane in Brazil. The unsustainable situation you are describing is discussed already in Ch02 and that is the reason why we mention about the need of positive policies (which will be changed to appropriate policies).
Schmall (Petrobras S.A.)	2	6	27	6	29	1	-	-	Should not focus only in perenial crops... annual crops could reach high GHG reduction also	It is necessary to discuss if sugar cane is perennial or not.
Schmall (Petrobras S.A.)	2	6	33	6	35	1	-	-	Should not focus only in perenial crops...Should take in account that in Brasil annual crops could also offer the same opportunities as perennial crops to combine adaptation measures ...	Not enough evidences except for sugar cane, which is already mentioned in the main text.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Schmall (Petrobras S.A.)	2	6	36	6	41	1	-	-	The policies and sustainability criteria focused mainly on environmental aspects should observe that the small biomass producers in developing countries should not become social excluded because of lack of opportunities to reach the criteria.	A sentence about that will be added.
Schmall (Petrobras S.A.)	2	6	27	6	27	1	-	-	What are the bioenergy systems?	It will be defined
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	6	43	-	-	2.1	-	-	Biomass is in fact the world's only source of food and fodder, by definition, and I feel this should be stated here.	Will change the sentence
Verduzco (Chevron Corporation)	2	6	30	6	30	ES	-	-	How can biomass potentials interact with climate change? Rephrase.	We are telling that biomass potential interacts with climate change impacts.
Verduzco (Chevron Corporation)	2	6	26	6	29	ES	-	-	The exact same language is used in p. 111. Paraphrase.	The exec. Summary has to be based in text already included in the Ch02.
Jack (Scion (New Zealand Forest Research Institute))	2	6	31	6	33	Exec utive Sum mary	-	-	Is this statement true? What about the impact of the Canadian forest beetle which is supposed to be associated with changing climate.	Not enough evidence.
de Campos Barbosa (Petrobras)	2	7	1	-	-	-	-	-	"include after ""dedicated herbaceous energy crops...""; ""...oil co-product from fodder crops...""; to include soy oil, since soy is primarily a fodder crop."	will make text compatible with Figure 1 so all sources are included clearly
McCormick (International Union for Conservation of Nature (IUCN))	2	7	2	-	-	-	-	-	"include in the text: other organic waste streams such as ""sewage sludge"". Include: biological process.."	will make text compatible with Figure 1 so all sources are included clearly
Marques (The Planter Group)	2	7	19	8	3	-	-	-	"The reference to LCA is way too strong. More specifically the sentence ""In all these cases a life-cycle analysis must be conducted to assure that the net effect of bioenergy options is positive"" seems to strongly condition the sustainable performance of any type of bioenergy system to a full LCA, which is not always the case."	sentence will be softened
philippe (international institute for water and environmental engineering)	2	7	12	-	-	-	-	-	Bioenergy option may reduction carbon emissions from sustainable forest use is not directly linked efficient technology would not replace appropriate forest management□.	reducing the demand for fuelwood will help improving forest condition
Pinho (Institut of Tecnology)	2	7	15	-	-	-	-	-	CHP = Combined Heat and Power	Accepted
Rubiera (Instituto Nacional del Carbon (CSIC))	2	7	15	7	15	-	-	-	CHP: Combined Heat and Power	Accepted
philippe (international institute for water and environmental engineering)	2	7	15	-	-	-	-	-	example not really illustrative	we think it is a good example
Jannuzzi (University of Campinas)	2	7	16	8	2	-	-	-	Health issues related to improper combustion of biomass (indoor air pollution and traditional practice of burning crops - sugar cane) should be mentioned here in addition to climate change, land uses, etc. Need to cite work done by WHO on indoor air pollution from biomass sources. Some of this information is presented later in the chapter (page 73)	text will be incorporated
McCormick (International Union for Conservation of Nature (IUCN))	2	7	4	-	-	-	-	-	include: methane (biogas)	will make text compatible with Figure 1 so all sources are included clearly
Gorissen (Flemish Institute for Technological Research)	2	7	19	8	2	-	-	-	Large-scale expansion of bioenergy may negatively impact ecosystems and the underlying ecosystem services.	will be added
Kahiluoto (MTT Agrifood Research Finland)	2	7	19	8	3	-	-	-	Referring to LCA is misleading, because the standard LCA is not sufficient to cover the mentioned impacts, not even the impacts on carbon budgets such as soil carbon sequestration or soil acting as a carbon sink.	sentence will be softened
Wang (Argonne National Laboratory)	2	7	4	-	-	-	-	-	renewable diesel, renewable gasoline, and other fuels need to be mentioned here.	will make text compatible with Figure 1 so all sources are included clearly
Schmall (Petrobras S.A.)	2	7	4	7	4	-	-	-	Should Include hidrotrated vegetal oil (HVO), DME (dimethyl ester) and biojet.	will make text compatible with Figure 1 so all sources are included clearly

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Visconti (Inter-American Development Bank)	2	7	9	8	3	2.1	-	-	Delete the text. The focus of this section should be on the current pattern of bioenergy use and trend. The sustainability of bioenergy is a key issue, but it is not the focus of this section. It will be extensively addressed in next paragraphs.	we feel that an introductory paragraph on sustainability is needed
Verduzco (Chevron Corporation)	2	7	1	7	6	ES	-	-	This is a direct quote from IPCC's AR4. Use quotation marks and reference or paraphrase.	will put text in quotations
Wang (Argonne National Laboratory)	2	7	-	-	-	-	2.1.1	-	"Need revisions: H2 to be added with electric energy; FT diesel to be added with gasification; interesterification should be transesterification."	table will be corrected including the main paths
Sims (Massey University)	2	7	-	-	-	-	2.1.1	-	"Not sure readers will realise ""mechanical power"" includes transport. Add ""Transport"" to bottom line. Note spelling ""thermo-mecHanical"" and ""physi[c]ochemical."	table will be corrected including the main paths
Rybach (Geowatt AG)	2	7	-	-	-	-	2.1.1	-	It would be useful to show the input materials like energy crop, dung, wood chips.	table will be corrected including the main paths
Pinho (Institit of Tecnology)	2	7	-	-	-	-	2.1.1	-	Why not Figure 2.1 as in the other chapters? Same for the other figures.	table will be corrected including the main paths
Verduzco (Chevron Corporation)	2	7	-	-	-	ES	2.1.1	-	"For consistency use the word ""Transesterification"" instead of ""Interesterification"""	Accepted
Marbán (Instituto Nacional del Carbón (CSIC))	2	7	-	-	-	-	2.2.1	-	"The box ""Gasification"" below the box ""Thermochemical conversion"" now goes to ""Gaseous fuel"" through ""Product gas"". In my opinion from the box ""Gasification"" two arrows, instead of one, should depart; one towards ""Product gas"" (as now) and another one towards ""Syngas"". From ""Syngas"" another arrow should end in the rounded box ""Liquid fuel"" via the following route: ""Syngas"" (no box) ---> ""Catalytic conversion"" (square box) ---> ""Methanol, ethanol"" (no box) ---> ""Liquid fuel"" (rounded box). As an example see: SRREN_Draft0_Review_Marban_Gregorio_Material_01.ppt"	table will be corrected
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	8	23	-	-	-	-	-	""more than 50% of TPES in the poorest countries"" -> the average in countries south of Sahara lies over 90% of TPES (IEA (2007); World Energy Outlook 2007. Paris: IEA; MEMD - Ministry of Energy and Mineral Development (2007): Renewable Energy Policy - 2007. Kampala: MEMD in WBGU-Report 2009 http://www.wbgu.de/wbgu_ig2008_en.pdf on page 33)"	will correct the figure
Wang (Argonne National Laboratory)	2	8	30	-	-	-	-	-	"after ""within large cities, ""rural areas"" need to be added."	Accepted
contaldi (ISPRA, Institute for Environmental Protection and Research)	2	8	14	-	-	-	-	-	Correctly MSW is quoted as part of biomass, why it is not in CH 1 ? Different definition used for biomass?	definitions will be made consistent
El-Hinnawi (National Research Centre)	2	8	33	-	36	-	-	-	delete	will modify the para
El-Hinnawi (National Research Centre)	2	8	17	-	26	-	-	-	delete, repetition of lines 4 to 16	Accepted
Wang (Argonne National Laboratory)	2	8	4	-	16	-	-	-	Description here is redondant with lines 3-9 on p.5.	redundancy will be deleted
Shi (Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry)	2	8	11	-	-	-	-	-	GBEP:definition missing	definition is within ref section
Smith (PNNL)	2	8	4	8	16	-	-	-	IEA statistics are not the only source of data, for example see Fernandes et. al. (2007) who should be referenced here, in particular as they discuss the limitations in biomass data. Fernandes, S. D., N. M. Trautmann, D. G. Streets, C. A. Roden, and T. C. Bond (2007), Global biofuel use, 1850 □ 2000, Global Biogeochem. Cycles, 21, GB2019, doi:10.1029/2006GB002836.	will check this ref
Titus (Natural Resources Canada, Canadian Forest Service)	2	8	2	-	-	-	-	-	land tenure or reduced food security □ any comment on exclusion of local people from managed forests affecting fuelwood gathering? Is this a potential negative impact on local communities?	Accepted
philippe (international institute for water and environmental engineering)	2	8	2	-	-	-	-	-	LCA might provide interesting information to select options but very different from 'must be conducted'	sentence will be softened

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Shi (Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry)	2	8	30	-	-	-	-	-	LPG:definition missing	Accepted
philippe (international institute for water and environmental engineering)	2	8	35	-	-	-	-	-	Modern forms is not clear is combustion of pellet a modern form of bioenergy? I don't understand the use of modern to classify bioenergy technology	will better define modern and traditional
Kaup (Potsdam Institute for Climate Impact Research)	2	8	14	8	14	-	-	-	MSW □ municipal solid waste	Accepted
Pinho (Institut of Tecnology)	2	8	14	-	-	-	-	-	MSW = Municipal Solid Waste	Accepted
Rubiera (Instituto Nacional del Carbon (CSIC))	2	8	14	8	14	-	-	-	MSW: Municipal Solid Waste	Accepted
El-Hinnawi (National Research Centre)	2	8	28	-	-	-	-	-	replace woodfuel by fuelwood	woodfuels include both fuelwood and charcoal, is not the same
contaldi (ISPRA, Institute for Environmental Protection and Research)	2	8	4	-	7	-	-	-	Reported data for biomass use are quite different from the one' quoted in ch1, pg xx. Source is the same (IEA). The effect is confusing , definitions of biomass should be consistent in the report.	data will be made consistent with Ch 1 and Ch 10
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	8	7	-	-	-	-	-	The figure (78 %) differs from the WGBU-Report 2009 http://www.wbgu.de/wbgu_jg2008_en.pdf , which states on page 33 that at present bioenergy has a proportion of 60 % at all global renewable energy sources, maybe this is due to different calculation methods (physical energy content method vs. substitution method)	different assumptions lead to different figures, we use IEA data
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	8	27	-	-	-	-	-	TRADITIONAL BIOMASS?	will be added to the Glossary
philippe (international institute for water and environmental engineering)	2	8	13	-	-	-	-	-	what is modern bioenergy?	glossary will be added
philippe (international institute for water and environmental engineering)	2	8	11	-	-	-	-	-	what is significant? Figure should be given	figure will be added
Titus (Natural Resources Canada, Canadian Forest Service)	2	8	34	-	-	-	-	-	Why just the G8 countries? Do Sweden and Finland warrant mention because of their very high use of bioenergy?	will include more countries
Smith (McGill University, Macdonald Campus)	2	8	11	8	11	2.1	-	-	It would be useful to comment on the need to consider the effects of crop residue removal on soil organic matter. Consistent removal of large amounts of crop residue (straw, stover, etc.) for fuel is equivalent to burning the soil organic matter as it results in an effective net transfer of carbon from the soil into the atmosphere. We can almost certainly use some of this, but care must be taken. I note that the same issue comes up at other points in the document and the potential risk is acknowledged in a few spots, but never addressed directly. There are now a few completed studies on this matter.	the section on environmental impacts will discuss this issue
Smith (McGill University, Macdonald Campus)	2	8	1	8	1	2.1	-	-	It would be useful to mention biodiversity as one of the factors potentially at risk	will be added
Smith (McGill University, Macdonald Campus)	2	8	3	8	3	2.1	-	-	Life cycle analyses should probably also be performed for greenhouse gases, water and economics	this is dealt with later on in the text
Verduzco (Chevron Corporation)	2	8	15	8	15	ES	-	-	Rephrase to clarify.	Accepted
Wang (Argonne National Laboratory)	2	9	42	-	50	-	-	-	"The question is how to adjust the ""underestimated"" biomass production. An attempt is needed."	we cannot produce new info
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	9	56	-	-	-	-	-	misprint: replace ii) The for ii) the	Accepted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Titus (Natural Resources Canada, Canadian Forest Service)	2	9	57	-	-	-	-	-	On first mention of 'MtCO2-eq' in summary and then first mention in main text, perhaps define whether this is actual CO2 equivalent or C in CO2?	will explain
Kessels (International Energy Agency Clean Coal Centre)	2	9	56	9	56	-	-	-	The global potential for bioenergy appears to be quite high at 250EJ/year. In Chapter 11 AR4 page 630 the actual estimated biomass for power and fuels adds up to 130 EJ/yr?	We include the potential from ALL applications stated in the AR4, for these reasons the potential is higher. However, we will check figures again
philippe (international institute for water and environmental engineering)	2	9	35	-	-	-	-	-	World production or world consumption?	FAO stats are on production
Rybach (Geowatt AG)	2	9	-	-	-	-	2.1.2	-	an approximate conversion factor from cubic meter to Joule should be given	Rejected. We understand that this would be more appropriate for a plot showing energy consumption. When presenting energy production we have several possibilities to make the suggested conversion. Using the wood heat content or using the conversion use efficiency. In the final report the volume was used to compare fuelwood use in developing countries with the use of industrial roundwood globally to establish that they are of the same order of magnitude (and one is not used for energy only). At the same time, the EJ of the various types of bioenergy, modern and was presented. We recognize the difficulty that the reviewer found. In the resources discussion we provide a range of EJ values for the global roundwood production as well.
Sims (Massey University)	2	9	-	-	-	-	2.1.2	-	Lengthy caption better in text	will try to move to main text
Pinho (Institut of Tecnology)	2	9	-	-	-	-	2.1.2	-	The legend is too big. Some of its text should be removed and included in the text.	will try to move to main text
Kruger (South African Weather Service)	2	9	31	9	41	2.1	2.1.2	-	The caption is too long. I can be partly moved to the text.	will try to move to main text
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	10	7	-	-	-	-	-	""up to 20, and up to 50 US\$/tCO2-eq"" -> doubling with line 5"	Accepted
Kahiluoto (MTT Agrifood Research Finland)	2	10	35	10	36	-	-	-	"1) Animal manure is one of the most important biomass types among the secondary agricultural residues at least in Northern Europe - often the one with most dry weight or next after straw (compare the classification based on level of the agrifood system which generated the biomass by Berndes et al., 2003; see Kahiluoto, H., Kuisma, M., Havukainen, J., Luoranan, M., Karttunen, P., Lehtonen, E., Horttanainen, M., 2009. Potential of agrifood wastes in mitigation of climate change and eutrophication - two case regions. Biomass and Bioenergy (submitted); Kahiluoto et al., 2009 Value chains for biorefineries of wastes from food production and services - ValueWaste. Tekes Yearbook 2009; KAHILUOTO, H., KUISMA, M., KARTTUNEN, P., HORTTANAINEN, M., GRÖROOS, J., RÖTER, R., VIRTANEN, M. 2009. Nutrient and energy potential for sustainable biorefineries based on wastes of agrifood systems: two regional cases. In: Climate change: global risks, challenges & decisions, Copenhagen 2009, 10-12 March, session 18: abstract book. Copenhagen: University of Copenhagen. S18.02.). 2) Agricultural by-flows such as aquatic plant and fish biomass and bottom sediments to be included. "	list here is not specific but summary, both comments already included in the wording "organic food/forestry by-flows"; section will be consolidated with 2.3.1.1. Final report cites more clearly the various types of resources.
McCormick (International Union for Conservation of Nature (IUCN))	2	10	-	-	-	-	-	-	"as secondary and tertiary residues i suggest to complete the list with: ""organic food processing residues, manures, organic fraction of MSW (Municipal Solid Waste), sewage sludge,"	All included in the broad categories listed; section will be merged with 2.3.1.1., which is more explicit
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	10	22	-	-	-	-	-	"misprint: replace: replace ""Within"" for 'within'"	Accepted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Titus (Natural Resources Canada, Canadian Forest Service)	2	10	32	10	38	-	-	-	Any comment on salvaged wood from forests killed by natural disturbance? This can be a large potential amount in some northern countries.	These opportunity feedstocks are presented in Table 2.2.1 "Dead wood from natural disturbances, such as fires and insect outbreaks, represents a second category."
Kessels (International Energy Agency Clean Coal Centre)	2	10	32	10	32	-	-	-	Could be useful to introduce here the cost per ha of producing different biomass feedstock	Yes, but not the right place - to be discussed elsewhere in the chapter
Kahiluoto (MTT Agrifood Research Finland)	2	10	11	10	17	-	-	-	Cut the sentence in four to five parts, please, to improve readability!	the para will be re-written
EI-Hinnawi (National Research Centre)	2	10	32	13	4	-	-	-	delete. Suggest replacement by attached (SRREN_Draft0_Review_EI-Hinnawi_Essam_Material_01.doc)	No reason given, not obvious
Treber (Germanwatch)	2	10	1	-	-	-	-	-	do we refer to CO2 or to CO2 equivalent?	unit is CO2-eq
Treber (Germanwatch)	2	10	35	-	-	-	-	-	Do you mean 'organic food' really in the meaning of 'organic' in the sense of the EU directive on organic food?	No, the word is used as opposed to non-organic by-products from the food industry
Jannuzzi (University of Campinas)	2	10	39	10	43	-	-	-	It would be best if average values were also plotted on the mentioned figures	These figures will be removed completely.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	10	26	-	-	-	-	-	LCA FOR BIOENERGY MUST BE COMPARED WITH LCA FOR FOSSIL FUELS	comparisons will be made in Chapter 9 to the extent that data are available.
Wang (Argonne National Laboratory)	2	10	11	-	17	-	-	-	Need better sentences for this paragraph.	the para will be re-written
Gorissen (Flemish Institute for Technological Research)	2	10	19	-	-	-	-	-	Next to an integrated and comprehensive review, it would contribute greatly to the scientific value if bioenergy would be assessed from an integrated whole system analysis.	we agree
Somogyi (Hungarian Forest Research Institute)	2	10	-	15	-	-	-	-	On page 10, the energy content of the currently harvested roundwood is reported, whereas on page 15 (Table 2.2.1) potentials are summarized. It is simply difficult to believe that, given the rather high rate of exploitation of the world's forests, there are so huge potentials. If, e.g., energy plantations could provide 700+110EJ when the energy content of ALL crops and roundwood is only 60+15-20, it would mean that the area for these plantations could be several times more than that of currently managed croplands and forests, which is hard to believe. Also, the figures in the table are not supported by any reference to studies. I have the feeling that unsupported claims could send a wrong message especially considering that even the current rate of forest use puts an enormous pressure on managed forests. I would very strongly suggest to try to provide realistic ranges, and, if needed, estimates of extreme values in paranthesis.	The point is noted, but the ranges in Table 2.2.1 include lower end of ranges as well, which are 0 or close to 0. The literature contains the upper ranges as well from peer reviewed studies. The text provides critical evaluation of the underlying assumptions. Also plantations dedicated to bioenergy have different properties from the current production systems aimed at roundwood and calories. The author team has taken into consideration concerns such as this one.
Titus (Natural Resources Canada, Canadian Forest Service)	2	10	20	10	29	-	-	-	Only some sections are mentioned by number. For consistency in style and flow, either do not mention any numbers and rely on text alone, or add all section numbers. E.g., 'To reach this goal, we first examine in Section 2.1 the biomass resource potential□', etc. (When a section is named, 'Section' is part of a proper noun and takes an upper case 's'.)	Accepted
Schmall (Petrobras S.A.)	2	10	33	10	38	-	-	-	Should be Include algae as a biomass source	ok
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	10	32	-	-	-	-	-	TO DISCUSS DEFORESTATION	Indirect land use effects and carbon payback times due to deforestation as well as biodiversity implications are discussed in 2.2 and 2.5
Titus (Natural Resources Canada, Canadian Forest Service)	2	10	6	-	-	-	-	-	What is meant by 'of 5-80% resp. 20-90% of'?	sentence will be clarified
Titus (Natural Resources Canada, Canadian Forest Service)	2	10	37	10	38	-	-	-	When markets are right, industrial roundwood from managed forests will be used for bioenergy, so we can no longer restrict our thinking in terms of biomass for energy being from either energy plantations or logging residue from managed forests (with the roundwood only used for traditional forest products). Managed forests should be included in this bullet. Therefore 'new types of agricultural plants, and forest species grown under varying rotation lengths in energy plantations or in managed forests'	added and discussed in the report as the past few years with a down economic cycle, there was a significant amount of managed forest materials that entered the solid wood (pellets) for energy.
Kessels (International Energy Agency Clean Coal Centre)	2	10	1	10	9	-	-	-	Where have these numbers come from? Reference if AR4 where?	numbers come from AR4, ref will be added

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Wang (Argonne National Laboratory)	2	10	42	-	43	-	-	-	Why is wood production presented in energy unit? It is produced not for energy purpose.	To provide a comparison between the markets of wood for energy and products (forest, agriculture, etc).
Popp (PIK)	2	10	39	11	22	2	-	-	To much detail about residues. In this section of the manuscript (Introduction) I would expect general remarks on potentials and a short description of the categories. I suggest to delete this part (incl. The figures 2.2.1).	These figures will be removed completely. The residues discussion is about the currently available potential in biomass without dedicated potentials and therefore an important point of introduction to the topic
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	10	11	-	29	2.1.2	-	-	"Delete this paragraph. The information is not relevant; the structure is too complicated"	the para will be re-written
Bilello (NREL)	2	10	26	10	26	2.1.2	-	-	The accepted term for LCA is life cycle assessment (ISO Standards). Whatever is chosen, however, should be standardized throughout the report.	will change the name
Jack (Scion (New Zealand Forest Research Institute))	2	10	37	10	37	2.2.1	-	-	"It is not very common to refer to ""forest plants""."	Seems bearable here, only unwieldy alternatives
Verduzco (Chevron Corporation)	2	10	35	10	36	2.2.1	-	-	"Provide a definition for industry ""by-flow"". On page 28, secondary residues are defined as ""by-products"", but in Table 2.2.1 residues from agriculture and forestry are ""by-flows"". Are these two terms used interchangeably? Are by-products the same as by-flows?"	Used with the same meaning; by-flows changed to by-products here and elsewhere
Verduzco (Chevron Corporation)	2	10	33	10	38	2.2.1	-	-	Reconcile these categories with what's presented in page 27, 2.3.1.1. For instance, is organic waste from livestock, urban and MSW considered post consumer waste?	Section 2.3.1.1 will be merged and harmonised with 2.2
Verduzco (Chevron Corporation)	2	10	35	10	36	ES	-	-	Include biomass from fire prevention management activities under secondary and tertiary residues category	Listing biomass sources, not management affecting sources. Management practices are discussed in 2.5.
Verduzco (Chevron Corporation)	2	10	1	10	9	ES	-	-	Presenting this data in a table would make it easier to understand. What is the base year for the \$ values?	data comes from AR4 directly
Somogyi (Hungarian Forest Research Institute)	2	11	-	15	-	-	-	-	"Although the text covers ""potential"" amounts, it does not explicitly differentiate between ""technical"" or ""maximum"" potential, and ""potential from a practical point of view"", i.e. what can realistically be utilized potentially from a practical point of view. I strongly suggest to explicitly apply these different concepts to make it even more clear the limited applicability of biomass for energetic use."	There are clear agreed definitions of different kinds of potentials that are used throughout the text, as is visible from the whole of this chapter and the report
Titus (Natural Resources Canada, Canadian Forest Service)	2	11	14	11	22	-	-	-	"Chapter usually deals with agriculture and then forestry; but here the order is the other way around. Probably easiest for readers if there is a consistent natural flow throughout the chapter, either from agriculture to energy plantations to managed forests, or visa-versa"	The order here is by energy volume
de Campos Barbosa (Petrobras)	2	11	20	11	22	-	-	-	"Conclusion isn't in accordance with initial sentence. Limitation of agricultural flow doesn't limit residues as the only part of biomass that can be significant part of the energy supply of many countries. Better to substitute: ""...residues..."" to: ""...biofuels..."""	Not clear if I understand the reviewer's point; residues are indeed meant here, and this does not imply that there is non-residue bioenergy potential also
Titus (Natural Resources Canada, Canadian Forest Service)	2	11	9	-	-	-	-	-	"felling losses" □ loss of what, from where? 'Loss' is a rather pejorative term; aim for neutral terminology, such as 'roundwood removals'"	In this context, losses are products that could be used but are lost in the extraction process, this is clear from the text; "roundwood removals" is not what is meant
Titus (Natural Resources Canada, Canadian Forest Service)	2	11	3	11	12	-	-	-	Any comment on salvage potential? 270 Mt C in mountain pine beetle-killed stands in BC alone (Kurz et al. 2008. Nature 452: 987-990). Forest fires?	Discussion is here on available volume, not on accessibility or management (fires)
Wang (Argonne National Laboratory)	2	11	14	-	15	-	-	-	Comparison between forest biomass flow and fossil energy is like comparison of apples with oranges. They are not for the same purpose and different magnitudes do not say much about the scale of each production.	They are both potential primary energy carriers and hence to compare their current volumes gives perspective.
McCormick (International Union for Conservation of Nature (IUCN))	2	11	5	-	-	-	-	-	include: ...up to □.	Current wording intended

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Titus (Natural Resources Canada, Canadian Forest Service)	2	11	12	-	-	-	-	-	large volumes' from thinning: at a stand level, regionally, nationally, or internationally? Does this apply to some of the largest forests in the world, in Russia, Canada and the US? <input type="checkbox"/> although logical source in some European and Nordic countries. Perhaps need to put thinning into some kind of larger context? Note that thinning is used in PNW USA primarily to reduce fire hazard, not improve growth.	clarifying wording added that this applies only to some world regions
Kahiluoto (MTT Agrifood Research Finland)	2	11	26	-	-	-	-	-	Soil and water quality maintenance in terms of hindering eutrophication could be included as one aspect - compare use of biomass from eutrophicated field soils especially in terms of phosphorus, use of biomass from vegetated buffer zones to hinder nutrient leaching to waters and use of biomass from eutrophicated waters. Note also the importance of well-justified soil quality criteria.	Comment is valid, but this is the introduction; detailed discussion of impacts and limitations including soil conservation and other environmental services in later sections of the chapter and the report
Kaup (Potsdam Institute for Climate Impact Research)	2	11	13	11	22	-	-	-	That small outline is not fitting very well and content wise not crucially needed <input type="checkbox"/> so maybe removable	Noted and taken into consideration, may be revised but remains for now. Rather, the corresponding figure will be removed.
Titus (Natural Resources Canada, Canadian Forest Service)	2	11	14	-	-	-	-	-	To 'global industrial forest biomass flow (i.e., roundwood) is'	Does not improve or clarify, roundwood alone is too narrow
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	11	5	-	-	2.2.1	-	-	"should read: ""50-60% of the aboveground biomass produced annually on the world's cropland"" (in the ecological literature, ""biomass"" usually denotes a stock, whereas here you mean a yearly flow)"	Stock is what is meant; for annual plants this is equal to the annual flow. The text refers to fractions of the plant not used currently.
Verduzco (Chevron Corporation)	2	11	3	11	14	2.2.1	-	-	"The text reads: "" The total biomass flows in agriculture and forestry <input type="checkbox"/> including also the flows considered to be potential bioenergy feedstocks <input type="checkbox"/> are substantially larger." Larger than what? Larger than fossil fuel flows? That would contradict line 14 of these same page: ""the present total global industrial forest biomass flow is much smaller than the present fossil fuel use. """	No contradiction here, "larger" refers to the numbers stated just before, the second statement is the reverse of the first. Wording has been improved for more clarity. Total biomass flows are meant to mean flows produced in this system, not made clearer
Bilello (NREL)	2	11	28	12	1	2.2.1	-	-	Is the y-axis on these graphs meant to be the GJ of the selected biomass energy per person per year? What is the point of these graphs? There's no correlation between the points on the graph. Is the point to show export and trade?	The figure this comment refers to will be removed.
Verduzco (Chevron Corporation)	2	11	11	11	12	2.2.1	-	-	It is important to mention that some crop waste and tree thinnings must remain on the land to prevent soil erosion and nutrient depletion	This is discussed in 2.2.4.1, entitled "constraints on residue extraction"
Somogyi (Hungarian Forest Research Institute)	2	11	-	12	-	2.2.1	-	-	"The figure depicts ""industrial roundwood"" data. However, roundwood is usually not used for energy, rather, fuelwood is. I suggest to use both data instead. Or, rather, this ""potential"" is not potential at all, because only a fraction of the food produced, and only a fraction of the industrial wood may be used for energy in the foreseeable future."	The figure this comment refers to will be removed.
Kaup (Potsdam Institute for Climate Impact Research)	2	11	29	12	1	2.2.1	-	-	Figure 2.2.1 <input type="checkbox"/> Once graphs EU 25 and on the other page EU 27 <input type="checkbox"/> can that be levelled ?	The figure this comment refers to will be removed.
Jannuzzi (University of Campinas)	2	11	-	12	-	2.2.1	-	-	I find these 2 figures difficult to understand. Is the x-axis the TOTAL energy from biomass and y-axis the percapita? Clarify the axis headings, please. Give a concise title to the figure and provide Notes explaining the data etc	The figure this comment refers to will be removed.
Visconti (Inter-American Development Bank)	2	11	-	12	-	2.2.1	-	-	The two figures, Industrial roundwood production and Crop production, present different references for EU, EU 25 and EU27 respectively. Suggestion: depending on data availability, use the same reference for EU.	The figure this comment refers to will be removed.
Jack (Scion (New Zealand Forest Research Institute))	2	11	28	11	29	2.2.1	2.2.1	-	"In the text it is not specified how this biomass is converted to energy units. I am also not sure about the figure that has been arrived at for NZ. In NZ roundwood production in 2009 was 16,562,000 cubic metres, current population is 4.35 M. Using these numbers I can get a value ranging from 33-36 GJ/capita/year depending on whether I assume a ""wet"" calorific value of 8GJ/tonne or a dry calorific value of 20 GJ/tonne. This seems to be a long way from the value of 55 in the figure."	The figure this comment refers to will be removed.
de Campos Barbosa (Petrobras)	2	12	21	12	22	-	-	-	"Add: ""...or providing cash or access to other resources that may improve food production."" As expressed elsewhere in the text."	Does not improve content, topic addressed elsewhere in the chapter

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	12	14	12	18	-	-	-	"I think it would be important to note that there are also very real impacts on ecosystems, so it may not be justified to speak only of ""socio-economic conditions"" or ""impacts"" as limits to bioenergy potentials here. Too high expectations for producing bioenergy might result in catastrophic changes in ecosystems that can jeopardize their future ability to sustain the production of bioenergy, i.e. there might well be real biophysical feedbacks"	The subsequent text of this paragraph mentions this, but the intention is to make it more explicit in the next version of text, as the point is well taken
McCormick (International Union for Conservation of Nature (IUCN))	2	12	26	-	-	-	-	-	"include: that impacts downstream water uses and ""environmental flows necessary to maintain downstream terrestrial and aquatic ecosystems and their benefit"""	Current wording already mentions "terrestrial and aquatic ecosystems maintenance"
Marques (The Planter Group)	2	12	8	12	10	-	-	-	"It is important to make clear that the biomass resource potential depends not only on the priority of bioenergy products vs other products obtained from land, but also on the opportunity costs of substitute products not-based on land (e.g. fossil fuels that can be replaced by biomass). In the absence of this caveat, the analysis might overestimate land competition and underestimate end-use competition, resulting in the overlooking of the backward and forward linkages in bioenergy production chains"	This section of text is about potential and not about levels actually realised by considerations of price levels of various energy technologies. So this is not "realised potential" but "potential in the absence of direct economic considerations (indirect effects are taken into account as constraints, however)"
Treber (Germanwatch)	2	12	19	12	27	-	-	-	"the content of these lines is not very dense; possibility to condense and shorten"	will be considered in revisions
Schmall (Petrobras S.A.)	2	12	20	12	22	-	-	-	The bioenergy can improve the food production life cycle analysis benefits by offering a regional market for the agricultural products, e.g of soya production in Brazil. The biodiesel demand can increase the soya crushin in Brazil. Integrating the soya production with animal protein (chicken or pig, etc.) is possible achieve a great reduction on fertilizer uses by recycling the animal waste production in to the soil. That way the LCA in termos of GHG intensity can be reduced. Also the transport of animal protein is much more sustainable than the soya.	Positive and negative consequences of bioenergy production as well as potential synergies are discussed more extensively later in the chapter, here only interconnections are briefly mentioned, as this is the potentials section; improved food production is not the topic of the report despite interconnections
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	12	16	-	-	-	-	-	WHAT ABOUT FOSSIL FUELS?	Don't understand the comment in the context of this line of text
Smith (McGill University, Macdonald Campus)	2	12	8	12	12	2.2	-	-	Access to news and related information on the internet has lead to decrease in newsprint use, and the widespread use of PDF files is now beginning to cause the same sort of effect in office paper use, which has caused economic hardship in the forestry sector, but means that, over time, more and more of this resource is likely to be available for biofuel production. Conversely, increasing global population and increasing meat consumption have the potential to mean reduced availability of agricultural biomass. However, given the more intensive management of agricultural systems there is more scope for modifying agricultural biomass production systems to accommodate biomass use for biofuel and bioproduct production.	True, it is the purpose of this chapter to discuss such interconnections, and it does.
Smith (McGill University, Macdonald Campus)	2	12	17	12	27	2.2	-	-	In addition to the other changes that could be made it is very possible to develop cropping systems that emit considerably lower levels of greenhouse gases through nitrogen management (careful fertilizer application, including precision agriculture), reliance on associative nitrogen fixation, improved nitrogen use efficiency in crop plants and the use of growth stimulating biofertilizers. Some of these technologies are currently poorly developed, but are positioned to move quickly through some research input.	Comment is editorial and does not apply to this paragraph; topic addressed by reviewer is discussed in depth in section 2.5 and elsewhere in the chapter
de Haan (Ernst Basler + Partner AG)	2	13	12	13	16	-	-	-	""food first"" and ""fibre first"" are not as clear as they might seem at first sight. The amount of ""food"" largely depends on the share of meat! (And, from a GHG point of view, especially from the share of beef meat)."	Yes, and this is noted in the studies and throughout the chapter, comment does not particularly apply to this line
McCormick (International Union for Conservation of Nature (IUCN))	2	13	23	-	24	-	-	-	chronological order for the list of reference	Done.
Popp (PIK)	2	13	16	-	-	-	-	-	Citation for assements on forest resource potentials is missing	Noted, will look for one during revisions.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Fulton (Deutsche Bank)	2	13	21	-	-	-	-	-	Fuel for food debate is discussed, but only on supply demand level and not the political level.	True, the reason being that this is the potentials section and not the policy or implementation section. These topics are treated later in the chapter and in other chapters of the report in more detail.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	13	1	-	-	-	-	-	the graph is not very clear to me	Why? It seems clear to us.
Fulton (Deutsche Bank)	2	13	10	-	-	-	-	-	What studies? This needs reference	Will be added.
Londo (Energy research Centre of the Netherlands)	2	13	19	13	19	2.2.1	-	-	"I think ""that"" should be deleted here. "	Done.
Jack (Scion (New Zealand Forest Research Institute))	2	13	11	13	11	2.2.1	-	-	It would be good to include the citations of these studies at this point. The are probably covered later but since they are mention here it would be good to also cite them here.	Will be added.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	13	22	-	-	2.2.1	-	-	This is not fully correct. We have recently published online a study (http://www.uni-klu.ac.at/socec/downloads/WP116_WEB.pdf) that is based on a food-first approach and quantifies bioenergy potentials (excluding those from forestry) under defined sets of assumptions regarding diets, yields, cropland expansion and efficiencies in the livestock sector. This study explicitly models interactions between food and bioenergy.	Yes, and there are now a few others, this will be corrected.
Schmall (Petrobras S.A.)	2	13	53	23	53	2.4.7.2	-	-	It should add that: Policies need to be established to avoid this situation with proper control mechanisms and measures that include e.g. agriculture zoning for food-bioenergy production.	Lines given do not exist, so not sure where this allies, also wrong section given. This section is not about policies but potentials
Kaup (Potsdam Institute for Climate Impact Research)	2	13	1	13	1	-	2.2.2	-	"Figure 2.2.2. - If all the linkages are shown shouldnt there be connections between water and food; energy & food"	Figure is a direct quotation from the source given. Point made is true, but the figure is focussed on bioenergy aspects, not on food, hence not on the food-water link, which therefore does not have to be shown.
Gorissen (Flemish Institute for Technological Research)	2	13	-	-	-	-	2.2.2	-	The cultural value of biomass (e.g. aesthetic) is not displayed. Yet this may prove to be an important factor for economy (rural tourism) or social acceptance (not in my back yard attitude towards wind turbines). Please either include or mention absence in legend.	True, the figure is imported from a quoted source, and the caption says that indirect land use and social issues are not included in this graph
Kahiluoto (MTT Agrifood Research Finland)	2	13	-	-	-	-	2.2.2.	-	The interrelations between agricultural efficiency (yields) and biodiversity + energy and fertilizer use are not shown	The caption says "key relationships" and notes some exclusions not depicted, it is not improved by adding additional relationships
Kahiluoto (MTT Agrifood Research Finland)	2	14	26	14	29	-	-	-	"...trade-offs and win-win options (e.g., integrated food and energy systems such as agro-forestry, utilization of biomass as fertilizer products after energy recovery; legume crops for bioenergy)□"	Added slightly less wording mentioning potential synergies in land use
Titus (Natural Resources Canada, Canadian Forest Service)	2	14	22	14	26	-	-	-	"Forest biomass inventories can vary widely, depending on the assumption used for the proportion of harvesting residue that should be left for environmental reasons. Some residue should also be left in agricultural systems. At the very least, this paragraph should include a clause for this, perhaps something like ' ; some harvesting residue should be left in agricultural and forestry systems, but these amounts are not always defined or known; "	Agreed, but this topic is addressed more explicitly later in the chapter. Here, only an overview of key topics is given without detailed discussion, which comes later.
Titus (Natural Resources Canada, Canadian Forest Service)	2	14	8	-	-	-	-	-	"'Theoretical/physical/technical' should explicitly include 'environmental'; even better, it should be enlarged to a short introductory paragraph (see comment above on different potentials as in Smeets & Faij)"	Will consider in revisions
TEIXEIRA COELHO (INSTITUTE OF ELETROTECHNICS AND ENERGY, USP)	2	14	16	-	-	-	-	-	STATISTICS FROM IEA INDICATES COMBUSTIBLES RENEWABLE AND WASTE, WITHOUT CONSIDER THE DIFFERENCES BETWEEN TRADITIONAL AND MODERN BIOMASS	Yes, and this chapter does.
MÄNNEH (MINISTRY OF FINANCE AND ECONOMIC AFFAIRS)	2	14	8	36	15	-	-	-	This Chapter could also be shortened from ranges or sections 2.2.2 to 2.3.4.	will be considered in revisions
Gorissen (Flemish Institute for Technological Research)	2	14	8	-	-	-	-	-	This is an unclear and confusing statement. What does this sentence mean? Including the ecosystem concept might greatly improve the understanding of the technological/physical/theoretical system boundaries versus the ecological system boundaries of biomass resource potential.	This is according to definitions used for the report. Noted for possible clarification in revisions.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Titus (Natural Resources Canada, Canadian Forest Service)	2	14	24	14	25	-	-	-	To suggest that 'biodiversity and nature conservation requirements set restrictions' is rather pejorative. This should be presented in neutral terms, perhaps simply 'biodiversity and nature conservation requirements are difficult to assess'	Agreed, will scrutinize text for such formulations during revisions, wording changed in this location to "limitations"
Titus (Natural Resources Canada, Canadian Forest Service)	2	14	15	-	-	-	-	-	Two years are used throughout the chapter for future resources: 2030 (e.g., P.10 L.20) and 2050. Perhaps a better explanation for these two timeframes could be included at the outset of this chapter so that readers know why there are two timeframes □ even if it is as simple an explanation as that these are the two available sources from the literature.	Time frames used throughout the report are 2030 and 2050 and depend on context and sources, this should be clear from the respective sections
Titus (Natural Resources Canada, Canadian Forest Service)	2	14	8	-	-	-	-	-	What is 'physical' potential?	There will be a glossary explaining how terms are used in the report
Marques (The Plantar Group)	2	14	26	14	29	-	-	-	Whenever general references to tradeoffs in bioenergy production chains and external variables (environmental, socio-economic contexts etc) are made, there should also be an equivalent and balanced reference to the same trade-offs of the fossil fuels, e.g. other environmental impacts of fossil fuels, which could/would be replaced.	This section is about the bioenergy potential and tradeoffs involved with it, not about the tradeoffs of this energy sector with other energy sectors; this will be looked at in the integrative chapters of the report
Titus (Natural Resources Canada, Canadian Forest Service)	2	14	1	-	-	2.2.1	-	-	Melillo et al., 2009' mentioned twice, and reference on page 127 is incomplete	Corrected.
Verduzco (Chevron Corporation)	2	14	26	14	27	2.2.2	-	-	"The text reads: ""Biomass potentials can also not be determined exactly as long as□"" Rephrase this sentence. It is confusing as it stands."	Was revised and simplified.
Schmall (Petrobras S.A.)	2	14	7	-	-	2.2.2	-	-	The estimation of aquatic biomass, like algae, aren't included. There is no sence in discuss the best use of forest production. The cost/prices will regulating what is more important for the society.	The topic of algae is covered later in the chapter in detail. Not the appropriate place here.
Verduzco (Chevron Corporation)	2	14	8	14	14	2.2.2	-	-	This paragraph is very confusing. It needs to be rephrased.	Reviewer does not explain why confusing, does not seem confusing to us. Noted for possible revision.
Verduzco (Chevron Corporation)	2	14	-	-	-	-	-	2.2.1	The ranges presented in this table are very wide. It would be more useful to disaggregate the resource potentials and present the main assumptions /regions of study and other information that may be relevant to understand the uncertainty. Under the forestry categories it would be useful to know the removal rates assumed.	This is a summary table, many of the assumptions are discussed in the text, and the reasons for the range are given in the table itself. The ranges are often not due to uncertainty but due to different assumptions. Potentials result from tradeoffs and implementation aspects, and are therefore necessarily ranges.
Rybach (Geowatt AG)	2	14	-	15	-	-	-	2.2.1	what potential is given here? Theoretical? Technical? Economic?	Noted for revision.
Londo (Energy research Centre of the Netherlands)	2	14	15	15	1	2.2.2	-	2.2.1	In the text and the table, no reference at all is made to biomass from algae, which opens up the marine environment as a source for bioenergy. Now I realise that their potentials are still highly uncertain, but at least they should be mentioned and discussed I believe.	There is a section on algae later in the chapter. Potential is highly uncertain.
Jack (Scion (New Zealand Forest Research Institute))	2	14	41	16	1	2.2.2	-	2.2.1	This is quite an important table for the entire chapter. It is disapointing to see that it has missed an important reference: Metzger, J. O. & Huttermann, A. 2009. Sustainable global energy supply based on lignocellulosic biomass from afforestation of degraded areas. Naturwissenschaften, 96: 279-288. Metzger and Huttermann's calculations seem to suggest that there is a possibility of an additional 18,300 Mtoe (approx 800 EJ) of energy from afforestation of degraded lands. If this is correct then the maximum potential from Unexplored forest growth should be more like 800 EJ. I find this more believable than an additional 700 EJ from energy crop production on surplus agricultural land.	Definitions are sometime vague and may cause confusion. Much of degraded lands is in fact agricultural land - e.g., croplands and pastures - presently covering about 5 billion hectares. "Unexploited forest growth" refers to net annual increment in existing forests that is above the level of present forest biomass extraction. "Afforestation of degraded land" counts as establishment of energy plantations, i.e., the same as establishing energy plantations on surplus agricultural lands.. Thus, Metzger and Huttermann's 800 EJ would be counted as energy crop production and not forest growth. The confusion might be less if we explained that energy crop production can be woody single stem crops grown in multiyear rotations, e.g., Eucalyptus and poplar plantations. Will inspect Metzger and Huttermann 2009.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	14	7	15	-	2.2.2	-	Table 2.2.1	"I think that this review and overview could gain a lot from incorporating data on current biomass production in terrestrial ecosystems worldwide. According to a recent study from our institute (PNAS vol 104, pp 12942-12947), the total annual aboveground net primary production on the earth's terrestrial surface is about 1.240 EJ/yr. A recent study has also quantified the amount of biomass burned in human-induced vegetation fires (Ecological Economics vol 69, p 301-318). Taken together, these two studies suggest that approximately 30% of the aboveground NPP (i.e. their total annual biomass production, including losses etc.) of potential vegetation are currently ""appropriated"" by humans: According to these studies, the NPP of the aboveground compartment of the currently prevailing vegetation is 1.240 EJ/yr of which 330 EJ/yr are harvested, grazed, lost or burned, i.e. 910 EJ/yr biomass remain in ecosystems at present in the aboveground compartment. In the light of these figures, any bioenergy potential in the order of magnitude of 1000 EJ/yr assumes increases in global biomass production through technological interventions that seem extremely implausible, plus a level of impact on ecosystems that is so high that it seems highly unlikely that catastrophic changes in ecosystems, including widespread loss of biodiversity, could be prevented."	Agreed, was noted for possible inclusion in revised text.
Ballesterio (National Meteorological Institute)	2	15	28	-	-	2.2.2	-	-	What should be an acceptable biodiversity loss? I think is better to delete this phrase because there is not specific answer to this question and so could become confusing to the reader	Wording was changed to "agreed" rather than "acceptable", the intent was to make clear that this is somewhat a matter of preferences (in addition to scientific insights into ecosystem functioning)
Schmall (Petrobras S.A.)	2	15	-	-	-	-	-	2.2.1	Should Include animal fat	Not a major factor for energy production (rather than food)
Kaup (Potsdam Institute for Climate Impact Research)	2	15	-	-	-	-	-	2.2.1	Table 2.2.1 <input type="checkbox"/> If that table is needed I would suggest to put it at the end of section 2.2.2. (including Smeets and all the discussed results). Still I am not sure why that table has to be shown at all. Since what is the result of that table? The assumptions are so vastly different that there aren't any conclusion. Rather depict more clearly two scenarios one with optimistic and one with pessimistic assumptions and then show the results.	The table shows the range of potentials found in the literature under various assumptions; it is the purpose of this report to assess the available knowledge and report it.
Wang (Argonne National Laboratory)	2	15	-	-	-	-	-	2.2.1	The lower estimate of biomass use is less than 50 EJ. On the other hand, the world is already using this amount (see the introduction section).	The numbers do not include traditional use, will be clarified
Sims (Massey University)	2	15	-	-	-	-	-	3.2	Comment on why Greece and Finland have similar solar fractions (maybe define it here).	Seems to comment about a different chapter (solar energy).
Titus (Natural Resources Canada, Canadian Forest Service)	2	16	1	-	-	-	-	-	""by-flows' or 'by-products'? The term 'by-flows' seems to be used the most in the chapter; perhaps note alternate terminology on first usage in chapter ('... by-flows (i.e., by-products)[]'. Confirm that terminology is consistent throughout chapter."	Was changed to by-products everywhere
McCormick (International Union for Conservation of Nature (IUCN))	2	16	46	-	-	-	-	-	"delete ""that"" in the text"	Done.
Titus (Natural Resources Canada, Canadian Forest Service)	2	16	29	16	30	-	-	-	""ecological restrictions' is pejorative; seek neutral terminology."	Changed to "concerns"
McCormick (International Union for Conservation of Nature (IUCN))	2	16	4	-	-	-	-	-	"I suggest to add the following sentence: "" They can reduce the land footprint of bioenergy production and improve the GHG and energy balances of biofuels"""	Does not add value to the text; topics discussed extensively later
McCormick (International Union for Conservation of Nature (IUCN))	2	16	35	-	-	-	-	-	"include: ""Determining land availability and suitability has to consider maintaining the economic, natural and social value of ecosystems by preventing ecosystem degradation and habitat fragmentation"""	Was added at the end of the paragraph in the text for revision
Titus (Natural Resources Canada, Canadian Forest Service)	2	16	19	-	-	-	-	-	"To consider 'soil conservation' as a 'competing use' for a commodity is pejorative; seek neutral terminology."	Generally agreed, but in this case it seems justified and is not pejorative: it is simply a competing interest in the use of this resource
Titus (Natural Resources Canada, Canadian Forest Service)	2	16	23	-	-	-	-	-	""unexploited forest growth' is pejorative; seek neutral terminology."	Agreed, was changed to "currently not used"

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Hakala (MTT Agrifood Research Finland)	2	16	16	16	16	-	-	-	Add references: Lal 2005 AND Hakala et al. 2009.	Will be considered during revisions.
Hakala (MTT Agrifood Research Finland)	2	16	37	16	37	-	-	-	Add references: Wolf et al. 2003, Hoogwijk et al. 2009, Hakala et al. 2009.	This sentence refers to earlier studies, so recent publications are not meant here, and the citation given is a review that covers a number of studies
Titus (Natural Resources Canada, Canadian Forest Service)	2	16	4	-	-	-	-	-	Add text: 'waste management and (within biophysical properties of landbase) from agricultural and forestry operations'	Not clear why the addition is important
Titus (Natural Resources Canada, Canadian Forest Service)	2	16	7	126	8	-	-	-	Again, it is the combination of demand for traditional agricultural and forest products plus the sustainability of the biophysical resource (land)	Text was revised to reflect this.
Popp (PIK)	2	16	41	18	6	-	-	-	All of this text is only referring to Fischer. Compared to the description of the other studies it seems to be a bit dominant -> shorten this contribution	Two more maps on potential for 2nd generation woody and perennial plantations will be added from a different source; Fischer is an authoritative source here
Kessels (International Energy Agency Clean Coal Centre)	2	16	7	16	10	-	-	-	Could delete this to save on text	Will be considered during revisions.
TEIXEIRA COELHO (INSTITUTE OF ELECTROTECHNICS AND ENERGY - USP)	2	16	35	-	-	-	-	-	DISCUSSION ON DEGRADED LANDS IS CONTROVERSIAL AND MUST BE INCLUDED	Agreed, and this is dealt with later in this chapter.
Marbán (Instituto Nacional del Carbón (CSIC))	2	16	43	-	-	-	-	-	First generation biofuels are typically produced from food crops. Jatropha is a non-food crop and therefore should be considered as a feedstock of second generation biodiesel (http://www.jatropha-platform.org/about.htm)	will be checked during revisions
Kaup (Potsdam Institute for Climate Impact Research)	2	16	42	16	43	-	-	-	if you sum up the most important feedstocks I would suggest to include sugar beet and wheat as well	will be checked during revisions
Popp (PIK)	2	16	2	16	30	-	-	-	Many citations missing. Almost all citations missing.	Noted for revision.
Gorissen (Flemish Institute for Technological Research)	2	16	19	-	-	-	-	-	soil conservation and other vital ecosystem services	Text revised to mention sustainability of land resource
Somogyi (Hungarian Forest Research Institute)	2	16	-	19	-	-	-	-	The use of energy from any source must be analysed not only energetically, but also concerning the net GHG balance of the system based on the source, and by comparing this balance with that of other systems. In the balance of energy plantations, all energy that is to be used for the establishment and management of the plantations, including the energy that is used in the production, transportation and use of fertilizers, must be analysed (see Table 2.3.1). IPCC could make this step at least by demonstrating such a comparison to make it clear that much research in this area must be undertaken BEFORE any large-scale program for energy plantations can be designed.	Agreed, and the GHG balance of bioenergy is discussed in detail in section 2.5; however, the IPCC can only use published literature and not
McCormick (International Union for Conservation of Nature (IUCN))	2	16	2	-	-	2.2.2.1	-	-	manures is also an important source of biomass for bioenergy. I suggest to add it.	Will do in revisions.
Kahiluoto (MTT Agrifood Research Finland)	2	16	-	-	-	2.2.2.1	-	-	+ set-asides, vegetative buffer zones etc. - see the comment to table 2.2.1.	Not sure what this refers to specifically, no lines given
Titus (Natural Resources Canada, Canadian Forest Service)	2	16	31	-	-	2.2.2.2	-	-	"Title suggests woody forestry crops, but text is mostly on agricultural crops; perhaps 'The contribution from energy crops and plantations'? Then need opening statement to make it clear what this section is about, and to define 'energy plantation' □ short-rotation woody crops (willow, poplar, Eucalyptus spp.) & fast-growing conifers grown specifically for bioenergy?"	Agreed, will be re-visited during revisions, and plans are to add 2 figures to Figure 2.2.3 on potential for woody and grassy dedicated plantations.
Marques (The Plantar Group)	2	16	31	19	7	2.2.1	2.2.2	-	It seems that the potential of short-rotation forests or dedicated planted forests for the production of fuelwood, charcoal and related products such as tar, has not been included in this sub-section. It would be important to do so, for the same reasons stated above.	Agreed, will be re-visited during revisions, and plans are to add 2 figures to Figure 2.2.3 on potential for woody and grassy dedicated plantations.
Fulton (Deutsche Bank)	2	17	4	17	15	-	-	-	Carbon debt from land use change	The GHG balance of bioenergy systems will be discussed in section 2.5, and the carbon debt is part of that; also the WBGU 2009 study cited in several places has it as an explicit criteria.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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SCOWCROFT (EURELECTRIC)	2	17	4	17	10	-	-	-	Global land suitability (currently unprotected grass- and woodland) for first-generation biofuel feedstock: Worldwide about 700 Mha soybean, 580 Mha maize and 470 Mha jatroph suitable. OK.	Yes, done.
Vahrenholt (RWE Innogy GmbH)	2	17	4	17	10	-	-	-	Global land suitability (currently unprotected grass- and woodland) for first-generation biofuel feedstock: Worldwide about 700 Mha soybean, 580 Mha maize and 470 Mha jatroph suitable. OK.	Yes, ok.
Treber (Germanwatch)	2	17	15	-	-	-	-	-	Please add: the same applies to grass- and woodlands, as conversion of natural systems to managed lands releases large quantities of CO2 from soils (cp. IPCC GPG on LULUCF) that can not only reduce but MORE THAN OFFSET potential gains from fossil fuels substitution.	Text will probably be generalised more during revisions.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	17	26	-	-	-	-	-	REFERENCE QUITE CONTROVERSIAL, OTHER REF MISSING - SEE ANNEX PLEASE	No reasons given by reviewer; highly reputed sources; reviewer comment too vague to know what to consider
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	17	24	-	-	-	-	-	SEE FAO FIGURES	Not sure what is intended with this comment. Which figures? Where? Why?
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	17	15	-	-	-	-	-	WHAT ABOUT SUGARCANE?	Comment does not seem to apply to the line given, can't place it.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	17	26	17	29	-	-	-	What are the specific assumptions?	The source of Table 2.2.2 will give the readers more extensively the background; but this point is noted for text revision
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	17	4	15	-	-	-	-	Would a total number of suitable land for biomass production for biofuel production not be more interesting than figures for different crops that can not be added? Beringer & Lucht (2008): Simulation nachhaltiger Bioenergiepotentiale (http://www.wbgu.de/wbgu_jg2008_ex01.pdf) in the WGBU-Report 2009 (http://www.wbgu.de/wbgu_jg2008_en.pdf) state that a total of 240-500 Mha are suitable for biomass production for bioenergy (depending how high nature conservation and agricultural land requirement for other uses are assumed) page 116	Here the Fischer study is being discussed, but the WBGU study, cited elsewhere, will possibly now also be mentioned in the revised text. At least two figures on production potential will be added to 2.2.3
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	17	14	-	-	2.2.2	-	-	"In fact many LCA based studies have shown that indirect land use change can result in GHG emissions of biofuels that are much higher than the GHG emissions of the fossil-energy based fuels they are substituted for (also also shown later in the draft report). i.e. it is not correct to claim that this effect can "dramatically reduce" the climate benefit, indeed it can be worse for the climate system to use such fuels than continuing using fossil energy."	The GHG balance is mainly discussed in section 2.5, and here the reference is only to palm oil in particular.
McCormick (International Union for Conservation of Nature (IUCN))	2	17	4	-	-	2.2.2	-	-	correct: agricultural land	Done.
LEITE DRACHMANN (PETROBRAS)	2	17	16	17	16	2.2.2	2.2.3	-	"Figure 2.2.3 indicates moderate to medium land sustainability for biofuels feedstock production for Mato Grosso State (Center-Western Brazil), which is the largest soybean producer region in Brazil. The figure also indicates a marginal to moderate land sustainability for Parana state region (Southern Brazil), which is the second largest soybean producer region in Brazil. In such context the Brazilian soybean production is conducted rather in a unsustainable land approach, that is not true. Another region that is indicated to have moderate land sustainability is the Brazilian Northern region, which is a palm tree potential land, where this species may even be used on the reclaim of degraded lands. Although the references used by the author regarding the suitability for land using, in Brazil's Center-Western Region a huge Program was conducted by EMBRAPA (Brazilian Research Organization for Agriculture and Farming) that resulted in an enhancement of soil fertility and of soybeans grows to be cultivated in the region. At least considering the Brazilian context this figure should be deleted."	The figure, from a particular source given (highly reputed), speaks of "suitability", not "sustainability". The figure just says that even though some regions in Brazil may be the largest producing regions, this assessment sees other world regions as even more suitable. The basis for this statement is very extensive work over many years with a great amount of data.
KOBAYASHI (Toyota R&D Labs. Inc.)	2	18	6	-	-	-	-	-	""from where"" should be grammatically 'from which'. And Figure 2.2.3 should be 2.2.4."	Agree

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Fulton (Deutsche Bank)	2	18	25	18	31	-	-	-	"DBCCA found that the challenge of land availability to meet growing demand was estimated to be inadequate. Source: DBCCA, ""Investing in Agriculture: Far-reaching Challenge, Significant Opportunity,"" June 2009, see page 45 (www.dbcca.com/research). See SRREN_Draft0_Review_Fulton_Mark_Material_05.pdf"	Inspect report and consider inclusion.
Titus (Natural Resources Canada, Canadian Forest Service)	2	18	6	-	-	-	-	-	"Fig. 2.2.3 is based on Fischer et al. (P.17 L.21), so it is not clear what this all means; clarify and reconcile caption to Fig. 2.2.3 with this text. Or does the text refer to Fig. 2.2.4?"	Yes Fig 2.2.4
Hakala (MTT Agrifood Research Finland)	2	18	16	-	-	-	-	-	Add text: However, permanent pastures often suffer from water deficit especially in large areas in Africa, which may reduce the production possibilities. Also provision of nutrients for economically profitable yield levels causes a problem in these areas.	It is stated in text to Table 2.2.2 that lands with low productivity (which includes pastures that suffer from water deficit) have been excluded. May be better elaborating in this place rather than adding the proposed text here.
McCormick (International Union for Conservation of Nature (IUCN))	2	18	7	-	-	-	-	-	corresponds to fig. 2.2.4 ?	Yes
Sims (Massey University)	2	18	7	-	-	-	-	-	Fig 2.2.4 (not 2.2.3)	Yes
Gorissen (Flemish Institute for Technological Research)	2	18	25	18	31	-	-	-	Formulation of message is confusing	Re-phrase
Treber (Germanwatch)	2	18	3	-	-	-	-	-	the unit is most not only 'ha': the world has 4605 ha grass- and woodland?	areas are given in million hecares
Verduzco (Chevron Corporation)	2	18	9	18	16	-	-	-	What are they yield assumptions of the Smeets et al. study? Does the study considered a future increase in land productivity?	Not clear if the reviewer asks us to explicitly state yield assumptions in one specific study. It is presently stated that critical parameters - level of improvement in agronomic technology is mentioned as example of this - can make the land availability vary substantially, as shown in Figure 2.2.4. This figure intends to illustrate how large variation there can be depending on how different parameters develop into the future. We may need to discuss whether it serves that function. Is there a risk that readers get distracted by the very high numbers and only take in the message that potentials can become very large?
Titus (Natural Resources Canada, Canadian Forest Service)	2	18	30	-	-	-	-	-	Why so little text on biomass plantations cf. agriculture? Can this be balanced more?	Unclear reviewer comment
Popp (PIK)	2	18	17	18	24	-	-	-	Wirsenius et al. Is submitted - okay for SRREN?	back from reviewers with request for minor changes: should be Accepted in time
Smith (McGill University, Macdonald Campus)	2	18	17	18	20	2.2	-	-	Another important issue is reduced losses in storage. While these are often low in developed countries they are often very high (50% is common) in developing countries.	Important! Have we not treated this sufficiently? Check!!
Smith (McGill University, Macdonald Campus)	2	18	21	18	22	2.2	-	-	Because the conversion efficiency of plant material into animal material is considerably better for poultry than pork, substituting poultry for pork is also important.	Include this notion in text
Londo (Energy research Centre of the Netherlands)	2	18	6	18	7	2.2.2	-	-	""from where Figure 2.2.3 is taken"" confusing fragment. The figure itself contains a different reference. Probably fig 2.2.4 is meant. "	Yes, should be Figure 2.2.4

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	18	1	18	24	2.2.2.2	-	-	Many of the older studies discussed extensively here have meanwhile been found to have used much too high estimates for yields (see Environmental Research Letters, 4, 014004- doi:10.1088/1748-9326/4/1/014004) and have not, or at least not sufficiently, looked at interlinkages between food, feed and bioenergy production. In my view, including these older studies results in a bias towards unrealistically high expectations regarding bioenergy potentials from dedicated bioenergy crops. This problem is aggravated by the fact that data on grasslands and its use for animal husbandry are generally very poor, and limitations of using tropical soils for intensive cultivations, in particular in Sub-Saharan Africa and Latin America, are also poorly understood. I therefore suggest to adopt a more cautious approach and rely more strongly on newer studies that have tackled (but not fully solved) these issues at least to some extent. Here our study (http://www.uni-klu.ac.at/socec/downloads/WP116_WEB.pdf) might be of some use as well.	doi:10.1088/1748-9326/4/1/014004 (Johnston et al 2009) discusses biofuel output/ha/yr for biofuels that are produced based on selected conventional agricultural crops. It compares own estimates of such biofuel outputs/ha/yr with those reported in two other publications and concludes that these two other publications seem to overestimate biofuel output/ha/yr. In (Johnston et al 2009) datasets for ten ethanol crops (barley, cassava, maize, potato, rice, sorghum, sugarbeet, sugarcane, sweet potato, and wheat) and ten biodiesel crops (castor, coconut, cotton, mustard, oil palm, peanut, rapeseed, sesame, soybean, sunflower) were converted from metric-tonnes-per-hectare to liters-per-hectare and analyzed across 238 countries, territories and protectorates. (Johnston et al 2009) refers to present day yield levels for these food/feed crops and seems therefore not to be so relevant as an argument against yield numbers stated in "older studies" since these studies often assess the potential of bioenergy several decades into the future (yields generally grow over time) and also commonly refers to lignocellulosic energy crops, which in many instances can offer higher yields than present day food/feed crops based on being multi-year rotation crops (longer growing period per year than annual crops) and having most of aboveground growth available for energy (many conventional food crops have less than half aboveground growth available for energy). It is unclear what other basis the reviewer have for stating that older studies lead to "unrealistic high expectations regarding bioenergy potentials". These older studies usually base yield estimates on either (i) results from real world lignocellulosic plantations and/or field trails; (ii) model based estimates generating yield levels as a function of biophysical factors (climate, soils, etc) combined with analytical representation of crop production systems. Admittedly, there are significant uncertainties but not clear that it is an upward bias. Possibly, relying on data only from field trails can generate too high yield numbers. Proposition is to revisit the text to see if "older studies" are given more emphasis than newer studies. This however requires that we define "old" and "new". The proposed study can be included as basis for Table 2.2.1. It is in the lower end but within ranges already given: "The range of bioenergy potentials from cropland and grazing land (58-161 EJ/yr)"
Londo (Energy research Centre of the Netherlands)	2	18	25	18	25	2.2.2.2	-	-	Reference WBGU (2009) not straightforwardly tracable in reference list.	Fix reference
Jack (Scion (New Zealand Forest Research Institute))	2	18	15	18	15	2.2.2.2	-	-	The value of 1500EJ is greater than the maximum given for Table 2.2.1. Are these two figure consistent?	See above

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Londo (Energy research Centre of the Netherlands)	2	18	17	18	24	2.2.2.2	-	-	Without becoming overly idealistic, I'd suggest also making a quantitative remark on the massive impact a shift towards vegetable proteins would have in terms of land demand.	Also important! Is this not sufficiently clear from the text referring to Wirsenius et al which explicitly treats effects of dietary changes. A recent publication that could further support this statement is DOI: 10.1007/s10584-008-9534-6
Kruger (South African Weather Service)	2	18	1	18	5	2.2.2.2	2.2.2	-	The units in the table should be stated, possibly 10 ⁶ ha?	Yes: areas are given in million hectares
Marbán (Instituto Nacional del Carbón (CSIC))	2	18	-	-	-	-	-	2.2.2	All figures in table unless otherwise stated are Mha (no ha, as stated by TSU)	Unit given in caption
Smith (McGill University, Macdonald Campus)	2	18	-	-	-	-	-	2.2.2	Some of these columns are without units.	Unit given in caption
Kaup (Potsdam Institute for Climate Impact Research)	2	18	-	-	-	-	-	2.2.2	Table 2.2.2. - Please indicate Mio ha or the needed value. Would not a column be needed where the area that is possibly productive and not protected is identified.	Unit given in caption. Might include one more column but the reader can also easily calculate these values based on given numbers
Pinho (Institut of Tecnology)	2	18	-	-	-	-	-	2.2.2	The numbers in the table cannot be ha.	Unit given in caption
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	18	-	-	-	-	-	2.2.2	all units in table if not otherwise stated are Mha (not ha)	Unit given in caption
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	18	-	-	-	-	-	2.2.2	The world balance available for bioenergy and the total bioenergy potential are much higher than the figures stated by Beringer & Lucht in WGBU 2009 (http://www.wbgu.de/wbgu_jg2008_en.pdf) on page 116 (780 Mha vs. 240-500 Mha and 176 EJ vs. 34-100 EJ)	Beringer & Lucht is one of many included studies and reflects one set of judgements. Other references were added too.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	18	1	18	24	2.2.2.2	-	Table 2.2.2	I think in discussing this Table it should be noted that if area potentials that require the removal of forests should be used to produce bioenergy this would be highly unlikely to be beneficial in terms of GHG emissions, even over time frames of several decades.	It is already stated in the text half page above Table 2.2.2 that "...converting large areas of forests with high carbon content into oil palm plantations would negatively impact biodiversity and also lead to large CO ₂ emissions that can dramatically reduce the climate benefit of substituting fossil diesel with biodiesel from the palm oil produced (see Section 2.5)."
Sims (Massey University)	2	19	8	-	-	-	-	-	"Change ""the sun"" to solar enegy"	Could not find "the sun" on page 19
Sims (Massey University)	2	19	6	-	-	-	-	-	And elsewhere - could delete these lines beneath main headings. Don't add anything.	Unclear comment
Titus (Natural Resources Canada, Canadian Forest Service)	2	19	13	19	19	-	-	-	Rather wordy ☐ can this be simplified?	Rephrase
Marques (The Planter Group)	2	19	17	19	19	-	-	-	The same as in comment 3 above (the opportunity costs of the substitute fuel to be replaced at the end-use, must also be considered in order to determine the potential of bioenergy crops). It seems that this is considered from lines 7 to 13 on page 20, but it should be further clarified.	rephrase
Titus (Natural Resources Canada, Canadian Forest Service)	2	19	13	-	-	-	-	-	Why is yield a 'restriction'? Is it not defined by biophysical properties of land + management inputs? Avoid pejorative terms for biophysical properties (i.e., ecosystems).	Rephrase
Londo (Energy research Centre of the Netherlands)	2	19	1	19	7	2.2.2.2	-	-	The section is lacking a concluding remark here. I must say that the wide ranges of potentials for cultivated crops make me think of the conclusion Kyriakos Maniatis (EC DG TREN) once drew on this: 'We honestly don't know'.	Consider adding 1-2 concluding sentences
Kruger (South African Weather Service)	2	19	8	19	11	2.2.2.2	2.2.4	-	The four different scenarios in the figure should be explained.	See comment higher up.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	19	-	-	-	-	2.2.4	-	"What are ""all other assumptions""?"	Elaborate in caption
McCormick (International Union for Conservation of Nature (IUCN))	2	20	28	-	-	-	-	-	-	no comment given

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Titus (Natural Resources Canada, Canadian Forest Service)	2	20	18	-	-	-	-	-	"As with P.20 L.13, define what Section 2.5 is about; maybe something like '□ and environmental issues are further discussed in more detail in Section 2.5.'"	Rephrase
Titus (Natural Resources Canada, Canadian Forest Service)	2	20	25	-	-	-	-	-	"Ash only returns cations, so 'recycle cation nutrients taken□' Also, ash is only of benefit when cations limit growth; there are two very good reviews out now on this. Nitrogen is also deduced to limit especially early growth (0 □ 15 years?) on some sites. And nutrient deficiencies operate at a stand, not forest level. Change sentence to something like 'On forest sites where cation nutrient removals because of intensive biomass harvesting limit subsequent growth, wood ash can be applied to regenerating stands to replenish cations; however, ash application has no effect on sites where nutrients such as nitrogen limit growth.' (There are two recent reviews published on ash effects; see Pitman (2006) Forestry 79; Aronsson & Ekelund (2004) J Env Qual 33)"	Section 2.2.4.1 will consider this comment
Titus (Natural Resources Canada, Canadian Forest Service)	2	20	13	-	-	-	-	-	"Would be clearer if contents of Section 2.7 were defined somewhat; maybe something like: 'Cost trends are discussed further in more detail in Section 2.7.'"	Change to the proposed phrasing
Titus (Natural Resources Canada, Canadian Forest Service)	2	20	26	-	-	-	-	-	Delete 'Yet,'	"Yet" deleted
Titus (Natural Resources Canada, Canadian Forest Service)	2	20	18	-	-	-	-	-	Likewise, 'exploitation' is also pejorative, although the use in this sentence suggests that current biomass harvesting is exploitive □ which is surely not true in all cases. Use neutral terms where possible, and be very cautious where neutral terms do not fit or are not available.	Follow this good advice
KOBAYASHI (Toyota R&D Labs. Inc.)	2	20	14	-	-	-	-	-	This whole section can be shortened.	Consider shortening section 2.2.4
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	20	14	-	20	2.2.4	-	-	delete this paragraph.	Might rephrase this first para in section 2.2.4, but it serves the purpose of informing the reader that 2.5 contains complementary treatment of toics in section 2.2.4. Se also comment 465 below
Kaup (Potsdam Institute for Climate Impact Research)	2	20	-	-	-	-	2.2.5	-	Figure 2.2.5. - in graphs shown before there are biomass energy potentials up to 1500 EJ but in that figure the cost curves are not even close to 400 EJ. That is a huge gap.	Consider this comment in processing for SOD
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	20	-	-	-	-	2.2.5.	-	Maybe A1, A2, B1, B2 should be explained again	Consider this comment in processing for SOD
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	30	-	-	-	-	-	"'constraint' is pejorative; is there a more neutral term? Is this not simply the 'biophysical land capability under intensive management'"	Will consider text everywhere unser this aspect; in some circumstances, constraint is a defendable term, in others less so, and we will have an eye on being neutral
Fulton (Deutsche Bank)	2	21	41	-	-	-	-	-	"DBCCA found that regional specific land allocation will be essential to achieve maximum yields. Source: DBCCA, ""Investing in Agriculture: Far-reaching Challenge, Significant Opportunity,"" June 2009, see page 42-44 (www.dbcca.com/research). See SRREN_Draft0_Review_Fulton_Mark_Material_05.pdf"	Will be looked at during revisions. Thanks for insightful comments
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	25	21	29	-	-	-	"Fair comment; highlights need for greater research effort. Is greater environmental research effort a key message that should be drawn to readers□ attention in initial summary, or Section 2.8.6? Note that there is usually a very large disparity in funding between environmental research as compared to research on conversion technology, or subsidies to bioenergy industry. "	Noted for revisions.
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	30	-	-	-	-	-	"Section sub-title reads 'agriculture and forestry' but section then discusses forestry first; order paragraphs by order in title"	Noted for revisions.

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Titus (Natural Resources Canada, Canadian Forest Service)	2	21	22	21	23	-	-	-	"There is not universal acceptance that stumping per se is environmentally acceptable. On the other hand, stumping is carried out in various countries on sites where root rot is a problem; here, it is possible that these stumps (already pulled for forest health reasons) may be transported off the site without this transportation incrementally adding to serious effects to sites. Also, there is now a stump cutter that severs lateral roots on spruce, reducing stump + root biomass recovery by about 50%, but reducing potential soil physical damage (http://www.skogforsk.se/upload/3795/Skogforsk_News_No_1_2008.pdf)."	Agreed, but no need to go into details in this section of text.
Kahiluoto (MTT Agrifood Research Finland)	2	21	2	21	4	-	-	-	A simplified view is presented. E.g., more efficient use of manure through energy recovery and subsequent (processing and) distribution according to the nutrient uptake by crops leads to reduced nutrient loads and energy use for fertilizer manufacture - this is an example of cascading use of material mentioned in I. 13. The added-value by energy recovery contributes to profitability of more equal distribution.	This is implicit in present text. Does it need this elaboration? Consider space limitation?
Hakala (MTT Agrifood Research Finland)	2	21	2	21	2	-	-	-	Add reference: Hakala et al. 2009	Has the reviewer given full info on the proposed ref elsewhere? Check if ref challenges the present statement supported by present references
Kahiluoto (MTT Agrifood Research Finland)	2	21	18	21	20	-	-	-	An important point is the possible shift between monogastrics and ruminants: more or less straw, more or less possibility to replace energy in fertilizer manufacture through legume cultivation etc.	Unclear
philippe (international institute for water and environmental engineering)	2	21	44	-	-	-	-	-	figure should be provided as a judgment is given on the unrealistic productivity increase in agriculture? What is called unrealistic?	There will be a revised section on agricultural intensification in the next draft and the point is noted; it will be discussed as an uncertainty as technological developments are difficult to forecast reliably
Marques (The Plantar Group)	2	21	31	21	36	-	-	-	It is not clear if the potential of long and short rotation forestry was not considered, in terms of making forest growth more intensive in the same land, or if it was not considered in the sense of expanding planted forest areas into marginal lands. In light of the general comments above, it would be key to consider the latter.	The text refers to all of these.
SCOWCROFT (EURELECTRIC)	2	21	37	21	40	-	-	-	Key aspect for biomass potential is intensification of agriculture. OK	Yes.
Vahrenholt (RWE Innogy GmbH)	2	21	37	21	40	-	-	-	Key aspect for biomass potential is intensification of agriculture. OK	Yes.
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	30	-	-	-	-	-	Logically, how can intensification be a constraint? If anything, is it not an 'opportunity'?	The degree of intensification meets with constraints from other considerations than the one leading to the intensification
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	35	-	-	-	-	-	Not 'in many instances identical', but 'in many instances are similar' □ if by 'bioenergy plantations' the authors mean 'plantations of short-rotation woody crops'	Change as suggested.
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	10	21	14	-	-	-	Repetitive? Hasn't this been said earlier in the chapter?	Judgement is that some considerations need to be repeated to make specific statements complete. The same reviewer remarked (comment 473) that the sentence stated to be repetitive here was instead insufficiently elaborated.
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	21	-	-	-	-	-	Thinning also used to reduce fire risk in PNW of US	Yes, but this does not need to be mentioned here.
Kahiluoto (MTT Agrifood Research Finland)	2	21	37	21	46	-	-	-	This conceptual model of focusing on land and yields is a simplistic one. The considerations should embrace the whole picture including the climate impact of inputs, biological nitrogen fixation replacing fossil fuel, opportunity costs for soil carbon budgets etc. I.	These aspects are discussed later in the chapter: GHG implications in 2.5, nitrogen requirements in various places, costs in the deployment and cost section. Though we realise the reviewer is mentioning some interesting additional views eg on soils, we will make note of this for revision.
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	41	-	-	-	-	-	What is meant by 'beyond national borders'?	Will be clarified in revision; what is meant is knock-on effects in land use from national policies on international patterns.

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Titus (Natural Resources Canada, Canadian Forest Service)	2	21	35	-	-	-	-	-	What is meant by 'bioenergy plantation'?	Plantations for the purpose of bioenergy production. This is a familiar term obvious from earlier sections of the text.
Titus (Natural Resources Canada, Canadian Forest Service)	2	21	30	22	31	-	-	-	Would it be more logical to have this entire sub-section follow on as the final part of at Sub-section 2.2.2 (P. 19 L.12)? Solves the 'constraint' question, and puts it at a point where readers' attention is on 'contribution from energy crops and plantations'	There may be some re-ordering for the next draft, point is noted.
Smith (McGill University, Macdonald Campus)	2	21	25	21	29	2.2	-	-	Through much of the last 50 years plant breeders have worked to increase the harvest index of many crops, particularly the small grain cereals. This has already reduced the amount of biomass going into agricultural soils. Some of this has been offset, in terms of total biomass, by management changes that have increased total biomass production, and therefore the amount of crop residue. There has often been a clear tradeoff between harvestable grain biomass and crop residue biomass. Recently there has been some discussion among some breeders that we should now work to decrease harvest index, which is a bit worrying, from the perspective of global food production.	Yes, and the text already mentions current uncertainties and restrictions due to these aspects
Schmall (Petrobras S.A.)	2	21	30	-	-	2.2.2.4.2	-	-	"Normally the agricultural intensification process increase the energy input. It's important include in this discussion the net energy of the intensification."	In the revised text there will be a new section concerning agricultural intensification, where this will be taken up.
Londo (Energy research Centre of the Netherlands)	2	21	10	21	11	2.2.4.1	-	-	Important determining factors', of what? The following sentence does not make clear how these factors affect the availability of residues.	The following sentence has been made more clear (end of sentence is now: "... , which ultimately determine the generation and location of residues. ")
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	21	30	22	31	2.2.4.2	-	-	"This section almost ignores the very complex issue of feed demand for livestock to be met from grazing areas. This is the major reason for uncertainty in global bioenergy potential studies, in my view. FAO figures on "permanent pastures" are highly problematic, and it is almost impossible to judge where livestock grazing is important/absent based on land-cover data resulting from remote sensing. While it is possible to intensify grazing areas/mowed meadows, there may be important ecological and economic constraints involved in doing so. I think these uncertainties should be mentioned here. FAO's study "livestock's long shadow" may be helpful here, as well as a recent study from our institute (Journal of Land Use Science 2(3), 191-224.) The fact that areas assumed to be available for bioenergy production are actually used, and required, to feed livestock is a major constraint for bioenergy potentials that is currently only poorly understood (see http://www.uni-klu.ac.at/socec/downloads/WP116_WEB.pdf for at least some information on that)"	In the revised text there will be a new section concerning agricultural intensification, where this will be taken up.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	21	30	22	31	2.2.4.2	-	-	I think that the above-quoted study (Environmental Research Letters, 4, 014004-doi:10.1088/1748-9326/4/1/014004) might be helpful in improving that section	See comment on 429 higher up.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	21	30	-	-	2.2.4.2	-	-	I think this section should start with an explanation of the general nature of restrictions of that kind, instead of starting with options to overcome these restrictions before they are explained.	Noted for revisions.
Jannuzzi (University of Campinas)	2	21	-	22	-	2.2.4.2	-	-	intensification in agriculture and forestry will be done also at the expense of more use of fertilizers and pesticides. What are the indications of the greater demand of these inputs. What are the prospects of availability of nutrients, their and costs. Also the potential the competition with food crops for fertilizers and pesticides?	Unclear what the reviewer suggests, these topics are mentioned and citations are given, with reference to 2.5, where impacts are discussed in more detail; in the revision there will be a more dedicated section on intensification potentials, though not an impacts, which will remain in 2.5
Fulton (Deutsche Bank)	2	22	14	-	-	-	-	-	"DBCCA found that infrastructure needs vary across geographies, and local governments need to provide infrastructure support in order to raise productivity. Source: DBCCA, "Investing in Agriculture: Far-reaching Challenge, Significant Opportunity," June 2009, see page 62-64 (www.dbcca.com/research). See SRREN_Draft0_Review_Fulton_Mark_Material_05.pdf"	True, but does not need to be mentioned explicitly here
Fulton (Deutsche Bank)	2	22	19	22	31	-	-	-	"Suggested Citation: Source: DBCCA, "Investing in Agriculture: Far-reaching Challenge, Significant Opportunity," June 2009, see page 41-44 (www.dbcca.com/research). See SRREN_Draft0_Review_Fulton_Mark_Material_05.pdf"	Reviewer suggests to cite reviewer; citation was already noted elsewhere for study and potential consideration

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Kahiluoto (MTT Agrifood Research Finland)	2	22	1	22	8	-	-	-	"There are several possible agricultural management strategies, which have different externalities and different relation between biomass yield and climate change mitigation potential. See the former comment! L. 5 to 8: ""□.such as eutrophication () and biodiversity (Vandermeer, J. H., and I. Perfecto. 2005. The future of farming and conservation. Science 308:1257□1258; Vandermeer, J, perfecto, I, 2007 The agricultural matrix and a future paradigm for conservation Conservation Biology 21: 274-277). ""	No disagreement here, noted for revisions
Titus (Natural Resources Canada, Canadian Forest Service)	2	22	8	-	-	-	-	-	Add reference to anoxic 'dead' zones in oceans, which are perhaps one of the most extreme examples of the impacts eutrophication	Noted for revisions.
Hakala (MTT Agrifood Research Finland)	2	22	31	22	31	-	-	-	Add text: However, political and societal issues in large areas in developing countries may prevent benefiting from this potential.	Mentioned sufficiently throughout the text, does not improve text here.
Titus (Natural Resources Canada, Canadian Forest Service)	2	22	19	22	20	-	-	-	Does the following report contain any quantitative information on agriculture that is relevant? EEA (2006) How much bioenergy can Europe produce without harming the environment? Report No. 7/2006	Noted for revisions.
Titus (Natural Resources Canada, Canadian Forest Service)	2	22	17	-	-	-	-	-	grazing land can experience'?	Wording changed to "undergo"
Marques (The Plantar Group)	2	22	41	22	44	-	-	-	Improve the balance of the text. Bioenergy plantations may or may not lead to falling groundwater, depending on management.	Increased productivity requires increased transpiration, this link cannot be broken by management, only optimised. Text already says "can".
Titus (Natural Resources Canada, Canadian Forest Service)	2	22	19	22	20	-	-	-	It can be deduced from Table 4.2 in EEA (2006) How much bioenergy can Europe produce without harming the environment? Report No. 7/2006 that, based on the soils criteria the authors chose, some 60% of forest harvesting residue is available for removal for bioenergy feedstock □ but this does not take into account biodiversity concerns. So far, this is the only large-scale analysis like this that provides some kind of quantitative analysis, and it would be good to quote it here to remind policy makers that biomass inventory net-downs of at least 40% for this source of biomass would be reasonable. See also comments on this by Titus et al. (2009) Science 324: 1389-1390.	Noted for revisions, but impacts are mainly discussed in 2.5
Kahiluoto (MTT Agrifood Research Finland)	2	22	14	22	18	-	-	-	I. Reference to the regionally varying climate change impact on biomass potential would be appropriate (see e.g., Jones, P.G. and Thornton, P.K. 2009. Croppers to livestock keepers: Livelihood transitions to 2050 in Africa due to climate change. Environmental Science and Policy 12: 427-437)	Noted for revisions.
philippe (international institute for water and environmental engineering)	2	22	1	8	-	-	-	-	larger crops yield increased is not linear with residues increase. Genetic improvement also generally correspond to less residues. the crop to residue ratio is not constant	Yes, but this section of the text does not discuss residues but intensification of food production to reduce the food production area to the benefit of bioenergy potentials
philippe (international institute for water and environmental engineering)	2	22	29	-	-	-	-	-	provide figure to illustrate the tropical country contribution is it 30 %, 60% or more?	The plan is to add biomass potential figures for woody/perennial types that will show that to Fig 2.2.3
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	22	40	22	45	-	-	-	TO INCLUDE UNDERGROUND WATER - CONTAMINATION	Noted for revisions.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Smith (McGill University, Macdonald Campus)	2	22	16	22	18	2.2	-	-	Beyond just land degradation there are some other concerning resource limitations that could strongly restrict biomass use for biofuels, and even food production, by the middle of this century. Overall energy limitations, if they actually occur, will mean higher energy prices which will drive up the price of nitrogen fertilizer. If nitrogen prices become high enough to put it out of reach for production of, for instance, field crops, this will mean reductions in total output of food and, in order to build alternative nitrogen sources (largely legume-based biological nitrogen fixation) into crop production systems, would mean substantial changes in rotation practices and general reorganization of our crop production systems. However, if the situation on the nitrogen side is concerning, it is probably more dire where phosphorus is concerned. Phosphorus is non-renewable resource and peak extraction of this resource is projected for sometime between 2030 and the middle of this century. This needs to be addressed as soon as possible! Probably the only practical way to do this is to begin recycling nutrients as soon as we reasonably can. This situation might make biofuel development important for another reason. For instance, biogas could be produced from human waste (mentioned on line 22 of page 35) and sales of the resulting biofuels could be used to underwrite the costs of recycling the nutrients that could be extracted from the sludges remaining after biogas production.	Statements are true and authors are aware of this, but does not merit detailed discussion in this section; noted for revisions.
Smith (McGill University, Macdonald Campus)	2	22	20	22	45	2.2	-	-	Increases in atmospheric CO2 will, for many plant species, result in reduced plant transpiration rates so that less water is lost per unit of biomass produced (improved water use efficiency).	Noted for revisions.
Treber (Germanwatch)	2	23	26	-	-	-	-	-	A general assumption of lower yields in alternative cropping systems is not consistent particularly for multi-crop systems.	Yes, that is true, noted for revisions.
Kahiluoto (MTT Agrifood Research Finland)	2	23	7	23	10	-	-	-	Are these figures in line with the figures shown in Table 2.2.2. - there Africa had a high share of the potential? Is the climate change impact taken into account here?	No, the numbers are not in line, as there is a variety of studies with a varieties of effects included and assumptions made, with no consensus or best projection; so the chapter has to report a variety of findings from the literature, with clear explanations. Here the focus is on studies that emphasize the water aspect. Conformity across published studies cannot be found, unfortunately.
Hakala (MTT Agrifood Research Finland)	2	23	18	23	19	-	-	-	Biodiversity does not limit potential, on the contrary. Change: measures taken to protect biodiversity in potentially available production areas may limit full exploitation of the available biomass potential.	Yes, and we think the text says that.
SCOWCROFT (EURELECTRIC)	2	23	41	23	43	-	-	-	Differences in the severity of biodiversity protection between IPCC scenarios have a larger impact on bioenergy potential than either irrigation or climate change. OK.	Yes.
Vahrenholt (RWE Innogy GmbH)	2	23	41	23	43	-	-	-	Differences in the severity of biodiversity protection between IPCC scenarios have a larger impact on bioenergy potential than either irrigation or climate change. OK.	Yes.
Verduzco (Chevron Corporation)	2	23	7	-	10	-	-	-	Does this assessment of water scarcity include considerations of expected changes in water availability due to climate change?	Will be checked.
Marques (The Planter Group)	2	23	30	23	36	-	-	-	Refer to the potential of developing ecological corridors (native fauna corridors interlinking plantation areas) See Scolforo 2008 for a reference on ecological corridors in forest plantations. This could also be developed for other energy crops, as a way of managing biodiversity.	Does not need to be discussed in this section, this belongs to the mainstream of biodiversity conservation strategies.
Sims (Massey University)	2	23	31	-	-	-	-	-	Suggest avoid 6th level numbering - just sub heading OK.	This is the plan for SOD.
SCOWCROFT (EURELECTRIC)	2	23	27	23	29	-	-	-	Yield increase for food crops in general has a more substantial impact on bioenergy potentials than yield increase for bioenergy crops specifically. OK.	Yes.
Vahrenholt (RWE Innogy GmbH)	2	23	27	23	29	-	-	-	Yield increase for food crops in general has a more substantial impact on bioenergy potentials than yield increase for bioenergy crops specifically. OK.	Yes.
Ballestero (National Meteorological Institute)	2	23	37	23	39	2.2.4	-	-	It has to be considered that in some countries there are laws to protect natural ecosystems from converting them into agricultural or grazing lands	True, but obvious and not relevant or contradictory here, eg the WBGU study cited includes part of that.
Gorissen (Flemish Institute for Technological Research)	2	23	-	-	-	2.2.4	-	-	Why only mention biodiversity constraints and not constraints related to ecosystem resilience? A comprehensive review would require incorporating these as well.	Noted for revisions, will add short note in this direction.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
McCormick (International Union for Conservation of Nature (IUCN))	2	24	6	-	-	-	-	-	"Biomass for energy can be increased based on increased use of also ""animal manures and the organic fraction of municipal solid waste""	This is not the intention of this particular statement; but manures added
Titus (Natural Resources Canada, Canadian Forest Service)	2	24	7	24	9	-	-	-	"Bullet isn't entirely clear because 'depends' introduces some ambiguity. It is also rather threatening in tone because 'depends' implies that if there is not increased intensive management then there will not be a strong future potential □ suggesting that current potential is 'weak'; is this true? Are there less pejorative and more neutral words that could be used, such as 'function of' rather than 'depends', and 'increased' rather than 'strong'?"	Don't understand why "depends" introduced ambiguity, and yes, without intensification the potential is lower. But will check for neutral expressions here and throughout.
Titus (Natural Resources Canada, Canadian Forest Service)	2	24	7	24	9	-	-	-	"Describing environmental sustainability as a 'constraint' or a 'restriction' is pejorative; use a neutral term. "	Depends on context, but is noted and will be considered throughout the whole chapter; here, "considerations" is now used, and then "constrain" instead of "restrict" - "Constrain" is not necessarily pejorative.
Titus (Natural Resources Canada, Canadian Forest Service)	2	24	6	-	-	-	-	-	"Needs caveat for environmental sustainability that reflects biophysical capability; perhaps something like: '□residues, respecting the biophysical capability of the landbase that assures environmental sustainability.'"	Was already discussed sufficiently in earlier text.
philippe (international institute for water and environmental engineering)	2	24	5	6	-	-	-	-	assumption not really demonstrated	Will be reviewed for revisions; the statement is not the problem, perhaps clarity of reference. The word "strongly" will be reviewed.
Titus (Natural Resources Canada, Canadian Forest Service)	2	24	2	24	3	-	-	-	Change to 'numbers is not yet possible'. Any comment on importance of this topic, to encourage policy makers to invest in the research needed to refine biomass resource assessments? Perhaps: '□is not yet possible, and further research is required to define this fundamental underpinning of a sustainable bioenergy sector'	This is not possible even with more research because this is about tradeoffs and priorities that do not have "one solution", it is a matter of how societies want to balance nature protection, climate protection and food security; there will never be a distinct number but only options with different consequences between which decisions have to be made.
Popp (PIK)	2	24	5	24	6	-	-	-	I do not agree with this conclusion. On p.21, l. 25, you state that residue potentials are uncertain. So how do come to this conclusions (strongly increased?)	The magnitude of the potential is uncertain, but not that there is a potential for increase.
philippe (international institute for water and environmental engineering)	2	24	10	13	-	-	-	-	I do not understand the relation of higher potential of lignocellulosic crops to compare to conventional crops	See explanations earlier in the chapter on potentials
Titus (Natural Resources Canada, Canadian Forest Service)	2	24	7	24	9	-	-	-	Is this 'agricultural energy crops'?	Any bioenergy production. Wording improved for revisions.
Sims (Massey University)	2	24	15	-	24	-	-	-	Needs refes	This is a summary, references in the previous text being summarised here.
Titus (Natural Resources Canada, Canadian Forest Service)	2	24	1	24	24	-	-	-	Nothing on managed forests in this sub-section, including increased productivity through more intensive management? Or are managed forests un-important, in the overall picture?	This was noted for SOD, and a forestry expert invited as CA for this purpose.
Titus (Natural Resources Canada, Canadian Forest Service)	2	24	7	24	9	-	-	-	Overall, this is an ambiguous and potentially pejorative bullet. It is essential that summary sections of Chapter 2 and their bullet lists be concise, neutral in tone and unambiguous □ because these are where policy-makers are likely to focus their attention. Perhaps something like 'Increased intensive but environmentally sustainable agricultural management systems offer the greatest potential for increased bioenergy production from agricultural crops over the short (X years) to medium (Y years)'?	Noted for revisions; do not quite see the problem as strongly, but many reviewer comments suggest a revision is needed here!
Shi (Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry)	2	24	17	-	-	-	-	-	Please add some content about the constraint of biodiversity	Noted for revisions.
Kahiluoto (MTT Agrifood Research Finland)	2	24	7	24	9	-	-	-	See comments on p. 21, 22.	And was treated there ...
Kessels (International Energy Agency Clean Coal Centre)	2	24	1	24	29	-	-	-	There is missing in this section an assessment of the biofuel yields per hectare for selected feedstock, see Pike, 2009 Royal society of chemistry lecture	This section is about global potentials and the yield potentials are being discussed.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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de Campos Barbosa (Petrobras)	2	24	10	24	13	-	-	-	This text seems truncated.	Not to us.
TEIXEIRA COELHO (INSTITUTE OF ELETROTECHNICS AND ENERGY USP)	2	24	2	-	-	-	-	-	TO DISCUSS ENVIRONMENTAL ZONING	Not the topic of section 2.2
Titus (Natural Resources Canada, Canadian Forest Service)	2	24	7	24	9	-	-	-	What is 'short to medium term', in approximate years?	Methods are discussed earlier.
Smith (McGill University, Macdonald Campus)	2	24	38	24	38	2.2	-	-	For many of the perennial grasses, once established, a stand can last for 20 to 30 years. This is also likely to be true for short rotation (only a few years between harvests) plantation forestry crops.	Not in contradiction to text
Smith (McGill University, Macdonald Campus)	2	24	10	24	13	2.2	-	-	The persistent root systems of perennial lignocellulosic crops can substantially improve degraded soils.	Yes, but this does not have to mentioned here and is actually even implied
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	24	3	24	4	2.2.5	-	-	"The review preceding this summary does in my view not at all justify the conclusion that ""it is clear that several hundred EJ per year can be provided for energy"" by using the biomass resource potential. If one considers the most recent studies (WBGU, van Vuuren, http://www.uni-klu.ac.at/socec/downloads/WP116_WEB.pdf), an order of magnitude around 100 EJ/yr (excluding forestry) or some 150 EJ/yr if forestry, animal manures and MSW are included seems a lot more reasonable than the 400 EJ suggested on p 5."	Point taken, but it is precisely the purpose of this chapter to review available science on this question, and this is the summary of evidence found in the literature. Individual authors and reserachers may come to their own conclusions. The lower potentials are mentioned throughout as very possibly the limit, but some studies see y higher potential.
Londo (Energy research Centre of the Netherlands)	2	24	9	24	9	2.2.5	-	-	energy crop cultivation' or crop cultivation in general?	Any, and text was ammended
Londo (Energy research Centre of the Netherlands)	2	24	17	24	9	2.2.5	-	-	I'd say a remark on biodiversity-induced limitations would also be appropriate here.	Noted for revisions.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	24	17	-	-	2.2.5	-	-	In my view, biodiversity, maintenance of healthy ecosystems, and avoidance of soil degradation deserve 2-3 additional bullets here, in particular in the light of the material preceding that summary.	Noted for revisions.
Londo (Energy research Centre of the Netherlands)	2	24	1	24	24	2.2.5	-	-	May be an overview table, such as included in Dornburg et al (2008) would be informative here.	Not possible to dublicate text on tables due to space limitations.
Smith (PNNL)	2	24	-	-	-	2.2.6	-	-	"Another uncertainty is the nutrient requirements for high-yield biomass crops. Fertilizer application will cause N2O emissions and consume energy in production. There is little sense of scale given for the various effects discussed in this section. For example, it should be made clear that the most important assumption is future ag productivity. If agricultural productivity continues to increase at historic rates then it is likely that substantial land will be available for bioenergy crops (and residues increase as well). If ag productivity grows only slowly, then little land will be available."	GHG balances will be treated in detail in 2.5. Agricultural productivity was dicussed earlier in the chapter, and will receive more attention in the revision to SOD
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	24	25	27	16	2.2.6	-	-	"In my view, an understanding of the interdependencies (synergies and trade-offs) between food, feed, fibre and bioenergy systems deserve an own subsection. Research needs include minimum requirements of residues left on the field in order to maintain soil fertility, and in particular the whole livestock-grazing-grazing area complex. These issues are extremely poorly understood and require targeted efforts that could help to improve ""biomass utilization cascades"" (see Land Use Policy 20(1), 21-39; Ecological Engineering 16(Suppl.), S111-S121). Integrated optimization of food and bioenergy systems could be a way forward to achieve higher output of bioenergy and food with lower environmental impacts, i.e. higher sustainability. Exploring these potentials seems extremely high on the agenda and should therefore be discussed in an additional subsection."	Yes, the tradeoff aspect needs more emphasis. Noted for revisions.
McCormick (International Union for Conservation of Nature (IUCN))	2	24	-	-	-	2.2.6	-	-	there is also the potential of reusing nutrients content in treated wastewater and the reuse of treated wastewater itself for irrigation of energy crops, provided it has comply with quality standards for preventing groundwater and soil contamination (i.e. WHO quality standards for reusing wastewater)	Noted for revisions.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Fulton (Deutsche Bank)	2	25	33	-	-	-	-	-	"DBCCA found that GM crops have only really penetrated the developed world and only marginal in the developing world. Some regions of the world will, similar to the case with nuclear energy among renewables, look at developing this sector within a robust regulatory framework. Source: DBCCA, ""Investing in Agriculture: Far-reaching Challenge, Significant Opportunity,"" June 2009, see page 69-74 (www.dbcca.com/research). See SRREN_Draft0_Review_Fulton_Mark_Material_05.pdf"	Plant breeding and dev countries is mentioned but might be elaborated a few sentences more?
Pálvölgyi (Budapest University of Technology and Economics)	2	25	31	25	33	-	-	-	"It should be mentioned that some EU member states (ie. Hungary) are declared as ""GMO free"" area (i.e. GMO crops are not allowed)"	Ok
Titus (Natural Resources Canada, Canadian Forest Service)	2	25	35	-	-	-	-	-	Change to something like: 'intensifying conventional forest management to increase' or 'traditional forest management'	Consider editing text
Shi (Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry)	2	25	31	-	-	-	-	-	GMO:definition missing	Add definition or refer to technology section
Hakala (MTT Agrifood Research Finland)	2	25	15	25	16	-	-	-	Meaninfg of sentence not clear. Missing words?	No words missing but will be revised.
Marques (The Plantar Group)	2	25	35	25	37	-	-	-	Mention short-rotation forests as well.	Line confusion? Where add SRF
Titus (Natural Resources Canada, Canadian Forest Service)	2	25	17	-	-	-	-	-	Modify heading to 'modification of agricultural crops' or add comments on forest species, plantations, and SRWC	Propose: keep heading and develop the text in as proposed by reviewer. But we need to harmonize with technology section to avoid overlap.
Verduzco (Chevron Corporation)	2	25	15	25	16	-	-	-	Rephrase this sentence.	Noted for revision.
Kaup (Potsdam Institute for Climate Impact Research)	2	25	17	25	33	-	-	-	Suggestion to add new crops to that section 2.2.6.3 not onyl breeding and modification but there are as well other promising crops as latropha was rarely know either. New crops to look into could be: moringa olifeira (especially degraded land and other uses of leaves and seeds) <input type="checkbox"/> pongamia (fitting plant for degarded land)	Maybe more relevant for technology sectoin
Somogyi (Hungarian Forest Research Institute)	2	25	34	-	37	-	-	-	This section is way too short. Unless new plantations are established, the source of any substantial increase of biomass from forests must come from managed forest lands, thus, discussing potentials and constraints from these lands must be much more considerable. For example, the State of European Forests 2007 report of MCPFE (www.mcpfe.org) discusses the increment versus harvest rates and related issues that must be covered here.	It seems that the discussion of forest biomass as a significant biomass source is considered too short in section 2.2. This might be improved when we include examples of regional studies?
Smith (McGill University, Macdonald Campus)	2	25	5	25	6	2.2	-	-	Although this is a side issue, the production of highly productive tropically adapted crops in developing countries could allow them to, at least in part, escape from the corrosive economic effects of western agricultural subsidies. This could meaningfully increase the productivity of agricultural systems in these countries, leading to more food and fuel availability and improving the standard of living for citizens, particularly rural citizens, of developing nations.	Yes, important, but a side issue for this particular text here.
Smith (McGill University, Macdonald Campus)	2	25	39	25	42	2.2	-	-	As outlined above, there is a need to overhaul our crop production systems so that they are low-input, or at least lower-input, and are integrated into a larger society-wide nutrient recycling process.	Many comments ask for more discussion of the environmental consequences of introducing lignicellulosic energy crops into the agri landscape. Should it be treated more and if so: here or in technology or environment sections?
Smith (McGill University, Macdonald Campus)	2	25	23	25	33	2.2	-	-	In general, at least at this time, genetic engineering focuses on single traits that may, or may not, contribute to overall biomass production (biomass yield). However, one hopes that genetic engineering will become more broadly effective at time goes by. Plant breeding, on the other hand, selects for increased yield under the field conditions where the crop will be grown. All-in-all, a careful blend of genetic engineering and plant breeding are probably what is needed, but breeding is probably the more important of these two activities.	The comment may be relevant for technology section

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Londo (Energy research Centre of the Netherlands)	2	25	18	25	33	2.2.6.3	-	-	<p>Some nuancing remarks seem appropriate here:</p> <ul style="list-style-type: none"> - as mentioned earlier in the document, yield improvements for food crops are more influential to energy crop potentials than yield improvements of energy crops specifically. However, plant breeding for food crops already has a long history, and massive improvements may be hard to realise. - many yield improvements in food crops have not significantly increased total biomass yields, but mostly led to shifts in biomass composition shares towards the desired product (more grain seeds, less straw, e.g.). More improvements along this line have the downside that residue flows for bioenergy may decrease. - As it is relatively difficult to substantially increase overall biomass yields by breeding, the prospects of improving productivity of 'whole-crop' energy crops may be significantly less than what was reached for food crops in the past decades. " 	Check section 2.2.6.3. Göran did and found it ok, i.e., not overstating potentials of plant breeding
Gorissen (Flemish Institute for Technological Research)	2	25	-	-	-	-	2.2.6.5	-	Incomplete. Please include 'combined food, energy and ecosystem services' concepts. See: Porter j., Costanza R., Sandhu H., Sigsgaard L. and Wratten S.. The value of producing food, energy and ecosystem services within an agro-ecosystem. <i>Ambio</i> 2009, 38: 186-193.	We could surely write a book on ecosystem services in agri & forestry landscapes. Needs to be discussed how much this topic can be elaborated. Also has bearing on section 2.5
Fulton (Deutsche Bank)	2	26	40	-	-	-	-	-	"DBCCA found that degraded crop and pasture lands can be brought into production of bioenergy crops. Source: DBCCA, ""Investing in Agriculture: Far-reaching Challenge, Significant Opportunity,"" June 2009, See page 65-68 (www.dbcca.com/research). See SRREN_Draft0_Review_Fulton_Mark_Material_05.pdf"	Consider adding the proposed reference. But seems not to be peer reviewed publication
Kahiluoto (MTT Agrifood Research Finland)	2	26	13	26	21	-	-	-	Examples of these would be welcome!	Unclear: line confusion? Does the reviewer refer to "...large area of degraded soils – classified as light and moderately degraded and covering about 10% of the total land area...?"
philippe (international institute for water and environmental engineering)	2	26	13	-	-	-	-	-	many plantation provide water services It is true they may but not as spread as the author suggest	Control so that the text does not give the impression that plantation establishment for the purpose of providing water related environmental services is very widespread.
Treber (Germanwatch)	2	26	40	-	-	-	-	-	Please add: statistics of degraded land tend to ignore non-commercial use by smallholder farmers and herders, thus igniting land right born conflicts.	This is treated in 2.5 but might be added here also?
philippe (international institute for water and environmental engineering)	2	26	37	-	-	-	-	-	productivity of marginal land would be very limited unless high investment it is not a possible drawback but a real economic limit of their potential	This is also what we write in section 2.2.6.6. Marginal / degraded land is vague and cover land of very different productivity level. This may need to be explained more carefully in section 2.2 somewhere? Some marginal/degraded lands are difficult to make economic use of but othermarginal/degraded areas are less problematic. One examples is pastures lands in Brazil that is used for sugarcane plantations.
Gorissen (Flemish Institute for Technological Research)	2	26	8	-	-	-	-	-	Reference of synergies and multiple benefits is: Connections between MASLM and the Climate Change and Biodiversity Conventions Ch7 Volume II in □Understanding Desertification and Land Degradation Trends□, White Papers for the First UNCCD Scientific Conference, Buenos Aires, Argentina 22-24 September 2009, This white paper will also be published in a peer-reviewed journal. For more information contact: [Annette.Cowie@une.edu.au]	Get info from Annette Cowie. Göran can do that
Kahiluoto (MTT Agrifood Research Finland)	2	26	32	26	35	-	-	-	Reference useful for the share. Very varying classifications for degraded land appear.	Reference for which share? Line confusion. See also comment 576
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	26	3	-	-	-	-	-	TO INCLUDE ILUC	iLUC is treated in 2.5
Smith (McGill University, Macdonald Campus)	2	26	31	26	40	2.2	-	-	Biochar may be able to upgrade degraded soils, or be added to other soils to replace biomass (crop residue) removed for biofuel production. The residence time of soil organic matter resulting from crop residues is on the order of decades, while the residence time of biochar is on the order of millennia, so that biochar additions could allow greater crop residue removals, and make more land available for food for fuel production.	This is all true but is section 2.2 the right place to discuss biochar applications? Shold in that case be 1-2 sentences. Can be technology section + brief mentioning in section 2.5?

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Smith (McGill University, Macdonald Campus)	2	26	3	26	12	2.2	-	-	If all the land currently being used to produce corn for ethanol production were converted into lignocellulosic perennial crops for biofuel production this would greatly improve the soils these crops are being grown on and would reduce greenhouse gas emissions associated with biofuel crop production.	Consider if effects from LUC from conventional crops to lignocellulosic crops is insufficiently treated. This aspect should also be treated in section 2.5
Kaup (Potsdam Institute for Climate Impact Research)	2	26	-	-	-	2.2.6.5	-	-	in section 2.2.6.5. there could be added that there are so called phyto decontamination projects. The idea is to decontaminate former arable now toxic areas as for example in Tschernobyl	Berndes 2008 includes phytoremediation as one of many examples of additional services that can be provided by bioenergy plantations. We can add references for specific such services if this is considered an improvement that justifies using more space. It was kept short in this section based on presuming that the technology section would elaborate more.
Londo (Energy research Centre of the Netherlands)	2	26	37	26	38	2.2.6.6	-	-	Analysis has been done: please include reference and clarify sentence.	Not clear what the comment is. May check with Marc for clarification
philippe (international institute for water and environmental engineering)	2	27	10	16	-	-	-	-	I would eliminate this example as not sufficiently developed and normally discussed in section 2.5	Noted for discussion during revision.
Verduzco (Chevron Corporation)	2	27	27	27	28	-	-	-	"Biomass production also includes harvest and preprocessing. This section is named ""feedstock production or recovery"". Proper harvesting techniques that minimize the number of passes are important for sustainability. Pre-processing methods such as baling are key to recovering more biomass from the fields."	OK, title will be changed accordingly
Popp (PIK)	2	27	42	-	-	-	-	-	do you talk about miscanthus here? Miscanthus is also seen to be best harvested after more than 1 year (5-6yrs) so it should be included in the next group?	Miscanthus does have an establishment phase, but may be harvested as soon as 2 years after plantation (so definitely unlike short-rotation forestry).
Verduzco (Chevron Corporation)	2	27	10	27	10	-	-	-	Explain what scenarios were developed by Melillo et al. - general assumptions.	Detailed discussion not intended here.
Marques (The Plantar Group)	2	27	36	27	42	-	-	-	Insert here the differentiation between renewable and non-renewable charcoal, as per comment # 1	Definition will be inserted
Popp (PIK)	2	27	42	-	-	-	-	-	perennial grasses per se are not annual species	Confusion: the sentence expresses that perennial grasses may be harvested ANNUALLY. Text will be clarified.
Popp (PIK)	2	27	42	27	24	-	-	-	Please give a citation for 'The use of synthetic fertilizers is considerably less intensive than on agricultural species.'	Nabuurs et al. Reference should support this (but will be checked)
Verduzco (Chevron Corporation)	2	27	24	27	26	-	-	-	This categorization of biomass feedstocks is slightly different from 2.2.1.1 (page 10). Please make them consistent.	Most of section 2.3.1. will be merged with 2.2.1 (on resource potential), and the typology harmonized
McCormick (International Union for Conservation of Nature (IUCN))	2	28	32	-	-	-	-	-	""wastewater treatment plants"" instead of water treatment plants"	OK, will be corrected
Marques (The Plantar Group)	2	28	11	28	28	-	-	-	"Insert potential of charcoal fines as a significant source of ""residues"", which is already becoming a co-product for some sectors, e.g. iron and cement, and can also help develop biochar techniques."	Biochar is not really an energy product, and is out of scope of the technology section. Biochar as a by-product of charcoal may be cited through the co-benefits it provides in section 2.5.
McCormick (International Union for Conservation of Nature (IUCN))	2	28	37	-	-	-	-	-	"instead of - evolved into - I suggest "" produce"""	OK, will be corrected
McCormick (International Union for Conservation of Nature (IUCN))	2	28	33	-	34	-	-	-	"instead of manure I suggest ""fertilizer"""	Manure refers to 'organic fertilizers' in general, and is more specific than fertilizers.
Rosinski (Electric Power Research Institute)	2	28	1	28	2	-	-	-	"The difference between lignocellulosic ""power"" and ""bioelectricity"" needs to be clarified"	Both are the same; we will use bioelectricity throughout to avoid confusion.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
philippe (international institute for water and environmental engineering)	2	28	19	-	-	-	-	-	33 and 80% of Processing residues' this figure normally should belong to the next type	See 597
Hakala (MTT Agrifood Research Finland)	2	28	6	28	6	-	-	-	Add reference: Hakala et al. 2009.	Reference will be examined and cited if relevant
Popp (PIK)	2	28	10	-	-	-	-	-	As far as I know is Nabuurs author of the forestry part of IPCC. So why do you relat these values to cropland, too?	A separate reference will be given for processing residues, and phrasing will be clarified.
philippe (international institute for water and environmental engineering)	2	28	35	-	-	-	-	-	fertilizer instead of manure?	similar to above
Popp (PIK)	2	28	5	28	10	-	-	-	Furthermore, increasing demand for livestock products will exacerate the demand for residues form this sector. You do not discuss this competitive effect at all...	This is true, but future trends are not covered here (current technology). This fact may be mentioned in the potentials section (2.2).
Popp (PIK)	2	28	9	28	10	-	-	-	in 2.2.1 you mention tha residues from forestry vary between 0 and 100. What is true?	Section 2.2.1 does not explicit mention this 0-100% range. The range from Nabuurs et al corresponds to a global average, but naturally the extraction rate of forest residues is to be managed on a case to case basis.
Popp (PIK)	2	28	9	28	10	-	-	-	Lal 2005 'World crop residues production and implications of its use as a biofuel' in Environment International states that even a partial removal (30-40%) of crop residue from land can exacerbate soil erosion hazard, deplete the SOC pool, accentuate emission of CO2 and other GHGs from soil to the atmosphere, and exacerbate the risks of global climate change.	The Lal et al paper offers poor experimental evidence in support of that statement. We quote other, more recent and better documented literature on that topic in section 2.2.4.1. Sections 2.3 and 2.2 will be aligned from that point of view. Sustainable removal rates should be defined on a site-specific basis and not generalized as in Lal et al (2005).
Titus (Natural Resources Canada, Canadian Forest Service)	2	28	11	28	19	-	-	-	No forestry examples?	OK, an example will be added.
Popp (PIK)	2	28	3	-	-	-	-	-	pleas mention how it could be densified: charcoal?	This is a general statement – details on pre-treatments cannot be provided here (reference to section 2.3.2. on logistics will be added).
de Campos Barbosa (Petrobras)	2	28	22	28	23	-	-	-	Residues availability seems not more difficult to predict than other agricultural variables used here. Sentence isn't referenced.	Paragraph will be merged with 2.2.4.1. and sentence erased.
SCOWCROFT (EURELECTRIC)	2	28	9	-	-	-	-	-	Value for recoverability of logging residues from 25 to 50% very high.	Duplicate of 593
Vahrenholt (RWE Innogy GmbH)	2	28	9	-	-	-	-	-	Value for recoverability of logging residues from 25 to 50% very high.	Range will be checked in Nabuurs et al report.
Klein (PIK)	2	28	39	-	-	2.3.	-	-	""first-generation"" is used the first time"	Reference to subsection on conversion technology will be added.
Londo (Energy research Centre of the Netherlands)	2	28	1	5	29	2.3.1	-	-	It's a bit confusion to find this bold feedstock type headers in the technology section, not the feedstock section. Text can mostly be transported to 2.2 or deleted, unless technology-relevant.	Agree. Most of this text will be merged with 2.2.1
Verduzco (Chevron Corporation)	2	29	36	29	38	-	-	-	"Rephrase to clarify. What is ""they""? Are you referring to higher revenues?"	Will be rephrased (they = bioenergy projects)
Titus (Natural Resources Canada, Canadian Forest Service)	2	29	15	29	38	-	-	-	"There are a few sentences on agroforestry, perennial species, and mixed cropping systems; are a few sentences on the forestry sector warranted?"	Interactions between energy and forest sectors will be illustrated to make section more comprehensive.
Hakala (MTT Agrifood Research Finland)	2	29	11	29	11	-	-	-	Add references: Graham et al. 2007, Wilhelm et al. 2007, Lafond et al. 2009	Reference to section 2.2.4.1 (where this discussion is expanded and the Wilhelm reference cited) will be included. The other references will be examined and included if relevant.
Popp (PIK)	2	29	27	-	-	-	-	-	biodiversity: There are also other papers out there that state the contrary	Statement is mitigated, and reference to section 2.5.3.3. addressing biodiversity with a larger scope

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Titus (Natural Resources Canada, Canadian Forest Service)	2	29	15	29	38	-	-	-	Could break this up with paragraphs, starting at 'Agroforestry□', 'Perennial species□' and 'Mixed cropping systems□'	OK, paragraph will be expanded (as asked by other reviewers), and structured as suggested.
philippe (international institute for water and environmental engineering)	2	29	2	-	-	-	-	-	delete 'and bioelectricity'	OK, will be corrected
Verduzco (Chevron Corporation)	2	29	1	29	2	-	-	-	Lignocellulose can be converted to liquid biofuels. Current technology can make this conversion technically feasible, although it is more expensive than converting some oil, sugar and starch crops.	Second-generation biofuels is considered as a technology under development (and addressed as such in section 2.6). This section deals with currently commercial technologies
Titus (Natural Resources Canada, Canadian Forest Service)	2	29	15	29	17	-	-	-	No forestry example? Perhaps 'wood chips for pulp and paper vs. energy production'?	same as above. Example is relevant.
Popp (PIK)	2	29	19	29	38	-	-	-	The title is named as: Interactions. However, most of the text discusses synergies. So I suggest to either (i) rename the title into: Synergies or (ii) discuss also negative effects in this section	Possible negative impacts (eg on biodiversity) will be included.
Verhoest (LABORELEC)	2	29	11	29	13	2.3.1.1	-	-	Not valid for all soils. Depending on soil type and initial heavy metals, nitrogen content, and on ash chemical composition and conditioning, Reference: Maria Zevenhoven, The Utilisation of Biomass Ash, May, 2001, □O AKADEMI, FACULTY OF CHEMICAL ENGINEERING Process Chemistry Group	OK, this condition will be made explicit.
LEITE DRACHMANN (PETROBRAS)	2	29	4	29	7	2.3.1.1	-	-	It is not true that biofuels production always compete with land for food production. It is possible to have an integrated production of different feedstocks even with an increase on their yield. Some examples may be found in Brazil, such as Irec□region, Bahia State, castor beans (which oil is used for biofuels production) is cultivated in association with Caupi beans (food product). This region is the major producer in Brazil of both Caupi and castor beans, even being a low rainfall region.	True. This is addressed in the 2.3.1.2. section (hence the 'may'), where this example may be included if references are found.
Londo (Energy research Centre of the Netherlands)	2	29	15	29	38	2.3.1.2	-	-	Again, why all this info (which is partly overlapping with 2.2 material) here?	Answered in 582.
Ballesterio (National Meteorological Institute)	2	29	20	-	23	2.3.1.2	-	-	Agroforestry has been mentioned as good option but, what are good combinations, a what densities? It should be good idea to point out some of them.	Detailed example will be provided, space permitting.
Kahiluoto (MTT Agrifood Research Finland)	2	29	-	-	-	2.3.1.2	-	-	The topic is important and challenging, but the section is unclearly written. It could be more structured, and at least divided in several paragraphs, and checked for comprehensiveness and best references.	Elements from 2.2.6.5. will be incorporated to make section more comprehensive, and paragraphs
Kruger (South African Weather Service)	2	29	45	29	46	2.3.1.2	-	2.3.1	"The ""+"" symbols should be explained in the caption."	Explanation (key) will be provided
SCOWCROFT (EURELECTRIC)	2	30	0	-	-	-	-	-	Price range for short rotation willow and forest residues is correct. Price of sorghum (sweet) from Africa and China is high.	Range will be checked.
Vahrenholt (RWE Innogy GmbH)	2	30	-	-	-	-	-	-	Price range for short rotation willow and forest residues is correct. Price of sorghum (sweet) from Africa and China is high.	The price is taken from a literature reference. We will seek more on that topic, but again costs are seldom reported.
Pinho (Institut of Tecnology)	2	30	-	-	-	-	-	2.3.1	"There should be na explanation for the ""+"" , ""++"" , and ""+++"" signs."	Explanation (key) will be provided
Verduzco (Chevron Corporation)	2	30	-	-	-	-	-	?	No table number. Missing input data for primary residues can be estimated by allocating part of the crop inputs to their residues using the appropriate recovery rate. Are the yield assumptions the same as in Figure 8.45? It would be useful to add a column of yield in tons per hectare for more transparency.	Table number IS given (2.3.1, bottom of page 29). The datamissing for primary residue outputs are the costs, which we did not find in the literature. There is no Figure 8.45. The yields are given per ha as expressed in GJ, and may be easily translated as dry matter output. LHV's will be added in texts.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Londo (Energy research Centre of the Netherlands)	2	30	-	-	-	-	-	2.3.1	"A relevant, but still quite sloppy table: - please specify the meaning of the +/++/+++ classification in the management columns - single numbers at places in the yield/ha column: I believe there need to be ranges given for all crops - in the cost column, all numbers behind the decimal point misleadingly suggest exactness. Here also, ranges would be more appropriate."	We agree that ranges are safer than single numbers, however they are not always available in the literature (at least at regional level) – in particular for costs. The decimal points arise from conversion to US\$, and can hardly be rounded. More literature will be explored to complete the ranges as much as possible. Key to ++ is answered in 624.
Kaup (Potsdam Institute for Climate Impact Research)	2	30	-	-	-	-	-	2.3.1	"Table 2.3.1. The USD\$/GJ are very low compared to table 2.3.5. and 2.7.3 where they are very high. Soybeans are cultivated as well in Africa (South Africa); Suagr Cane in Africa as well (Mozambique; Sierra Leone); the iatropha seed cake is not necessarily toxic. MSW is not limited to the US but worldwide"	2.3.1 provides feedstock costs whereas 2.3.5 and 2.7.3 refers to costs of final energy carriers (which are of course much more expensive to obtain, hence the difference). Table 2.3.1. does not claim to be comprehensive in terms of regions or feedstocks, and draws on data available in the literature. Those mention jatropa cake as toxic.
Rosinski (Electric Power Research Institute)	2	30	-	-	-	-	-	2.3.1	"The ""management"" column is confusing. What do the plusses mean? Does a single ""plus"" in water mean it uses only a little? Or a lot? Similar comment for N/P/K use and Pesticides"	Explanation (key) will be provided
Marques (The Plantar Group)	2	30	-	30	-	-	-	2.3.1	It is not clear where the case of planted forests as a source of fuelwood is covered by the table. It should be made clear in either the Fuelwood line (which only mentions native sources - non-renewable ?) or in the short-rotation eucalyptus section. Overall the references to woody biomass should make clear what is assumed to be renewable or non-renewable wood. Also, a reference to charcoal seems to be missing on the table.	Origin of wood will be specified. Wood from native forests is not necessarily NOT renewable, if managed appropriately (see Nabuurs et al report in AR4)
Ballestero (National Meteorological Institute)	2	30	-	-	-	-	-	2.3.1	Yield (Gj/ha)/fraction of what?, What exactly mean: +, ++, +++?	Time unit is years (will be added). Explanation (key) will be provided.
Tolmasquim (Empresa de Pesquisa Energética - EPE)	2	30	-	31	-	2.3.1	2	2.3.1	The cost showed for sugarcane bagasse in Brazil (1.0 - 2.0 USD/GJ) is different from the value showed in the table 2.3.2 (1.6 - 7.6 USD/GJ).	The cost of Table 2.3.1 is for sugar from sugarcane used for making ethanol. The cost range in Table 2.3.2 is for bagasse and is a range depending on whether it is on site use or sold to others. Tables will be made more clear and sources confirmed.
Ballestero (National Meteorological Institute)	2	30	-	-	-	-	-	2.3.2	Energy content for cattle slurry??. odt stand for?	Odt = oven dry tonne; will be added.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	30	-	-	-	-	-	Table 2.3.1	Column 3: Unit should be GJ/ha/yr	True. Will be corrected.
Marques (The Plantar Group)	2	31	13	31	15	-	-	-	Clarify if pellets and briquettes come from renewable or non-renewable sources.	To add necessary detail and coordinate with edit of Table 2.3.2
Titus (Natural Resources Canada, Canadian Forest Service)	2	31	28	32	5	-	-	-	Comment on torrefied pellets?	To add necessary detail
philippe (international institute for water and environmental engineering)	2	31	15	-	-	-	-	-	definition of thermal efficiency of briquettes	May be covered when comon glossary is developed across chapters
philippe (international institute for water and environmental engineering)	2	31	25	-	-	-	-	-	reference is missing and probably very specific not duplicable without subsidies	Explanation to be added concerning caveat re-subsidies
philippe (international institute for water and environmental engineering)	2	31	23	-	-	-	-	-	these are the only reason of the failure of briquetting in DC delete the other explanations.	Text to be edited. Verify statement on 'only' reason for failure
Helynen (VTT)	2	31	28	-	-	-	-	-	wood waste such as sawdust□ should be wood residues such as sawdust	Good suggestion
Jack (Scion (New Zealand Forest Research Institute))	2	31	7	31	7	2.3.2	-	-	I think this section needs an introduction to the distributed nature of biomass. This introduction can explain why energy densification and logistics are such an important aspect of bioenergy systems.	To add relevant text

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	31	7	35	37	2.3.2	-	-	In my view this could be shortened a lot, as this mostly repeats well-known technical facts about bioenergy	Will summarise text but improve on detail
Marques (The Plantar Group)	2	31	-	31	-	-	-	2.3.2	Clarify wether the reference to charcoal is covering renewable or non-renewable charcoal. In addition to very different GHG emissions, there is a significant cost difference between both, especially if the charcoal comes from dedicated planted wood.	Charcoal comes from planted forests (eucalyptus in that case), so it is renewable. It will be specified in the table.
Rybach (Geowatt AG)	2	31	-	-	-	-	-	2.3.2	Energy content: what is □odt□? And should not be in the last row also odt?	odt will be defined. Last row has to be in GJ (energy unit common to whole Report)
LEITE DRACHMANN (PETROBRAS)	2	31	5	31	6	2.3.1.2	-	2.3.2	"Table 2.3.2 indicates the costs (USD/GJ) for sugarcane varying from 1.6 to 7.6. The upper limit is exaggerated for this feedstock."	OK, upper end value will be checked. However, the bagasse can be used for other applications and sold, for instance, as replacement of fuel oil in certain countries where it could command a higher price or for pulping.
Kruger (South African Weather Service)	2	31	5	31	6	2.3.1.2	-	2.3.2	Explain the unit odt.	Odt = oven dry tonne; will be added.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	31	-	-	-	-	-	Table 2.3.2	Energy content should be expressed as GJ per ton of dry matter or GJ per ton C content. 3.4 GJ/inhabitant per year? 14-17 per cattle head per year?	It is already the case (but will be specified, along with the timeframe)
Helynen (VTT)	2	32	16	-	-	-	-	-	""It burns without smoke"" should be taken away, it is not an exact description "	Text to be edited to it burns with less smoke than wood.
Titus (Natural Resources Canada, Canadian Forest Service)	2	32	6	32	7	-	-	-	"Globally, there is more to forestry than just plantations, and thinnings and salvage could be included. Perhaps: 'Chips can be produced from managed forests from harvesting residue (and even roundwood) from thinnings and final fellings, from stumps, and from stems salvaged after stand-ending natural disturbances such as wildfire, insects and disease; they can also be produced from industrial by-products of wood processing.'"	Will incorporate suggested text
Rubiera (Instituto Nacional del Carbon (CSIC))	2	32	18	32	18	-	-	-	"Replace ""is produced traditional"" by ""is produced in traditional"""	Accepted
Rubiera (Instituto Nacional del Carbon (CSIC))	2	32	3	32	3	-	-	-	"Replace ""Wood pellet"" by ""Wood pellets"""	Accepted
Klein (PIK)	2	32	17	-	-	-	-	-	A low bulk density would not reduce transport costs	Correction to be made
Helynen (VTT)	2	32	14	-	-	-	-	-	Addition: An alternative technology for chipping is crushing.	Text to be edited
Klein (PIK)	2	32	10	-	14	-	-	-	Belongs to 2.3.2.2 logistics	Cut and paste the text to logistics. Edit.
Klein (PIK)	2	32	24	-	-	-	-	-	Charcoal in oil-based electric power plantes sounds implausible, Reference?	Also check for possible mistyping
Marques (The Plantar Group)	2	32	15	32	27	-	-	-	Insert definitions of renewable and non-renewable charcoal.	Text to be edited
Rosinski (Electric Power Research Institute)	2	32	5	-	-	-	-	-	Note that wood pellets are also used in many countries to generate electricity	To add necessary detail
Marques (The Plantar Group)	2	32	-	33	-	2.3.2.2	-	-	As per comment #2, references to the industrial use of fuelwood and charcoal should also be inserted.	To add necessary detail
Helynen (VTT)	2	33	19	-	-	-	-	-	"No bold letters for ""Grate combustion"" because the chapter has a wider content"	will remove
Marques (The Plantar Group)	2	33	-	33	-	-	-	-	As per comment #2, references to the industrial use of fuelwood and charcoal should also be inserted.	will be included
KOBAYASHI (Toyota R&D Labs. Inc.)	2	33	8	-	-	-	-	-	I believe many readers would like to see more detailed descriptions on conversion technologies, including the future possible pathways	more detailed description may not be possible due to space constraint
Verhoest (LABORELEC)	2	33	19	33	22	2.3.3.1	-	-	This part leads to misunderstanding as one mentions the characteristics of the fluidized bed technology in the paragraph related to grate combustion. Advantages that are mentioned are not valid for grate combustion,	will include benefits of fluidised bed technology separately

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	33	-	-	-	2.3.3	-	-	<p>"Cellulosic and algae technology overview is superficial. Additional information about key conversion processes, efficiencies, greenhouse gas emissions, costs and status of technology commercialization would be helpful. This section doesn't mention the challenges that this technologies face regarding scalability, biomass feedstock sourcing (e.g. seasonal effects), and geographic location. Potential sources of information: Ayhan Demirbas, Biomass resource facilities and biomass conversion processing for fuels and chemicals, Energy Conversion and Management, Volume 42, Issue 11, July 2001, Pages 1357-1378, ISSN 0196-8904, DOI: 10.1016/S0196-8904(00)00137-0. (http://www.sciencedirect.com/science/article/B6V2P-42T4F51-7/2/47a12ec46f7c7096efce59a3fd7e00b7)</p> <p>Lee R Lynd, Willem H van Zyl, John E McBride, Mark Laser, Consolidated bioprocessing of cellulosic biomass: an update, Current Opinion in Biotechnology, Volume 16, Issue 5, Tissue and cell engineering/Biochemical engineering, October 2005, Pages 577-583, ISSN 0958-1669, DOI: 10.1016/j.copbio.2005.08.009. (http://www.sciencedirect.com/science/article/B6VRV-4H2G8Y3-2/2/3f0c8ecaf263123fae0bf5c07a522d0f)</p>	will add more information based on the references cited; algae are considered a future technology (and addressed in section 2.6). A more recent Demirbas reference was added as were references to consolidated bioprocessing
Rosinski (Electric Power Research Institute)	2	33	12	-	-	2.3.3.1	-	-	These classifications seem pretty arbitrary and a bit misleading. Perhaps all that is needed is combustion, pyrolysis, and gasification, and maybe cogeneration. This section should be either longer or shorter, but it's quite uneven now.	will modify and make it shorter
Londo (Energy research Centre of the Netherlands)	2	33	13	34	38	2.3.3.2	-	-	No consistency of the bold headers (e.g. charcoal is not a technology). Strange that grate combustion is bold and fluidised bed is not. Cogeneration is not a basic principle but deals with the energy after burning. All in all, solid edit required.	will be edited as suggested
Marbán (Instituto Nacional del Carbón (CSIC))	2	33	-	-	-	-	-	2.3.4	"In the cell intersecting second row ("Thermochemical conversion") and third column ("Conversion technology") it should also appear "GTL (gas to liquid) catalytic conversion". This process refers to the conversion of biomass to liquid biofuels (mainly methanol and ethanol) by the catalytic transformation of syngas (CO+H2) formed after biomass gasification. This comment is linked to comment 2. In a similar way, in the cell intersecting second row ("Thermochemical conversion") and fourth column ("End use") it should also appear "Liquid biofuels"	A separate reference will be given for processing residues, and phrasing will be clarified.
McCormick (International Union for Conservation of Nature (IUCN))	2	33	-	-	-	-	-	2.3.4	"include in type of feedstock for biochemical process : "sewage sludge", or better "wastewater", cause anaerobic digestion of wastewater with high content of organic matter or codigestion might also produce good biogas yield"	will be included
Rubiera (Instituto Nacional del Carbon (CSIC))	2	33	-	33	-	-	-	2.3.4	Third column, second row, cogeneration should be removed	will be removed
Londo (Energy research Centre of the Netherlands)	2	33	11	33	11	2.3.3	-	2.3.4	"Line thermochemical conversion: not logical to mention lignocellulosic crops first, as they are rarely applied now. The other feedstocks are currently more widely applied. And cogeneration is a strange term in the conversion technology cell as it makes use of (one of) the other processes such as combustion. Liquefaction and Pyrolysis are also a bit strange here as they usually do not lead to direct end use but to intermediate products. Line chemical: How do the technologies directly lead to electricity? Sure combustion is somehow involved as well... Ditto for biochemical line. By the way, why mention 'in vehicles' here and not in the line before? Table needs a thorough overhaul. "	table will be modified accordingly
Fukui (Toyota)	2	34	45	34	47	-	-	-	"If possible, it's better to explain not only process technology but fuel characteristics of hydrogenated biofuel. FAME is prone to oxidized easily because they have double bond and oxygen atom in their molecule. This might attack vehicle fuel systems. On the other hand, hydrogenated fuel has no oxygen and double bond, that means it is removed this concern. This might help increasing biofuel usage not to cause adverse effect to vehicle."	will clarify fuels
Rubiera (Instituto Nacional del Carbon (CSIC))	2	34	32	34	32	-	-	-	"It reads: "a range synthetic", it should read: "a range of synthetic"	will change

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Rubiera (Instituto Nacional del Carbon (CSIC))	2	34	26	34	26	-	-	-	"It reads: ""down Air"", it should read: ""down. Air""	will modify
Maeda (The Federation of Electric Power Companies, Japan)	2	34	6	34	9	-	-	-	"Only if you have full heat demand, the designed efficiency is achieved. Tokyo Electric Power Company's brochure shows that in some cases overall efficiency percentage is from 40% to 50%. http://www.tepco-switch.com/biz/book/pdf_020.pdf page 9."	will be modified based on reference provided
Helynen (VTT)	2	34	15	-	-	-	-	-	Addition: Cogeneration is widely used for district heat production in Scandinavian countries.	Included
KOBAYASHI (Toyota R&D Labs. Inc.)	2	34	45	-	-	-	-	-	Need some description on the merit of hydrotreated BD over FAME.	will include
Hakala (MTT Agrifood Research Finland)	2	34	25	34	32	-	-	-	Remove text until □ (synfuels). This is technical description of a system, and differs from other parts of the text.	will consider removing in consensus with other reviewers
Fukui (Toyota)	2	34	35	34	38	-	-	-	There is no mention about pyrolysis technology in the gasification explanation.	will include
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY, USP)	2	34	16	34	34	-	-	-	TO MENTION DIFFICULTIES ON BIOMASS GASIFICATION ONLARGE SCALE - THERE IS NOT A SINGLE PROJECT FOR LARGE SCALE BIOMASS GASIFICATION - TECHNICAL DIFFICULTIES - MUST BE MENTIONED	will include in short
Schmall (Petrobras S.A.)	2	34	5	34	13	2.3.3.1	-	-	Should consider Brazil's experience on bagasse base cogeneration.	will be included
Kaup (Potsdam Institute for Climate Impact Research)	2	34	-	-	-	2.3.3.2	-	-	2.3.3.2 By product of the pressing and transesterification process are glycerin and rape meal	will include
SCOWCROFT (EURELECTRIC)	2	35	34	35	36	-	-	-	"IPCC report restricts the benefit of biogas in Germany to ""...more returns to the farmers."" Increasing involvement of energy companies is neglected."	text revised
Vahrenholt (RWE Innogy GmbH)	2	35	34	35	36	-	-	-	"IPCC report restricts the benefit of biogas in Germany to ""...more returns to the farmers."" Increasing involvement of energy companies is neglected."	text revised
Fukui (Toyota)	2	35	17	35	17	-	-	-	"Is this ""efficient"" means ""energy"" efficiency, such as Energy Producing Ratio, or ""GHG"" efficiency? It should be noted what efficiency is discussed."	Accepted
Wang (Argonne National Laboratory)	2	35	11	-	20	-	-	-	A chart of worldwide ethanol production in 2009 could be very helpful.	will be included
Hakala (MTT Agrifood Research Finland)	2	35	11	35	20	-	-	-	Belongs to Introduction, remove from here.	based on discussion will remove
Tolmasquim (Empresa de Pesquisa Energética - EPE)	2	35	12	-	-	-	-	-	Brazilian buses don't use ethanol (pure or in mixtures).	will be included
Kaup (Potsdam Institute for Climate Impact Research)	2	35	10	35	10	-	-	-	Hydrous ethanol can be used as well as a fuel as long as it is used solely	will include
Kaup (Potsdam Institute for Climate Impact Research)	2	35	35	-	-	-	-	-	In Germany... the plants are using mainly maize silage and manure. What is Green Power? The most modern biogas plants are processing biogas (methane) into natural gas quality and do feed-in that processed gas into the natural gas grids in Germany.	definition of green power will be included in glossary
SCOWCROFT (EURELECTRIC)	2	35	21	-	-	-	-	-	Mentioning of agricultural feedstock as an important organic matter for anaerobic digestion.	will be made clear
Vahrenholt (RWE Innogy GmbH)	2	35	21	-	-	-	-	-	Mentioning of agricultural feedstock as an important organic matter for anaerobic digestion.	will change
SCOWCROFT (EURELECTRIC)	2	35	23	-	-	-	-	-	Mixture of methane reaches from 50 up to 70% (not only 60%).	will change
Vahrenholt (RWE Innogy GmbH)	2	35	23	-	-	-	-	-	Mixture of methane reaches from 50 up to 70% (not only 60%).	will change
Vahrenholt (RWE Innogy GmbH)	2	35	21	35	36	-	-	-	Some amendments concerning the IPCC description of anaerobic digestion as follow.	will check ipcc and change
SCOWCROFT (EURELECTRIC)	2	35	21	35	36	-	-	-	Some amendments concerning the IPCC description of anaerobic digestion as follows.	will check ipcc and change
Titus (Natural Resources Canada, Canadian Forest Service)	2	35	37	-	-	-	-	-	Title of Section 2.3.4 is very similar to 2.3.2 Logistics and supply chains	they are different
Londo (Energy research Centre of the Netherlands)	2	35	1	35	36	2.3.3.3/4	-	-	Technology descriptions are quite sloppy, contain several entire and half mistakes and are not clearly written. Suggest major overhaul.	will improve
Verduzco (Chevron Corporation)	2	36	13	36	15	-	-	-	This sentence is very confusing. It needs to be rephrased.	will be rephrased

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Klein (PIK)	2	37	-	-	-	-	-	2.3.5	"What is ""TC"" and ""BC""?"	TC=thermochemical; BC=biochemical lignocellulosic conversion to ethanol. table is being reworked out and prepared on the basis of biomass fuels
Schmall (Petrobras S.A.)	2	37	1	42	1	-	-	2.3.5	In should include some infromation about feed stocks for biodiesel in Brazil like castor oil, sunflower, microalgae and animal fat and other information like lignocellulose for ethanol, also in Brazil. Avialable at www.embrapa.org.br, e.g.	table is being reworked out and prepared on the basis of biomass fuels. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc
Kaup (Potsdam Institute for Climate Impact Research)	2	37	-	42	-	-	-	2.3.5	Table 2.3.5, the table can be summarized into a maximum of 2 pages. It is confusing and muddled. I wouldnt open a row for every possible feedstock including comments. When it comes to biogas there are no production costs indicated but years. Hydrogen is not a state-of-the-art technology used for the production of bioenergy, if ever. It should not be in that table. Production costs are probably a lot higher.	table is being reworked out and prepared on the basis of biomass fuels. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc
Treber (Germanwatch)	2	37	-	-	-	-	-	2.3.5	Too many empty lines at the beginning	table is being reworked out and prepared on the basis of biomass fuels. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc
Kessels (International Energy Agency Clean Coal Centre)	2	37	-	-	-	-	-	2.3.5	Why is co firing with coal and biofuel/biomass left out of the table?	It will be incorporated in the next version as a commercial technology. table is being reworked out and prepared on the basis of biomass fuels. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc
Smith (McGill University, Macdonald Campus)	2	37	-	42	-	2.3	-	2.3.5	It might be useful, in column 2, to break transportation into surface and aerospace transportation as the requirements for the two can be very different.	table is being reworked out and prepared on the basis of biomass fuels. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc
Londo (Energy research Centre of the Netherlands)	2	37	1	42	1	2.3.4	-	2.3.5	Table header (focusing on biofuels) not consistent with contents (also containing heat and other applications) en referenceto the table in the text. Furthermore: as most biomass applications are in heat and/or power, why start with this extensive list of routes into biofuels? Furthermore, table is extremely bulky: I would suggest focusing on the key information and reducing it to, say, one page. Probably, this can be done by slightly expanding table 2.3.6 and deleting 2.3.5.	table is being reworked out and prepared on the basis of biomass fuels. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc
Takeuchi (Advanced Industrial Science and Technology)	2	37	-	43	-	-	-	2.3.5-2.3.6	It is important that the distance between the production site of bio-energy and the energy conversion site should be close, because the transportation of biomass needs energy. This concept should write in the text.	table is being reworked out and prepared on the basis of biomass fuels 2.3.6 is being deleted. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	37	-	-	-	-	-	2.3.5.	What are EU\$? Are US\$ or □ meant? Better use US\$ in the whole report?	Costs will be in US\$ of 2005 as will all report. table is being reworked out and prepared on the basis of biomass fuels. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	37	-	-	-	-	-	Table 2.3.5.	What are EU\$? Shouldn't there be only one currency involved in all these Tables?	Costs will be in US\$ of 2005 as will all report.table is being reworked out and prepared on the basis of biomass fuels. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6. See File: Secs3_6_Template_of_Technology_Tables.doc
Treber (Germanwatch)	2	38	-	-	-	-	-	2.3.5	"6th row at microalgae: ""Productivity=10 g/aqm/day"" is probably 10 g/sqm/day"	Reviewer is right. It was a typo. table is being reworked out and prepared on the basis of biomass fuels
Treber (Germanwatch)	2	38	-	-	-	-	-	2.3.5	again microalgae: add at productivity that this is probably Biomass productivity and not Lipid productivity.	Reviewer is right. table is being reworked out and prepared on the basis of biomass fuels
Marques (The Plantar Group)	2	39	-	40	-	-	-	2.3.5	As per comment #2, references to fuelwood and charcoal (if any) are limited to small scale processes and to heat. References to the industrial use (large scale use of renewable fuelwood and renewable charcoal for industrial needs) should also be mentioned.	table is being reworked out and prepared on the basis of biomass fuels. It will separate small and large scale processes.
Sirms (Massey University)	2	40	14	-	-	-	-	-	"Stick with ""concentrating"" not concentrated throughout text."	table is being reworked out and prepared on the basis of biomass fuels
Klein (PIK)	2	40	-	-	-	-	-	2.3.5	""Gasification"", ""Gas engine"" and ""Gas turbine"" are steps in the same conversion process and not different categories as supposed here. For usage in a Gas engine and gas turbine biomass has to be gasified. From gasification alone there is no Power/Heat-production"	table is being reworked out and prepared on the basis of biomass fuels
Verhoest (LABORELEC)	2	41	-	-	-	-	-	2.3,5	"How comes that ""co-firing"", ""biomass pyrolysis"" and ""biomass for direct combustion"" under the title of ""BIOGAS"""	table is being reworked out and prepared on the basis of biomass fuels
Titus (Natural Resources Canada, Canadian Forest Service)	2	43	8	44	6	-	-	-	"From title of 2.4, this paragraph suggests that readers can expect a section on developing countries; therefore a fuller introductory paragraph could perhaps be used to give the layout of Section 2.4. The focus of a section on the US (2.4.5.2) and then Asian countries (2.4.5.3) makes this even more confusing."	Noted for the major revisions that this section will undergo
Marques (The Plantar Group)	2	43	5	43	10	-	-	-	Again, regional potential limited to small scale/residential users. Industrial scale should also be considered for fuel wood and charcoal	table is being reworked out and prepared on the basis of biomass fuels
Londo (Energy research Centre of the Netherlands)	2	43	-	54	-	2.4	-	-	"This is a section in which I find a lot of info that seems less relevant, given the section title, and in which I find other relevant info lacking. Given the title, I would expect the section to start with some quantitative information showing the energy production for the different technology routes, globally and possibly regionally. Which are the most significant bioenergy markets today? Which technologies are mostly deployed, and where are the key industrial players? Soon, the section starts discussing barriers for further development of several bioenergy routes. Relevant information, but only later there is a section (2.4.6) focussing on barriers and opportunities. However, 2.4.7 also contains a barriers section, now focusing on biomass and biomass trade. It would be logical if the policy overview is positioned after an analysis of key barriers, and ideally a connection would be made between barriers and policies to reduce them. the policy section 2.4.5 almost entirely reviews biofuels policies, while biofuels are only a minor share of biomass use today. Section 2.4.7, by the way, is relatively well written, but its position in the section is not entirely clear and logical. All in all, this section 2.4 is poorly structured, is lacking essential information, is redundant in other material, and needs major rewriting."	We agree with the reviewer and the section will be revised. See also comment 714; the revision of section 2.4 will also incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Marques (The Plantar Group)	2	43	-	49	-	2.4	-	-	Comment on the whole section: In terms of fuelwood and charcoal, the section provides great emphasis to small scale processes, but it would be important to balance it, by inserting one sub-item in Section 2.4, reflecting the potential of fuelwood and of renewable charcoal, for large scale systems, e.g. industrial processes (heaters, boilers, iron/steel reducing agents), as per comment # 1 above. Also, it is important to mention the potential of increasing the supplies of sustainable sources of feedstocks of wood for traditional/small scale processes, through sustainable forest management or dedicated planted forests.	Section 2.4 will undergo strong a major revision and will be complemented with the following information: statistical information of biofuel production, use of biomass for power and heat, international markets and trade of biofuels and pellets. Current information supply on specific markets (e.g. industrial boilers) is limited and due to space constraints focus will lay on global figures on main biomass markets and applications.
Marques (The Plantar Group)	2	43	-	-	-	-	-	2.3.6	"Add ""charcoal-based iron reduction process"" or ""industrial use of renewable charcoal""	It will be added.
McCormick (International Union for Conservation of Nature (IUCN))	2	43	-	-	-	-	-	2.3.6	"In characteristics of Biogas Plants: anaerobic fermentation of organic matter, manure or wastewater produce biogas and digestate (liquid effluent used as organic fertilizer). Efficiency is 20% ??, Efficiency of what? reference??. The efficiency of the overall systems varies depending on the feedstock(s). Cost of a biogas system varies and can be much less for decentralized systems in developing countries. "	Biogas from different sources will be discussed in both section 2.3 and section 2.6, including parameters expressing their performance. The efficiencies on tables will be defined. Centralized and decentralized systems will be discussed.
Shi (Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry)	2	43	-	-	-	-	-	2.3.6	SVO:definition missing	Accepted
Kaup (Potsdam Institute for Climate Impact Research)	2	43	-	-	-	-	-	2.3.6	Table 2.3.6. It is unclear what the purpose behind that table is. No possibility to compare column (Cost US2005\$). The table confuses more than it explains. I would suggest to delete it.	table is being reworked out. Information will be added. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6 being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Titus (Natural Resources Canada, Canadian Forest Service)	2	44	6	-	-	-	-	-	"Helpful if some comment is made on content of Sub-section 2.5 so readers aren't left wondering what this is about; maybe something like: 'discuss them in Section 2.5 (Environmental and Social Issues).'"	Accepted
Smith (PNNL)	2	44	16	-	-	-	-	-	"Not clear what ""geological investigations"" has to do with biogas."	geological investigations ..into proper siting of biogas technologies in developing world (avoid contamination of water bodies and use geotextiles to contain materials)
philippe (international institute for water and environmental engineering)	2	44	-	-	-	-	-	-	biomass technologies are capital intensive this is the main reason of their limited dissemination. Other aspect pay a minor role	Barriers will be discussed in a more general way due to space constraints.
Titus (Natural Resources Canada, Canadian Forest Service)	2	44	8	-	-	-	-	-	Define 'biogas systems' at the outset. Does it differ from 'biomass gasification' on P.34 L.16ff?	Biogas from different sources will be discussed in both section 2.3 and section 2.6, including parameters expressing their performance. Biogas is defined as from the biochemical processing (anaerobic digestion). Biomass gasification is defined as the thermal process and the characteristics of the gases produced according to the conditions (reactor engineering and carrier gases).
Verduzco (Chevron Corporation)	2	44	16	44	16	-	-	-	Geological investigations for biogas? Please explain!	Done. Geological investigations are needed for proper siting of biogas technologies in developing world (avoid contamination of water bodies and use geotextiles to contain materials)
Kaup (Potsdam Institute for Climate Impact Research)	2	44	27	44	27	-	-	-	If you mention China and India as countries that initiated biogas programs please do not forget Germany. The biogas technologies and facilities increased enormously over the last years.	Brief text will be dedicated to developments in Europe; large scale digestion will be dealt with in technology sections
SCOWCROFT (EURELECTRIC)	2	44	27	44	29	-	-	-	No comment on variety of biogas programmes throughout Western Europe, e.g. Renewable Energy Act (REA/EEG) in Germany.	Brief text will be dedicated to developments in Europe; large scale digestion will be dealt with in technology sections

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Vahrenholt (RWE Innogy GmbH)	2	44	27	44	29	-	-	-	No comment on variety of biogas programmes throughout Western Europe, e.g. Renewable Energy Act (RE/EEG) in Germany.	Brief text will be dedicated to developments in Europe; large scale digestion will be dealt with in technology sections
McCormick (International Union for Conservation of Nature (IUCN))	2	44	10	-	-	-	-	-	psychological??. I suggest: human behaviour and traditions	Will be improved
Shi (Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry)	2	44	41	-	-	-	-	-	RET:definition missing	Accepted; Renewable Energy Technologies
Verduzco (Chevron Corporation)	2	44	41	44	41	-	-	-	Spell out RET	Accepted
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	44	8	-	-	-	-	-	TO MENTION THAT GHG FROM BIOGAS (METHANE) EMISSIONS ARE MUCH HIGHER THAN OTHERS	Biogas from different sources will be discussed in both section 2.3 and section 2.6. Section 2.5 will raise the provide the Lifecycle Assessment of the various routes including the methane emissions higher than carbon dioxide.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	44	7	45	25	2.4.2	-	-	"In my view this section should discuss the following important issue: biogas can be hugely beneficial if its production is based on organic wastes and residues and if it is used in cogeneration plants. However, in recent years, the practice has emerged to base biogas production on crops like maize specifically planted for that purpose, and to use the gas more or less exclusively for electricity generation. Under such conditions, the benefits of biogas in terms of sustainability and climate change mitigation is highly dubious. I .e. in my view it would be extremely important to state that sustainable biogas should be based on a ""cascade utilization"" of biomass, i.e. on residues and wastes, and that high energy use efficiencies are important (CHP systems)"	Biogas from different sources will be discussed in both section 2.3 and section 2.6, including parameters expressing their performance. Section 2.5 will raise the issues of sustainability and cascade utilization.
Kaup (Potsdam Institute for Climate Impact Research)	2	44	-	-	-	2.4.2	-	-	2.4.2 Biogas Technology (I would rather call it: Biogas Market development and technologies)	Accepted
Verduzco (Chevron Corporation)	2	45	10	45	10	-	-	-	"Local authorities should also be included in the dissemination of information. Consider rewording as follows : ""It should make potential users and local authorities aware of the existing□"""	Section will be strongly revised
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	45	10	-	12	-	-	-	needs rephrasing, could be put in a more laconic way	Section will be strongly revised
Kaup (Potsdam Institute for Climate Impact Research)	2	45	10	45	25	-	-	-	this whole part seems somehow completely out of the context.	Section will be strongly revised
Pinho (Institut of Tecnology)	2	45	-	-	-	-	-	2.4.1	The table should have a legend.	Accepted
Kaup (Potsdam Institute for Climate Impact Research)	2	46	29	46	29	-	-	-	I do not understand the logic and the sentence at all, but maybe that is just me	Section will be strongly revised

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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LEITE DRACHMANN (PETROBRAS)	2	47	24	53	34	-	-	-	"Some feedstocks can be used either for food or for biofuels. Agriculture production in many cases also qualifies labour, in Brazil several labour and environmental protection measures are in place (against children labour, sugarcane burning reduction, etc.)"	Acknowledged; details on policies will be included to the extent possible. Section 2.4 will undergo strong revision and will be complemented with the following information: statistical information of biofuel production, use of biomass for power and heat, international markets and trade of biofuels and pellets. Current information supply on specific markets (e.g. industrial boilers) is limited and due to space constraints focus will lay on global figures on main biomass markets and applications. In the revision of section 2.4 will also incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.
Kheshgi (ExxonMobil Research and Engineering Company)	2	47	36	48	6	-	-	-	"Text references old numbers for wind production tax credit (currently 2.1 cents/kWh) and ethanol mandates; suggest updating with current values."	Will be checked
Verduzco (Chevron Corporation)	2	47	38	47	38	-	-	-	"The text states: ""closed-loop biomass", which means only energy crops purchase the required biomass. "" This wording is confusing."	Closed-loop biomass is used in the United States to indicate dedicated biomass plantations for energy purposes for which there are specific tax provisions. Will be dropped and text strongly modified to address types of policies in understandable terms globally.
Schmall (Petrobras S.A.)	2	47	24	53	34	-	-	-	Some feedstocks can be used either for food or for biofuels production. Agriculture production in many cases also qualifies labour, in Brazil several labour and environmental protection measures are in place (against children labour, sugarcane burning reduction, etc.). see: Brazil's Biodiesel Program, available at www.mre.org.br	Acknowledged; details on policies will be included to the extent possible. Section 2.4 will undergo strong revision and will be complemented with the following information: statistical information of biofuel production, use of biomass for power and heat, international markets and trade of biofuels and pellets. Current information supply on specific markets (e.g. industrial boilers) is limited and due to space constraints focus will lay on global figures on main biomass markets and applications. In the revision of section 2.4 will also incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Verhoest (LABORELEC)	2	47	-	-	-	2.4.5.2	-	-	No reference made to European countries policies!	Will be included. In the revision of section 2.4 will also incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.
Kruger (South African Weather Service)	2	47	3	47	4	2.4.4	-	-	Sentence unclear.	Accepted; text will be strongly revised.
Kaup (Potsdam Institute for Climate Impact Research)	2	47	-	-	-	2.4.5	-	-	If you give an overview about existing policies why not in those countries where the bioenergy sector developed due to those policies (Brazil, US, Germany) and maybe even pointing out the different approaches (mandatory blending vs. Tax exemption)	See previous three comments
Schmall (Petrobras S.A.)	2	47	11	49	2	2.4.5	-	-	Should have a 2.5.4.4 for Biofuel policies in South America including at least Argentina and Brazil (the pioneer country) and a 2.5.4.5 Biofuel policies in Europe with a table like the Asian one (table 2.4.2). In the case of Brazil it could say that there is Brazilian Ethanol Program (Procool) since the 70's and the new Biodiesel Program. Brazil has developed a set of policies named Climate Risk Zoning and Ecological-Economic Zoning that consider economical crops that are suited, based on soil and climate characteristics, besides other socio-environmental impacts, for each specific area. Thus it is possible to protect some biomes and regions of interest such as Amazon and Pantanal. The Brazilian Biodiesel Program has a socio-environmental strategy. The Brazilian Government has created and implemented the National Program of Production and Use which provides accumulative taxes relief for Companies who buy their feedstock produced from small farmers or in semiarid areas, wastelands, focusing on increasing the sustainability of these systems, avoiding rural exodus to the cities and developing country's rural areas. In Brazil, feedstock production for biofuels is focused on the recovery of degraded areas by cultivating perennial crops. In 2002 it was established in Brazil, a National Plan for Slave Work Eradication that includes also child work and the work conditions specially in rural areas.	Section will be expanded with other policies and countries; see response of the previous row. Specifically, the Agroecological zoning of Brazil will be highlighted in the appropriate places.
Sims (Massey University)	2	47	-	-	-	2.4.5.1	-	-	Out of place judging by sub-heading of 2.4.5	Accepted; text will be strongly revised.
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	47	20	-	25	2.4.5.1	-	-	GBEP has undertaken to prepare a number of reports: the information about report should be either specified or deleted. It is much more important to emphasize that GBEP was established by member countries following the G8 decision. It might be useful to list all member states which cooperate within the framework of GBEP.	Will be sharpened.
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	47	26	121	12	2.4.5.2	-	-	it is not clear why the paragraph concentrates totally on the USA policy. Either delete or add examples on policy of other developed countries and EC.	Will be sharpened. Text will be strongly revised.
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	48	28	-	-	-	-	-	"misprint: replace ""others"" for ""other"" "	Editorial comment

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Hakala (MTT Agrifood Research Finland)	2	48	32	-	-	-	-	-	Add information about EU efforts in biofuel policies. New Section 2.4.5.4. To efficiently contribute to mitigation of climate change, EU has taken a decision in December 2008, where the 27 EU countries are committed to cut their greenhouse gas emissions by 20% (compared with the 1990 level), to increase the share of renewable energy sources to 20% of all energy needed, and to cut energy use by 20% by 2020. In addition, 10% of transport fuel should originate from renewable sources by 2020.	Section 2.4 will undergo strong revision and will be complemented with the following information: statistical information of biofuel production, use of biomass for power and heat, international markets and trade of biofuels and pellets. Current information supply on specific markets (e.g. industrial boilers) is limited and due to space constraints focus will lay on global figures on main biomass markets and applications. In the revision of section 2.4 will also incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.
Coulibaly (International Institute fo Water and Environmental Engineering (2iE))	2	48	13	-	-	-	-	-	Section is too short. Need more development based on various country experiences	Section 2.4 will undergo strong revision and will be complemented with the following information: statistical information of biofuel production, use of biomass for power and heat, international markets and trade of biofuels and pellets. Current information supply on specific markets (e.g. industrial boilers) is limited and due to space constraints focus will lay on global figures on main biomass markets and applications. In the revision of section 2.4 will also incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	48	7	-	-	-	-	-	TO UPDATE INFORMATION CONSIDERING RECENT POSITION OF US GOVERNMENT ACCEPTING BRAZILIAN ETHANOL (GHG EMISSIONS)	In the revision of section 2.4 will also incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.
philippe (international institute for water and environmental engineering)	2	49	8	-	-	-	-	-	the problem of definition of modern biomass system remains. Do the author consider improved cook stove as modern as example?	Will also be dealt with in revising the section; many more examples will be included when covering different markets and countries.
Coulibaly (International Institute fo Water and Environmental Engineering (2iE))	2	49	-	-	-	-	-	2.4.2	In 2nd column the parameters E5, E10, BDF, E3, and B5 need definition	Thanks. The section will be strongly revised and this level of detail will be dropped in favor of more generic types of policies.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	49	-	-	-	-	-	2.4.2.	Additional detailed information can be found in the WGBU-Report 2009 (http://www.wbgu.de/wbgu_jg2008_en.pdf) on page 42-44	Thanks. Section 2.4 will undergo strong revision and will be complemented with the following information: statistical information of biofuel production, use of biomass for power and heat, international markets and trade of biofuels and pellets. Current information supply on specific markets (e.g. industrial boilers) is limited and due to space constraints focus will lay on global figures on main biomass markets and applications. In the revision of section 2.4 will also incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.
Verduzco (Chevron Corporation)	2	50	13	50	24	-	-	-	"In this paragraph, social and ecological standards are mentioned, but there is no mention of the economic standard. Remember that sustainability is based on three principles: environmental social and economic enhancement. A certification system must include all three components. It is also important to mention chain of custody issues in this section. Certification and standardization organizations are grappling with the challenge of documenting the sustainability of a feedstock or bioenergy product and ensuring that the sustainability certification is attached to the product throughout the value chain. IPIECA is working on a document that describes CoC options to support the expansion of sustainable biofuels. Document will be available to the public in March 2010. It is also important to mention that certification standards should create at thebv/demand from biomass and users to engage growers in certification systems."	Section 2.4 will undergo strong revision and incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.; state of the art overview of certification efforts will be incorporated. CoC will be addressed.
de Campos Barbosa (Petrobras)	2	50	6	-	-	-	-	-	"Remove: ""... And perhaps certified..."". It's out of context in the phrase."	Section will be strongly revised
Verduzco (Chevron Corporation)	2	50	10	-	-	-	-	-	"The last sentence is confusing. Consider rephrasing: ""Hence there is a need to assess internal demand against exports of biomass and bioenergy products.""	Section will be strongly revised
Verduzco (Chevron Corporation)	2	50	39	50	42	-	-	-	"The text reads: "" A compromise should be found between developing certification efforts and ensuring sustainability of bio-energy□"" Please explain why we need a compromise. Doesn't the word ""certification"" refer to sustainability standards? "	Partly rephrasing; what is ment is that certification should not result in a barrier for sound market development, which is a real concern for industry.
Wang (Argonne National Laboratory)	2	50	22	-	24	-	-	-	RSB needs to be mentioned here.	Accepted
philippe (international institute for water and environmental engineering)	2	50	24	-	-	-	-	-	see ref references of Brazil by the Plantar steel industry company	The Chapter has space limitations; Brazil's use of planted forests for steel industry will be given in the charcoal process and uses.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY, USP)	2	50	13	-	24	-	-	-	TO MENTION UNCTAD CODUMENTS DISCUSSING CERTIFICATION FORO DEVELOPING COUNTRIES	Accepted
Verhoest (LABORELEC)	2	50	-	-	-	2.4.6	-	-	Also mention EUBIONET framework for quality standards	Accepted
Marques (The Plantar Group)	2	50	-	50	-	2.4.6	-	-	The experience with certification schemes for woody biomass (e.g. FSC) could be cited as potential ways of incorporating sustainability criteria into the production of both liquid and solid biofuels.	Accepted
Kahiluoto (MTT Agrifood Research Finland)	2	50	-	-	-	2.4.6	-	-	A brief summary of on-going international and national standardization and certification efforts and debate would be valuable.	See previous comment

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Verhoest (LABORELEC)	2	50	-	-	-	-	-	2,4,6,2	Mention some voluntary verification scheme for sustainable imported biomass, such as the one developed by Laborelec-SGS-Electrabel. References: 1) van Dam et al., Overview of recent developments in sustainable biomass certification, 2008, Biomass and Bioenergy issue 32 and 2) BTG, Sustainability Criteria & Certification Systems for Biomass Production, 2008	Section 2.4 will undergo strong revision and incorporate the state-of-the-art developments on certification and sustainability frameworks and deal with the main policy programmes and biomass deployment in a number of key countries/regions (SDAC, Brazil, China, India, EU, US and several other). This information will be used to illustrate the different approaches and strategies found with respect to bioenergy in key nations. Information on barriers (and opportunities) will also be updated based on new reviews and scientific information.
philippe (international institute for water and environmental engineering)	2	51	38	-	-	-	-	-	it seems obvious' please provide references	Section will be strongly revised
philippe (international institute for water and environmental engineering)	2	51	31	-	-	-	-	-	reference? Volume concerned?	Section will be strongly revised
philippe (international institute for water and environmental engineering)	2	51	24	-	-	-	-	-	what is this suitable structure mentioned. This is typically the type of information which is required	Comment unclear
Visconti (Inter-American Development Bank)	2	51	5	51	8	2.4.6.5	-	-	Specify the need for creating capacity building programs for developing countries access to biofuels certification. Targeted certification procedures for small scale biofuels producers, such as group certification schemes, should also be promoted in order to lower the barriers for getting certifications (especially auditors costs, but also administrative procedures). Source: UNCTAD (2008) Making Certification Work for Sustainable Development: the Case for Biofuels, UNCTAD/DITC/TED/2008/1 available at http://www.unctad.org/en/docs/ditcted20081_en.pdf	Accepted
Marques (The Plantar Group)	2	51	-	54	-	2.4.7	-	-	The barriers analysis conducted under this whole section (Intl trade) is not only applicable to intl trade but also to many aspects of regional/local production. As such, the listing and the analysis of such barriers could appear elsewhere or be consolidated in a way that covers both intl trade and local/regional markets.	This is only section where international biomass markets and trade are discussed in detail.
Verhoest (LABORELEC)	2	51	-	-	-	-	-	2,4,7,1	Belgium is also an important market player for imported biomass (mainly woodpellets from Canada) Reference: AEBIOM, A Pellet Road Map for Europe, November 2008	May not appear due to lack of space, but will be considered.
de Campos Barbosa (Petrobras)	2	52	37	52	38	-	-	-	"In developing countries infrastructure is under construction. This example would be more complete citing planned ethanol pipelines for this area (reference: Ewing, Brazil: leading sugar companies build ethanol pipeline; Ethanol producer magazine, may 2008 issue. www.uniduto.com.br/arquivos/c_130.pdf), balancing threats with advantages of constructing the appropriate infrastructure with sustainability issues in mind."	May not appear due to lack of space, but will be considered.
Verduzco (Chevron Corporation)	2	52	32	52	32	-	-	-	"Provide references of the ""various studies""."	Accepted; will be part of the revision.
philippe (international institute for water and environmental engineering)	2	52	24	-	25	-	-	-	if the technology is available it is therefore not a technical barrier but rather economic or other type□.	Example -- capital replacement time. To accept other feedstocks new feeding systems have to be added.
Rahimi (IRIMO)	2	52	8	-	-	-	-	-	In addition this barriers, we have also cultural and sociological barriers.	Accepted
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY, USP)	2	52	13	-	25	-	-	-	NOT CONSIDERED THAT BRAZILIAN CONDITIONS ARE DIFFERENT	Different country perspectives will be mentioned in section 2.4; also in 2.2, 2.5, and 2.7
philippe (international institute for water and environmental engineering)	2	52	14	-	-	-	-	-	please provide figures of volume concerned	Will be part of the overall revision of 2.4 and specific volume figures will be in biorefineries (2.6)
philippe (international institute for water and environmental engineering)	2	52	38	-	-	-	-	-	please provide references when referring to specific example	Accepted; will be part of the revision.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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philippe (international institute for water and environmental engineering)	2	52	42	-	43	-	-	-	sentence not finished	Accepted
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	52	35	-	40	-	-	-	TO MENTION EXISTING PROJECTS IN BRAZIL FOR ALCOHOL TRANSPORTATION FROM CENTER WERT REGION	May not appear due to lack of space, but will be considered.
philippe (international institute for water and environmental engineering)	2	52	31	-	-	-	-	-	various study . references ?	Accepted; will be part of the revision.
philippe (international institute for water and environmental engineering)	2	52	34	-	-	-	-	-	very specific to europ	Different country perspectives will be mentioned in section 2.4
Schmall (Petrobras S.A.)	2	52	36	52	38	2.4.7.2	-	-	"The sentence that begins: "" For example, in Brazil...."" should be changed to: For example, in Brazil that is very complied with the sustainable development and is considering the biofuels production and use as an opportunity to tackle the GHG emissions, the adoption of Life Cycle Analises as a tool to define priorities aiming to clean the energy systems along the hole chain. For this, considering the very new biofuels production in the Centre-West, other modals of transportation and bigger investments on infrastructure will happen to achieve CO2 reduction and economicity.see: www.biodiesel.gov.br/docs/cartilha_ingles.pdf ; www.mre.gov.br "	May not appear due to lack of space, but will be considered.
Kahiluoto (MTT Agrifood Research Finland)	2	52	-	53	-	2.4.7.2	-	-	A lot of overlapping with other sections before and after. Would it be better to refer to other parts of the report where these are thoroughly dealt with, rather than to very shortly to try to say something here?	Section will undergo strong revision.
Schmall (Petrobras S.A.)	2	52	37	52	38	2.4.7.2	-	-	Should rewrite to consider : ..., but the cost of transport and lack of infrastructure are the main aspects that have to be improved for increasing the sustainability of this new Brazilian bioethanol production, that representes less than 10% of the total production.	May not appear due to lack of space, but will be considered.
Marques (The Plantar Group)	2	53	24	53	34	-	-	-	"Balance the text by inserting the following sentence right after line 29: "" Also, the incorporation of sustainability criteria, such as the development of ecological corridors and biodiversity indicators, can also provide a sustainable basis for the large scale energy crops, such as planted forests.""	Specifics of what such criteria imply will be dealt with in section 2.5
Fulton (Deutsche Bank)	2	53	20	-	-	-	-	-	"DBCCA mapped land availability that has potential to raise yields while limiting deforestation and revitalizing abandoned and degraded lands. Source: DBCCA, ""Investing in Agriculture: Far-reaching Challenge, Significant Opportunity,"" June 2009, page 36-39 and 62-68 (www.dbcca.com/research). See SRREN_Draft0_Review_Fulton_Mark_Material_05.pdf"	Thanks for the various comments and significant materials provided. They contain very useful information for the preparation of the report.
Treber (Germanwatch)	2	53	32	-	-	-	-	-	"insert after "" ... potential use of child labour,"" : land ownership/land rights"	Accepted
Verduzco (Chevron Corporation)	2	53	28	-	-	-	-	-	"Provide references of the ""various studies""."	Accepted
Treber (Germanwatch)	2	53	17	53	20	-	-	-	"Replace those two sentences by: Food security might be severely affected by large energy plantations. While sufficient overall production of food could be sustained if proper management and policies are put in place, in practice access to food depends on purchasing power and access to land. Both would be negatively impacted by rising demand for land, and increasing prices and high price volatility as has been observed."	Food security is and will be dealt with in section 2.5
Treber (Germanwatch)	2	53	21	51	23	-	-	-	"Substitute whole paragraph by: A key issue for energy from agricultural residues is competition with fodder production. In developed countries, a large increase in demand could lead to scarcity of fodder products and according price increases."	Section will see revision and additional referencing.
Titus (Natural Resources Canada, Canadian Forest Service)	2	53	18	53	20	-	-	-	Food vs. fuel statement would benefit from several key citations, as it will no doubt remain controversial amongst at least the general public. Would (or should) this statement be qualified to allow some doubt? <input type="checkbox"/> or are the authors fully convinced that there are no grounds for concern about future food supply, that starvation is solely a function of purchasing power, and that food prices have not been (and will not be in the future) affected by the agrofuel sector?	Food security is and will be dealt with in section 2.5; here it is discussed as a general barrier for further development of the market.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	53	7	53	9	-	-	-	For consistency, provide cost in 2005 \$USD. Also, this example of transport tariff increase would be better if the original transportation cost was provided too to understand how much transport tariffs have increased in the Netherlands.	Chapter still needs to be checked as whole on this.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	53	15	-	-	-	-	-	IN SOME REGIONS	Accepted
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	53	27	-	-	-	-	-	INCLUDE UNDERGROUND WATER	Accepted
Treber (Germanwatch)	2	53	29	-	-	-	-	-	Insert: Nevertheless it is a fact that energy plantations would increase the overall share of large scale monoculture plantations and therefore contribute to the decrease in resilience of agro-ecosystems worldwide (especially regarding climate change impacts).	This is not a given and depends on governance of land use, types of cropping systems, etc.; these topics will be dealt with in section 2.5
philippe (international institute for water and environmental engineering)	2	53	23	-	-	-	-	-	reference? Please refer to OECD work	Section will see revision and additional referencing.
philippe (international institute for water and environmental engineering)	2	53	28	-	-	-	-	-	references?	We will add references
Wang (Argonne National Laboratory)	2	53	13	-	34	-	-	-	These two paragraphs belong to Section 2.5.	It is also appropriate to be presented as barriers.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	53	13	53	24	-	-	-	This important discussion is very general here and thus not really helpful. Might be deleted here and taken up in another section, maybe 2.5?	Will be rephrased and dealt with in other sections, but will also be mentioned as barrier here.
Gorissen (Flemish Institute for Technological Research)	2	53	13	53	23	-	-	-	This paragraph is messy and incomplete. Please improve	Section will be strongly revised and materials distributed to appropriate parts of the chapter.
de Campos Barbosa (Petrobras)	2	53	21	53	23	-	-	-	This sentence isn't correct for some crops. In the case of soybean production it is possible to produce oil for fuel without competition with fodder production, once soy meal and soy-oil are co-products. Better to reference.	Section will see revision and additional referencing.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	53	7	-	9	-	-	-	TO DISCUSS COSTS FOR ETHANOL TRANSPORTATION	Acknowledged comment, but is likely to go into too much detail given limited space. Information on international supply and logistics will however be included in sections 2.3 and 2.6.
philippe (international institute for water and environmental engineering)	2	53	13	-	20	-	-	-	very rapid several publication exist	We already added 3. Please, provide further references and we can add after examination.
Gorissen (Flemish Institute for Technological Research)	2	53	24	-	-	-	-	-	What about valuation of ecosystem services? It this perceived as a barrier or opportunity?	Specifics of what such criteria imply will be dealt with in section 2.5
philippe (international institute for water and environmental engineering)	2	53	7	-	-	-	-	-	what was the reference price to be able to evaluate the significant increase	Will be checked
Schmall (Petrobras S.A.)	2	53	30	53	34	2.4.7.2	-	-	Should add at the end of paragraph: In 2002, Brazil created the National Plan for the Eradication of Slave Labor, with the aim of coordinating efforts to prevent, suppress and eradicate forced labor, illegal labor of children and adolescents, crimes against the organization of work, violence and other health rights of workers, especially in rural areas. If Companies and individuals utilize slave labor they will suffer legal sanctions and are included in a register of public access.	Brazil will be covered in more specific country descriptions, but there may be not enough space to include all those specific issues. Note: There was no space for the country specific descriptions but the various topics are addressed in Section 2.5 and in the sustainability certification discussions.
Schmall (Petrobras S.A.)	2	53	25	53	29	2.4.7.2	-	-	Should be consider at the end of the paragraph that implementation of appropriated management and policies can prevent these risks.	This kind of statement is being presented many times in Ch2, where we claim that we can grow biomass in an inappropriate or in a appropriate way. Thus, we don-t want to say this again.
de Campos Barbosa (Petrobras)	2	54	14	54	15	-	-	-	Alien invasive species are not specific to bioenergy crops.	Accepted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Titus (Natural Resources Canada, Canadian Forest Service)	2	54	23	-	-	-	-	-	Consider: '□ effluent from conversion technologies leads□'	Accepted
Titus (Natural Resources Canada, Canadian Forest Service)	2	54	20	-	-	-	-	-	Consider: '□ water use, especially in agriculture, is one□'	to be added
Visconti (Inter-American Development Bank)	2	54	2	54	8	-	-	-	Delete this paragraph. It is not clear the purpose of this para. It is too specific and the problem of un-coherence of standards and specifications is already covered in other parts of the chapter.	Section will undergo revision.
Verduzco (Chevron Corporation)	2	54	24	54	30	-	-	-	Do all of these references referred to reducing wildlife risk? Suggestion: Redistributes references throughout the text and/or use only the most important references.	The references referred to the whole section. Referencing to be refined and references placed closer to subject
SCOWCROFT (EURELECTRIC)	2	54	10	54	30	-	-	-	Production, conversion and use of biomass causes a wide range of both positive and negative environmental impacts. One aspect of the most striking driving forces are consequences of land use changes with agricultural management being of high importance. OK.	Section will be redrafted and highlight this fact
Vahrenholt (RWE Innogy GmbH)	2	54	10	54	30	-	-	-	Production, conversion and use of biomass causes a wide range of both positive and negative environmental impacts. One aspect of the most striking driving forces are consequences of land use changes with agricultural management being of high importance. OK.	Accepted
Kessels (International Energy Agency Clean Coal Centre)	2	54	3	54	8	-	-	-	Reference needed	Accepted
Gorissen (Flemish Institute for Technological Research)	2	54	17	-	-	-	-	-	Repetition?	to be checked
Verduzco (Chevron Corporation)	2	54	10	54	17	-	-	-	Run-on sentence. Break apart. Consider adding references to the studies mentioned.	Accepted
Titus (Natural Resources Canada, Canadian Forest Service)	2	54	43	54	46	-	-	-	Should the Cramer reports be cited? Wasn□t this one of the earliest national standards?	to be added in 2.4
Wang (Argonne National Laboratory)	2	54	24	-	30	-	-	-	Some of the references are not what you implied here. One additional reference is Wu et al. 2009 (see attachment).	The references referred to the whole section. Materials will be revised and references placed closer to subject; references provided added. Thanks
Schmall (Petrobras S.A.)	2	54	2	54	8	-	-	-	The citation is not a good example of the subject. The conditioning of biomass deployment for electricity production to the obtention of emission permits is not a Legal Barrier, but an environmental incentive. Laws do not regulate the biomass deployment but (gas) emission. Another point is that the question mentioned is not a national issue, but international, between the Netherlands and EU.	Accepted
Kahiluoto (MTT Agrifood Research Finland)	2	54	42	59	-	-	-	-	The second last figure in the titles seems to be necessary.	Accepted
Titus (Natural Resources Canada, Canadian Forest Service)	2	54	24	54	46	-	-	-	This is a long list of citations. Does make the paragraph more readable, but also means readers have more work to do if they wish to track references for a given statement. Should they be listed at the end of each relevant statement, or at the end of the paragraph? Same goes for next paragraph.	referencing to be refined
Londo (Energy research Centre of the Netherlands)	2	54	10	54	30	2.5	-	-	Information in this paragraph all correct, but sentences way too long! Strange to put all references at the end.	Referencing to be refined

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	54	9	-	-	2.5	-	-	SEVERAL IMPORTANT REFERENCES ARE MISSING:ADDITIONAL IMPORTANT REFERENCES NOT INCLUDED IN THE DOCUMENT: Jos Goldemberg. The Brazilian Experience with Biofuels. Innovations. Fall 2009. Volume 4, issue 4.; □ J. Goldemberg, P. Guardabassi. Are Biofuels a feasible option?. Energy Policy 37 (2009) 10-14; J Goldemberg, P Guardabassi. The potential for first generation ethanol production from sugarcane. Biofuels, Bioproducts & Biorefinery. (2009). Published online in Wiley InterScience (www.interscience.wiley.com); DOI: 10.1002/bbb.186.; □ J. Goldemberg. The role of biomass in the world's energy system. Springer - in publication.; J. Goldemberg. Bioethanol from Sugar - The Brazilian Experience. Encyclopedia of Sustainability Science and Technology. Springer - in publication."	Thanks and references will be checked.
Londo (Energy research Centre of the Netherlands)	2	54	42	54	42	2.5	-	-	Where is heading 2.5.1 including its intro? Based on the contents, it seems 2.5.1 focuses on methodological discussion, but it's not clear.	Accepted
Hakala (MTT Agrifood Research Finland)	2	55	13	55	21	-	-	-	"Remove text beginning from word ""One"" on line 13 to the end of line 21."	Accepted
Verduzco (Chevron Corporation)	2	55	1	55	9	-	-	-	Country-specific organizations are also working to develop sustainability certification programs for bioenergy. For example the Council on Sustainable Biomass Production in the United States - www.csbp.org.	to be added
Wang (Argonne National Laboratory)	2	55	1	-	-	-	-	-	Need to mention US EPA's RFS2 regulation proposal.	to be added; in fact, it became final in Feb 10. We waited until the regulation was final to include it.
Titus (Natural Resources Canada, Canadian Forest Service)	2	55	10	-	-	-	-	-	systems must be' or 'systems should be'? See also P.57 L.33	Bioenergy system...must be compared to the...
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	55	-	-	-	2.15.2.	-	-	TO MENTION RECENT EU DIRECTIVE - AND TO DISCUSS THA CONSEQUENCES OF SO MANY CERTIFICATION CRITERIA	A reviewer provided an up-to-date review which will be included
Gorissen (Flemish Institute for Technological Research)	2	55	-	-	-	-	-	2.5.1	It would greatly add to make a distinction between biophysical and societal areas of concern.	Societal areas and sustainable development will be discussed in Chapter 9.
Wang (Argonne National Laboratory)	2	56	5	-	6	-	-	-	"Need more clarification on ""LCA quantifies environmental effects in a more general manner than in relation to a specific bioenergy project.""	text will be rewritten
Kaup (Potsdam Institute for Climate Impact Research)	2	56	5	56	6	-	-	-	LCAs can be very specific instruments for evaluating distinct technologies	Accepted
Rubiera (Instituto Nacional del Carbon (CSIC))	2	56	-	58	-	-	-	-	Section too long, specially if one considers that Section 2.5.2 discusses environmental impacts from Life Cycle Assessments	Section being revised
Wang (Argonne National Laboratory)	2	56	18	-	-	-	-	-	See one additional reference by Wang et al. 1999 (see attachment).	Accepted
Coulibaly (International Institute fo Water and Environmental Engineering (2iE))	2	56	-	76	-	-	-	-	The sections lack of proportion. There are sections with 5 to 15 lines whereas others have more than 2 pages. Some sections can be cancelled or put together in order to shorten the chapter	Text being edited
Hakala (MTT Agrifood Research Finland)	2	56	3	56	18	-	-	-	Would be better explained only under section 2.5.2 and only referred to here.	restructuring of the whole section
Londo (Energy research Centre of the Netherlands)	2	56	1	60	9	2.5.1.1-3	-	-	"These subsections are well-written and organised. However, they are very comprehensive in their discussion. Please consider whether that is essential within the overall flow; they could be reduced somewhat. "	Accepted
Schmall (Petrobras S.A.)	2	56	26	56	28	2.5.1.1	-	-	Should add at the end of paragraph that: The ethanol program in Brazil has one of objectives to reduce / eliminate fires for harvesting sugar cane.	will be added

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Soimakallio (VTT Technical Research Centre of Finland)	2	56	40	56	41	2.5.1 .1.1	-	-	Very important issue is also the definition of functional unit, reference flow and indicators in order to define what is compared with what and by which measure (Soimakallio et al. 2009b). Biomass can be utilised in different ways in climate change mitigation i.e. by conserving carbon pools, sequestering carbon into forests, soils and wood products and by substituting fossil fuels. The effectiveness of these measures depend on many factors e.g. the target level and time frame for GHG emission reductions, substitution credits available etc. It should be noted that the reference flow for bioenergy system under consideration may include another biomass utilisation option which may furthermore be more effective in climate change mitigation than the considered one. These issues should be mentioned in this section.	At least partly incorporated in the new text version.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	57	7	57	18	-	-	-	"The key point here is that ""indirect land-use change"" (iLUC) might be a misleading concept. iLUC cannot be quantified in any meaningful sense by looking at a specified biomass feedstock or technology, because the question of how much additional land-use change results from the production of a unit of feedstock/bioenergy depends not only on the production chain of the feedstock/bioenergy source, but also on the amount to be produced, as well as on many other factors outside the bioenergy chain, in particular demand for food and feed, yields in (food-related as well as bioenergy-related) cropland agriculture and livestock rearing, on the question whether there is integrated optimization of food and energy or not, and on many other factors. Therefore, GHG emissions per unit of bioenergy produced depend not only on the specific bioenergy production chain, but also on the amount of bioenergy produced as well as on many factors outside the bioenergy chain. That is, in order to meaningfully assess the GHG emissions associated with bioenergy production, it is necessary to establish integrated land-change scenarios that incorporate food, livestock, fibre and bioenergy in an integrated picture."	Very good point. Clarifying text added
Hakala (MTT Agrifood Research Finland)	2	57	47	-	-	-	-	-	Is this really the last line of the page?	text missing
Verduzco (Chevron Corporation)	2	57	44	-	-	-	-	-	Microbial enhanced oil recovery is not very common.	still in use however
Gorissen (Flemish Institute for Technological Research)	2	57	27	-	-	-	-	-	see Rockström et al, Nature 2009.	to be added
Wang (Argonne National Laboratory)	2	57	8	-	-	-	-	-	See two additional references by Wang et al. 2003 and Wang et al. 1997 (see attachments).	to be added
Soimakallio (VTT Technical Research Centre of Finland)	2	57	33	57	47	2.5.1 .1.1	-	-	The fundamental problems of LCA to quantify environmental and climatic performance of bioenergy systems are discussed here. However, these issues are not illustrated in examples given in the report (figures 2.5.1 and 2.5.2) and in the conclusions of the report. Due to these problems there are significant uncertainties and sensitivities involved and it is questionable how objectively environmental performance or GHG benefits of bioenergy systems can be quantified. This should be emphasised in the conclusions of the report.	will be addressed. Figure 2.5.2 demonstrated the improvement in technical performance with time of ethanol from corn (dry mills are the prevalent technology) in North America and how these technologies continue to evolve with time in conjunction with CHP. This is the situation in Brazil and in many European countries.
Verduzco (Chevron Corporation)	2	58	21	58	22	-	-	-	According to the International Energy Agency World Energy Outlook 2009 it will not take decades to reach the global GHG emissions peak required to reach the 2°C target. It will only take years.	AR5 is in preparation and it will present the state of the modeling and measurements by the IPCC
Verduzco (Chevron Corporation)	2	58	9	58	13	-	-	-	Is this referring to all petroleum from Middle East or just that exported to US?	It is referring to the petroleum from the Middle East that the U.S. imports. Subsequent 2010 citation has more data

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Titus (Natural Resources Canada, Canadian Forest Service)	2	58	18	-	-	-	-	-	More elaboration on 'temporal dimension' would be useful. This is a very important point in comparing benefits (or problems with) different bioenergy systems. Ensuing discussion elsewhere focuses mostly on land use change and C effects, and this is a major consideration. However, a second element of the temporal dimension (or a sub-set of the larger question) that may warrant explicit discussion are the differences in the times that it takes for different bioenergy crops to regrow to harvestable age: a year for most agricultural crops, 5 to 15 years for many bioenergy plantations (short-rotation woody crops), but anywhere up to 120 years for managed forests. Overall, this has serious ramifications for policy choices. (Included in this could be the fact that forest salvage, by sometimes destroying advance regeneration, pushes way out into the future the cross-over point at which there is a net C benefit to salvage for bioenergy.)	will be addressed in the new writeup of the section.
Gorissen (Flemish Institute for Technological Research)	2	58	1	-	-	-	-	-	This statement is also discussed in the following paper: Gorissen et al. Why the debate about Land Use Change should not only focus on biofuels. EST. In press. Correct details of this paper should be provided shortly, please mail leen.gorissen@vito.be	Authors contacted reviewer and the reference has been added.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	58	1	58	13	-	-	-	While this is correct, in principle, it should be noted that fossil energy systems usually require about 3-4 orders of magnitude less area per unit of energy produced than bioenergy systems (see, e.g., Environmental Management and Health, 10(3), 177-190.), so the LUC-related GHG emissions of fossil energy systems should not be overstressed.	text to be refined. The comparison of fossil energy systems with renewables is addressed in Chapter 9.
Soimakallio (VTT Technical Research Centre of Finland)	2	58	1	58	13	2.5.1.1.1	-	-	Considering the length of the overall climate impacts handling in the report, the extension of iLUC related to fossil fuels is too large. I agree that this is relevant to be mentioned but it should not darken iLUC issues related to bioenergy systems which are likely significantly more relevant from GHG impact point of view.	text to be refined
Schmall (Petrobras S.A.)	2	58	10	58	13	2.5.1.1.1	-	-	The sentence: Preliminary estimates for the case...shoud be eliminated...it is not related directly to RE.	will be checked; this reviewer would eliminate topic other reviewers were ok.
Verduzco (Chevron Corporation)	2	59	8	59	8	-	-	-	"I suggest the following clarification in the first paragraph of 2.5.1.1.3, line 8: ""The most commonly reported criteria for evaluating economic sustainability are private production costs□"" "	Good comments were overlooked by the authors. Variables were not replaced by criteria
Verduzco (Chevron Corporation)	2	59	18	59	24	-	-	-	There are other social impact indicators such as wages, workers compensation, benefits, and others. For more information, two good resources are: http://www.extension.iastate.edu/Publications/FM1862.pdf and the International Labor Organization (ILO).	Good comments were overlooked by the authors although the text was modified and references added to the multicriteria analysis methods that include these social impact indicators
Wang (Argonne National Laboratory)	2	59	-	-	-	-	-	2.5.2	These four cases are a matter of function unit in life cycle analysis.	Yes, these are four ways in which to evaluate biofuels
Verduzco (Chevron Corporation)	2	60	15	60	16	-	-	-	"Considered rewarding as follows: ""...bioenergy use that e.g. reduce the snow cover albedo in the Arctic; and hydrocarbon aerosol emissions associated with forests. "" Reduction of snow cover albedo doesn't only a occur in the Arctic"	Accepted
Marques (The Planter Group)	2	60	11	60	11	-	-	-	"Either insert the word ""negatively"", as to read ""negatively influence global warming"" or quote the positive mitigation contribution of mitigating fossil fuels"	Accepted
Kim (VTT Technical Research Centre of Finland)	2	60	17	63	15	-	-	-	"Numbers of other GHG indicators than just % net reductions should be illustrated, e.g. GHG savings per tonne of feedstock (or per tonne of biogenic C) should be given, as the % criterion can be very misleading. We have introduced indicators in Table 2.5.2; why not to use them? The efficiency of biomass use and energy conversion is a very important goal when considering the bioenergy potentials from the viewpoint of end-use energy."	numbers will be added
philippe (international institute for water and environmental engineering)	2	60	5	-	9	-	-	-	a table similar to the one 252 would have been interesting	Good idea. Such table was considered based on the multicriteria analysis methods that have been applied. However, the information was very complex to show as most multivariate analysis treatments are and was abandoned.
Kim (VTT Technical Research Centre of Finland)	2	60	10	66	24	-	-	-	Divide the section to two subsections instead of one: 2.5.2.1 Bioenergy chains excluding land-use impacts. 2.5.2.2 Land-use impacts. It should be possible to handle the traditional bioenergy under these subsections.	to be changed as the section is rewritten

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Titus (Natural Resources Canada, Canadian Forest Service)	2	60	10	-	-	-	-	-	If Section 2.5.2 is 'Environmental impacts', why is 2.5.3 'Environmental impacts not related to climate change'? These two need equal weighting in their wording to clearly distinguish these two categories of impacts, so perhaps 'Environmental impacts related to climate change'?	Accepted and to be changed as the section is rewritten
Helynen (VTT)	2	60	39	-	-	-	-	-	New technologies for cofiring, such as gasifiers connected to coal boilers, or use of pellets allow the share of biomass up to 30 %. Source: IEA Energy Technology Perspectives 2008. Chapter Biomass and Bioenergy	moved to commercial technology
Kahiluoto (MTT Agrifood Research Finland)	2	60	-	-	-	2.5.2	-	-	"The title would better be ""Impacts on climate"" , because the other environmental impacts are treated with later in 2.5.3. "	structure has been changed
Kim (VTT Technical Research Centre of Finland)	2	60	10	-	-	2.5.2	-	-	Change section name: 2.5.2 Climate change impacts	restructuring of section 2.5
Londo (Energy research Centre of the Netherlands)	2	60	10	66	24	2.5.2	-	-	Very good material. However, again the text starts with (and focuses on) mostly impacts of biofuels, while this is still a very minor part of total biomass use. Why not start with the key messages for wood (and residue) use in power and heat, then put 2.5.3, and then go into the complex fundamentals of biofuels?	to be considered in the new version
Titus (Natural Resources Canada, Canadian Forest Service)	2	60	43	-	-	2.5.2	-	-	CCS' □ if this is the first use of this abbreviation, then best to define it	Accepted
Schmall (Petrobras S.A.)	2	60	30	60	36	2.5.2	-	-	Should add at the end of paragraph: In this last case, the bioethanol in Brazil has strong benefits for GHG reductions.	is already included
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	60	-	-	-	-	-	2.5.2.1.	TO DISCUSSE RECENT US DECISION ABOUT BRAZILIAN ETHANOL	case study in chapter 8
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	61	7	-	17	-	-	-	TO DISCUSS THAT IN MANY STUDIES ON LCA ARE INCLUDED DEFORESTATION OF NATIVE FOREST	already mentioned
Kessels (International Energy Agency Clean Coal Centre)	2	61	-	-	-	-	-	-	Would be good to have an example of a coal fired power station using biomass, such as Drax in the UK	More examples co-firing will be added and the technology will be classified as commercial
Kruger (South African Weather Service)	2	61	3	61	6	2.5.2	-	-	The caption inside the graph can be removed.	Accepted
Kessels (International Energy Agency Clean Coal Centre)	2	61	-	-	-	-	2.5.1	-	Need to make this figure clearer	will be done. For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Coulibaly (International Institute fo Water and Environmental Engineering (2iE))	2	61	-	-	-	-	2.5.1	-	readability. Items need to be clearer	structuring will be improved. For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Wang (Argonne National Laboratory)	2	61	-	-	-	-	2.5.1	-	The much less GHG reduction by landfill gas is questionable. The result depends very much on how to treat carbon in landfill gas.	For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.doc. Good point.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	61	-	-	-	-	2.5.1.	-	Is this figure really meaningful considering the restrictions mentioned in the text? In the WGBU-Report 2009 (http://www.wbgu.de/wbgu_jg2008_en.pdf) on page 183 there is a very detail figure concerning GHG improvements of many processes.	reference to be considered. For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	61	-	-	-	-	Figure 2.5.1	-	It would be good to also include combined heat and power (CHP) plants. Co-firing looks a bit weird.	to be added; For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Schmall (Petrobras S.A.)	2	62	12	60	12	2.5.2.1	-	-	Should describe what GHGenius means.	to glossary. It is one the LCA models used in Canada. For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Kruger (South African Weather Service)	2	62	2	63	7	2.5.2.1	2.5.2	-	The caption should be rephrased - unclear. Maybe better to discuss the contents of Figure 2.5.2, instead of the graph. This will also shorten the chapter somewhat.	will be elaborated. For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	62	-	-	-	-	2.5.2	-	To me the figure is not accessible too.	will be elaborated. For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	62	-	-	-	-	Fig 2.5.2.	-	This Fig could be misleading, because it is based on a complex set of assumptions that are to some extent explained below the figure, but are difficult to understand and nevertheless highly influential on the results. This whole part should be presented in a much clearer fashion, and the question of how robust these conclusions are, given the high uncertainties involved in much of this modeling / assessment work, should be explained clearer and more easily understandably.	will be elaborated. For the reviewer, the file attached has the actual figure that should have been in the FOD with its caption. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Kim (VTT Technical Research Centre of Finland)	2	63	31	-	-	-	-	-	"ADD: The rapid oxidation in tropical conditions (not even including emissions from preceding deforestation) could last for decades depending on the depth of the peat layer. The average palm oil yield of a plantation is of the order of 4 t/ha/y. This palm oil refined to biodiesel would displace only approximately 4 tCO ₂ e/ha/y emissions compared to fossil-based diesel (Edwards et al. 2008) so that the emissions from soil oxidation could be more than 20 times higher than the emission savings from biofuel. REASONING: It is necessary to illustrate the worst bioenergy case showing concrete numbers of impacts and benefits."	text to be added, reference added
Kheshgi (ExxonMobil Research and Engineering Company)	2	63	8	63	15	-	-	-	"Suggest that the large uncertainty in N ₂ O emissions associated with agriculture and fertilizer use be addressed in more detail. Implications of Crutzen article (Crutzen et al., 'N ₂ O release from agro-biofuel production negates global warming reduction by replacing fossil fuels, Amos. Chem. Phys. Discuss., 7, 11191-11205, 2007) are not addressed at all although this reference is listed. The effects of N ₂ O have been found to be a potentially important factor in scenarios where intensification of agriculture is driven by expanding demand by bioenergy: see Mellilo et al. 2009 Science." "	Crutzen's reference is already included and will be discussed although it too has been subjected to criticism. Mellilo et al., Science article is also cited.
Kim (VTT Technical Research Centre of Finland)	2	63	16	-	-	-	-	-	"The dynamics of biospheric carbon change due to direct land use should be described in more detail. Different cases, e.g.:1) Instant C loss due to lost of forest cover; 2) Continuing decay of organic soils with high C stocks (peatlands); 3) Increase in terrestrial C stocks due to biomass plantations (win-win-case); etc. Which are the real hot-spots from the viewpoint of negative impacts."	to be added
Kim (VTT Technical Research Centre of Finland)	2	63	16	-	-	-	-	-	"The indicator ""C payback time"" is a simple and useful measure for describing the dynamical impacts of land use. Figure 3 in the article of Gibbs et al. (2008) (appeared in some earlier draft) should be brought back."	to be added; the reviewer was one of the lead authors of the report and for this reason was aware of what were the contents of previous versions.
Kheshgi (ExxonMobil Research and Engineering Company)	2	63	19	63	20	-	-	-	"While the conversion of natural ecosystems to crops can lead to positive and negative changes in biosphere carbon stocks, the change is much more likely to be negative for highly productive ecosystems. Suggest that this be highlighted." "	noted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Verduzco (Chevron Corporation)	2	63	8	63	15	-	-	-	Is this a big issue? Seems that major concern is over N2O emissions from the fields, not the fertilizer factory.	noted
Verduzco (Chevron Corporation)	2	63	25	63	31	-	-	-	Need frame of reference for this. It's a dynamic process so more relevant to assess in terms of changes in carbon stocks as in Table 2.5.3	Text rewritten and references given. See Figure 9.10 in final version
KOBAYASHI (Toyota R&D Labs. Inc.)	2	63	45	-	-	-	-	-	Please add the reason for this.	IPCC numbers are only coarse average numbers. As specific numbers are measured and provided to IPCC Working Group II, these more refined numbers then are used.
Verduzco (Chevron Corporation)	2	63	21	63	21	-	-	-	Provide more detailed description of iLUC, w/ example of corn and soybean.	to be done. The new draft version will incorporate the latest results from modeling by EPA of carbon intensity of biofuels routes including ILUC that were extensively peer reviewed.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	63	18	63	24	-	-	-	See my notes on iLUC above	noted, already addressed in explanation to previous comment
Wang (Argonne National Laboratory)	2	63	13	-	-	-	-	-	See one additional reference by Wang et al. 1999 (see attachment).	reference to be added
philippe (international institute for water and environmental engineering)	2	63	28	-	-	-	-	-	the first driver for deforestation was not palm oil plantation but rather wood logging. The palm trees came later. Please cross check literature	noted; it is difficult to establish cause and effect. The ILUC calculations of the U.S. EPA will be presented in the final version and this fact is noted as well as in other cases (soy bean in Amazon forest -- first was logging, land tenure,... and then was agriculture).
philippe (international institute for water and environmental engineering)	2	63	25	-	-	-	-	-	This not a realistic scenario	No explanation given by the reviewer
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	63	18	-	24	-	-	-	TO MENTION ILUC IS IMPOSSIBLE TO EVALUATE - SEE EXISTING STUDIES FROM ICONE	noted. The new draft version will incorporate the latest results from modeling by EPA that take into consideration ICONE's models for land use distribution in Brazil.
Smith (McGill University, Macdonald Campus)	2	63	8	63	15	2.5	-	-	"It is not really clear what is meant by ""plants that have nitrous oxide gas cleaning"". There is much that can be done to reduce nitrous oxide emissions associated with crop production systems. Perennial crops have root systems already present when the fertilizer is applied so it is taken up rapidly, leaving it in the soil and vulnerable to denitrification, for less time. For cellulosic biofuel crops, harvest after leaf and stem senescence means that the bulk of the nitrogen is remobilized from the above ground structures into roots for storage for the winter, meaning less N fertilizer needs to be applied, again meaning less likelihood of denitrification to nitrous oxide. In the same way, improving crop nitrogen use efficiency (NUE) will reduce the need for nitrogen fixation. One might also genetically engineer crop plants to contain nitrous oxide reductase so that they convert any nitrous oxide produced into dinitrogen (80% of the atmosphere). There is even a need to carefully consider crop production systems. While no-till enhances soil carbon and therefore is one of those carbon sequestration mechanisms it also tends to result in soils that are more wet more often and wet soils are more likely to be oxygen limited and therefore more likely to produce nitrous oxide through denitrification of added fertilizer N. Interestingly, if the N is added to the system through legume N fixation (crop rotation with legumes) no-till results in less denitrification than conventional till as the N is slowly released into the soil from the residue of the previous crop and is not generally in the soil and therefore available for denitrification. "	discussion to be added. Good point of the reviewer.
Ballesterio (National Meteorological Institute)	2	63	13	-	15	2.5.2	-	-	I do not see how plants with nitrous oxide gas cleaning will reduce the N2O generated in the field after the application of N fertilizers	text to be refined
Soimakallio (VTT Technical Research Centre of Finland)	2	63	8	63	15	2.5.2	-	-	N2O emissions from soils are likely more important source of N2O than fertilizer production. This should be mentioned.	noted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Schmall (Petrobras S.A.)	2	63	18	63	24	2.5.2.2	-	-	Should add at the end of paragraph that: However, it can be emphasized that biofuels can be produced with small footprint without including secondary land use, through correct management on the activity as well as appropriate policies such as zoning for planting in specific places and in preventing on other places for avoiding this kind of impact. Brazilian Bioethanol Program is an example of this.	noted
Wang (Argonne National Laboratory)	2	64	-	-	-	-	-	2.5.3	What period of time for the carbon stock changes in tons/ha?	Table 2.5.3 will be removed
philippe (international institute for water and environmental engineering)	2	65	28	-	29	-	-	-	domestic uses of fossil fuels in DC are not particularly efficient. Please check with work done by	noted. Still done in the context of developing countries
Titus (Natural Resources Canada, Canadian Forest Service)	2	65	14	-	-	-	-	-	Expand: 'rape seed' to 'rape seed (canola)'	done
de Campos Barbosa (Petrobras)	2	65	17	65	25	-	-	-	In this paragraph it's said that the conversion of grasslands and forests it is likely to have negative impacts in GHG emissions. The conclusion is in contradiction to values showed at table 2.5.3 with respect to grassland. It's also important to identify which land cover will have more probability to in fact change.	check the facts. See Figure 9.10 in final version
Hakala (MTT Agrifood Research Finland)	2	65	27	65	31	-	-	-	Remove text, not necessary here, repetition.	to be consolidated
Smith (McGill University, Macdonald Campus)	2	65	17	65	25	2.5	-	-	One additional benefit of biofuel development would be more intensive research into low-input crop production systems, with some of the findings then being applied to the production of food crops. We will have to develop and apply methods for low input crop production to all crops during the second half of this century, and really, the sooner the better.	To be added to section 2 (feedstock prod)
LEITE DRACHMANN (PETROBRAS)	2	65	17	65	25	2.5.2.2	-	-	Land use change from grasslands to agriculture in many cases, specially considering developing countries, provides a better social use of land, generating employment and revenue for rural communities. Such LUC may also provide an environmental improvement of the ecosystems as one should consider that many of those grasslands are degraded lands where perenne species are cultivated and most of them are exotic species.	noted
Wang (Argonne National Laboratory)	2	65	-	-	-	2.5.2.3	-	-	How about to take into account albedo effects of different ecosystems for biofuel production?	more text on that effect will be added
Coulibaly (International Institute fo Water and Environmental Engineering (2IE))	2	65	-	-	-	-	2.5.3	-	id. numbers on Y-axis are fuzzy	Figure 2.5.3 will be removed
Ballestero (National Meteorological Institute)	2	65	-	-	-	-	2.5.3	-	The x□s axis has to include the units.	Figure 2.5.3 will be removed
Kruger (South African Weather Service)	2	65	1	65	8	2.5.2.2	2.5.3	-	The abbreviations, e.g. WEO-V1, should be explained. Units are missing on the X-axis.	Table 2.5.3 will be removed
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	65	-	-	-	-	2.5.3	-	What is the meaning of TAR-V1: 22/55, TAR-V1: 2/26, WEO-V1 :3/30?	Figure 2.5.3 will be removed
Treber (Germanwatch)	2	66	37	-	-	-	-	-	"insert after "" ... wildfire risk"". But at the same time, such measures risk long-term nutrient depletion and degradation of forest soils with according carbon emissions."	Good complementary suggestion.
Treber (Germanwatch)	2	66	32	-	-	-	-	-	"replace last sentence by: ""However, the production of biomass for energy can generate both additional benefits and environmental challenges.""	Text rewritten for clarity
Kaup (Potsdam Institute for Climate Impact Research)	2	66	18	66	18	-	-	-	3,8 t Co equivalent per year □ is that per stove per liter paraffin?	per stove per year
Marques (The Plantar Group)	2	66	12	66	17	-	-	-	Insert reference to the efficiency of carbonization processes, in addition to the need of increasing sustainable sources of biomass (e.g. SFM or planted forests).	text will be revised and a ref inserted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	66	21	66	24	-	-	-	It's not clear what's the connection with traditional bioenergy use.	Needs to be defined better. Traditional biomass is from combustion in developing countries for cooking needs. It is done with about 5% efficiency and after the multilateral organizations and governments worldwide, 830 million people (out of 3 billion) are now using improved cookstoves with efficiencies of 15%-20%. Much higher efficiencies are observed for the use of wood heating in Northern European countries.
Titus (Natural Resources Canada, Canadian Forest Service)	2	66	33	-	-	-	-	-	Suggest: '□ harvesting on some sites also has' and 'It can improve□'. To this list could be added 'Removal of insulating organic matter can warm soils in northern forests where temperature limits seedling growth (Kranabetter et al. 2006. Soil Sci. Soc. Am. J. 70: 1591-1599).'	Good complementary suggestion. Reviewer reference will be added
Titus (Natural Resources Canada, Canadian Forest Service)	2	66	26	67	7	-	-	-	The section opens with positive impacts, then breaks into sub-sections for different topics and discusses both negative and positive impacts (e.g., positive impacts on biodiversity P.68 L.34-36). This mixed approach is a bit confusing, diverts readers' attention, and can lead to a sense of repetition. Consider moving text on P.66 to appropriate sub-sections, and limit introductory paragraph to pointing out to readers the structure of Section 2.5.3 and what topics will be covered. Then each sub-section can deal with the negative and positive impacts, topic by topic.	Good suggestion. Text is being restructured and will address this comment.
Verduzco (Chevron Corporation)	2	66	17	66	19	-	-	-	With how many stoves?	there are already 830 million people (out of 3 billion) using improved cookstoves (WHO, 2009)
Schmall (Petrobras S.A.)	2	66	5	66	24	2.5.2	-	-	Could be eliminated.	Figure 2.5.3 will be removed
Londo (Energy research Centre of the Netherlands)	2	66	-	71	-	2.5.3	-	-	Good review material, although quite comprehensive. There is some overlap with section 2.2.4 (factors constraining biomass potentials). Please make sure the texts are consistent and there is as little redundancy as possible.	Restructure of chapter will avoid repetition.
Kahiluoto (MTT Agrifood Research Finland)	2	66	-	69	-	2.5.3	-	-	Redundancy should be reduced between this and some other sections and cross-references introduced, e.g. for water and biodiversity issues (e.g., with 2.2.4.2 to 2.2.4.4). Examples would make the message clearer. E.g., on p. 66 l. 37 to 39: examples and references desirable, such as also p. 69 l. 8 to 10, and reference on p. 69 l. 42 to 43.	Good suggestion noted. Examples will be provided.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	66	-	-	-	2.5.3	-	-	TO MENTION THAT ADEAUQTE ZONING CAN CONTRIBUTE TO SOLVE THE PROBLEMS	Suggestion noted and will be reflected.
Titus (Natural Resources Canada, Canadian Forest Service)	2	67	3	67	7	-	-	-	"□ nutrients to the soil, and residue retention physically helps prevent erosion, and in forestry may provide a bed for equipment to travel on, thus reducing compaction and displacement; organic matter also increases soil C content, improves structure, and provides habitat and substrates for soil organisms, and thus only a share□"	Good suggestion noted and incorporated.
Schmall (Petrobras S.A.)	2	67	40	-	-	-	-	-	"Add ""may"" after ""crop irrigation""	will be incorporated
Titus (Natural Resources Canada, Canadian Forest Service)	2	67	18	67	21	-	-	-	"Anoxic 'dead' zones in oceans are dramatic outcomes of eutrophication; find examples from literature?"	Examples will be provided and the flow of the waters of the Mississippi into the Gulf of Mexico are one good one.
Schmall (Petrobras S.A.)	2	67	13	-	-	-	-	-	"Replace ""emissions are reduced"" by ""emissions are reduced to zero""	As a general statement "significant reductions" are acceptable but reduced to zero is too strong a statement for the broad classes of biofuels under development. There is a broad set of biofuels including those that are coprocessed with oil. So suggestion is partially Accepted.
Schmall (Petrobras S.A.)	2	67	34	-	-	-	-	-	"Replace ""lost"" by ""transferred""	will be incorporated
Wang (Argonne National Laboratory)	2	67	15	-	16	-	-	-	The statement that biodiesel has higher Nox emissions than petroleum diesel may be questionable.	Text will be improved to show examples of decrease and increase in the literature as well as the current trends.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Smith (McGill University, Macdonald Campus)	2	67	20	67	21	2.5	-	-	Eutrophication has also occurred in marine systems, with the best example being the dead zone that develops every summer where the waters of the Mississippi flow into the Gulf of Mexico.	Good example and there are many. Text revision will incorporate examples
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	67	-	-	-	2.5.3.1.	-	-	TO MENTION THARE ARE COMMERCIALY AVAILABLE TECHNOLOGIES TO REDUCE IT - SEE ATTACHED REFERENCES	references will be consulted
Fulton (Deutsche Bank)	2	67	-	-	-	2.5.3.2	-	-	"General comment: Only brief coverage of nutrification from runoff from bioenergy crops. Excess nitrogen application causes water quality problems. See Foley 2005 (science) reference is in report. Foley, J. A., R. DeFries, et al. (2005). ""Global consequences of land use."" Science 309(5734): 570-574."	Good comment. Reviewer reference will be incorporated
Gorissen (Flemish Institute for Technological Research)	2	67	-	-	-	5.5.3.1	-	-	"A relevant reference is Verhaeven et al., 2005 Erik. Verhaeven, Luc Pelkmans, Leen Govaerts, Rudolf Lamers and Frans Theunissen, Results of demonstration and evaluation projects of biodiesel from rapeseed and used frying oil on light and heavy duty vehicles, SAE Technical Paper Series 2005-01-2201 (2005).	Reviewer reference was reviewed and added
Verduzco (Chevron Corporation)	2	68	14	68	15	-	-	-	"The text reads: ""Given that several types of energy crops are perennial leys and woody crops grown in multi-year rotations"" What are leys?"	Leys are arable fields being used temporarily as a pasture for grazing animals. May use simpler words or add to definition
Titus (Natural Resources Canada, Canadian Forest Service)	2	68	1	67	3	-	-	-	Any evidence of greater snow accumulation under canopy in plantations, and extension of season over which melting takes place?	Sublimation of intercepted snow and sub-canopy snowpack are poorly understood-particularly in forested mountainous regions (<i>Bales, R. et al 2006 Mountain hydrology of the western United states. Water Resources Research 42. WO8432.</i>
Marques (The Plantar Group)	2	68	42	68	46	-	-	-	Negative impacts of plantations may also be addressed by setting aside a smaler portion of the productive are for native regeneration (see Scoforo 2008). In Brazil, for example, 20 to 80% of the total area must be set aside for native preservation purposes, depending on the biome.	References will be assessed and reflected in text if in available in peer reviewed accessible literature. In addition, although the legislation mandates specific levels, the actual measurements do not indicate compliance with the limits. See the paper: Environmental, land-use and economic implications of Brazilian sugarcane expansion 1996–2006 by Gerd Sparovek & Alberto Barretto & Goran Berndes & Sergio Martins & Rodrigo Maule, Mitig Adapt Strateg Glob Change, DOI 10.1007/s11027-008-9164-3. The most relevant reference materials in this regard continue to be the work of Virginia Tolbert and Virginia Dale out of the USDOE. Most notable Tolbert, V. R., J. E. Lindberg, T. H. Green, R. Malik, W. E. Bandaranayake, J. D. Joslin, F. C. Thornton, D. D. Tyler, A. E. Houston, D. Pettry, S. Schoenholtz, B. R. Bock, and C. C. Trettin. 1997. Soil and water quality implications of production of herbaceous and woody energy crops. In. Proc. IEA International Workshop on Environmental Aspects of Energy Crop Production, Brasimone, Italy pp. 195–206. Joslin, J. D. and S. H. Schoenholtz. 1997. Measuring the environmental effects of converting cropland to short-rotation woody crops: A research approach. Biomass Bioenergy 13:301–311. McLaughlin, S. B. and M. E. Walsh. 1998. Evaluating environmental consequences of producing herbaceous crops for bioenergy. Biomass Bioenergy 14:317–324. Mann, L., and Tolbert V. 2000 Soil sustainability in renewable biomass plantings. Ambiop 29(8) 492-498

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Gorissen (Flemish Institute for Technological Research)	2	68	17	-	-	-	-	-	Other system dynamics exists, E.g. Vegetation cover might also influence rainfall patterns.	noted
Gorissen (Flemish Institute for Technological Research)	2	68	44	-	45	-	-	-	Please include reference	References are provided but in a general way. Will be done more selectively to address the reviewer question and in the section. The reference requested is Borjesson and Berndes 2006, The prospects for willow plantations for wastewater treatments in Sweden. Biomass and Bioenergy, 30: 428-438. Ecological Principles for the Design of Wildlife Corridors David B. Lindenmayer and Henry A. Nix, Conservation Biology, Vol. 7, No. 3 (Sep., 1993), pp. 627-630 is a very specific reference to be included.
Verduzco (Chevron Corporation)	2	68	41	68	46	-	-	-	Please provide a reference.	References are provided but in a general way. See Semere et al. 2007; The Royal Society 2008. Will be done more selectively.
Schmall (Petrobras S.A.)	2	68	31	68	33	2.5.3	.3.	-	Should include at the end of paragraph: Agriculture good practices, management and appropriated policies could avoid this impact on biodiversity.	The restructure of the chapter will give increased prominence to the integrated land use management practices of agriculture, forestry, and bioenergy crops as a way to avoid negative impacts as described, including on biodiversity.
Titus (Natural Resources Canada, Canadian Forest Service)	2	69	24	69	35	-	-	-	"One senses that much of this has been said before; should it not all belong here in this subsection? Note lack of comment on forest soils."	Forestry comments like this and others from this reviewer have led to the addition of a contributing author with specific forestry background to the chapter to address the topic. Noted that the reviewer correctly states that the sentence as written is inappropriate for an IPCC report.
Hakala (MTT Agrifood Research Finland)	2	69	10	-	-	-	-	-	Add text: However, taking degraded land into use again will require investements in production technology such as irrigation, fertilisation, liming etc., which have to be evaluated before production can be considered profitable enough in these areas.	Comments noted and certainly valid for developed country situations. The profit criterion is different in regions of the world when economic development is considered such as in developing world. See Kohling and Ostwald 2001. Ambio 30:37-42
Titus (Natural Resources Canada, Canadian Forest Service)	2	69	17	69	18	-	-	-	<input type="checkbox"/> biodiversity impacts may still arise in the real world.' Why is a nature conservation area any less of a 'real world' than agricultural land or managed forests? Who gets to decide what is 'real' (and therefore presumably acceptable) and 'not real' (and therefore can be ignored)? This is not only a pejorative term, but it suggests an industrial bias <input type="checkbox"/> to the exclusion of environmental concerns <input type="checkbox"/> on the part of the author. Neutral terminology is essential if this ICPP chapter is to have credibility and be seen as objective.	Forestry comments like this and others from this reviewer have led to the addition of a contributing author with specific forestry background to the chapter to address the topic. Noted that the reviewer correctly states that the sentence as written is inappropriate for an IPCC report.
Hakala (MTT Agrifood Research Finland)	2	69	2	69	2	-	-	-	It is not clear what is Orissa?	Orissa is a state in India. Orissa, India will be added
Gorissen (Flemish Institute for Technological Research)	2	69	10	-	-	-	-	-	Please include reference	Kohling and Ostwald 2001. Ambio 30:37-42. Another most appropriate references would be Francis,G., Edinger, R., and Becker,K., (2005) A concept for simultaneous wasteland reclamation, fuel production, and socio economic development in degraded areas of India: Need, potential, and perspective of Jatropha plantations. Natural Resources Forum 29 (2005) 12-24

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Gorissen (Flemish Institute for Technological Research)	2	69	43	-	-	-	-	-	Please include reference	Reference will be provided to the reviewer at a later date. There are many groups throughout the world working in this field. A major reference is: Sannigrahi, P., A.J. Ragauskas, and G.A. Tuskan (2010). Poplar as a feedstock for biofuels: A review of compositional characteristics. Biofuels, Bioproducts and Biorefining, 4(2), pp. 209-226.
Schmall (Petrobras S.A.)	2	69	13	69	16	-	-	-	Should be removed considering the text is too long and needs cuts. The affirmative is wrong. There is no incentive for that. Look the zoning for food and biofuels in Brazil.	Although Brazil provides excellent examples of zoning, the statements of South-East Asia are poorly referenced and the statement is correct -- there has been deforestation for biofuels production in some specific regions. It is true that in many regions the deforestation occurs by logging and lack of land tenure. Biofuels are not the direct cause of these activities. This is one reason why it is so difficult to model the indirect impacts.
Verduzco (Chevron Corporation)	2	69	37	69	42	-	-	-	These paragraphs were already entered on page 25	Revised section structure will eliminate redundancy.
Gorissen (Flemish Institute for Technological Research)	2	69	22	-	-	-	-	-	What about GMO impact? What about invasive exotic species? It would be unlikely that they do not have an impact on biodiversity	These topics are addressed in treated in 2.5.3.5.1 and 2.5.3.5.4, respectively and the link with potential biodiversity impacts will be noted.
Schmall (Petrobras S.A.)	2	69	11	69	11	2.5.3.3	-	-	Should add at the end of paragraph: Biofuels Program in Brazil shows that it is possible to protect some biomes and regions of interest such as Amazon and Pantanal using a proper zoning for biofuels production.	Biofuels production zones will be included as an example of a potential solution. In addition, although the legislation mandates specific levels, the actual measurements do not indicate compliance with the limits. See the paper: Environmental, land-use and economic implications of Brazilian sugarcane expansion 1996–2006 by Gerd Sparovek & Alberto Barretto & Goran Berndes & Sergio Martins & Rodrigo Maule, Mitig Adapt Strateg Glob Change, DOI 10.1007/s11027-008-9164-3
Schmall (Petrobras S.A.)	2	69	22	69	23	2.5.3.3	-	-	Should begin the paragraph with: Unless proper policies are established, biodiversity loss may also occur...	Noted
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	69	24	69	35	2.5.3.4	-	-	This section should also note the potential threats for soil fertility that might result from too high harvest of residues (see the work by Lal and others). It might be sufficient to cross-link to section 2.2.4.1 or to cut some text there and paste it here.	Revised section structure will eliminate redundancy. Good suggestion
Titus (Natural Resources Canada, Canadian Forest Service)	2	70	15	70	18	-	-	-	But more was said about GMOs in 2.5.3.5. Consolidate these sections, one way or the other	Revised section will consolidate the two sections mentioned.
Sims (Massey University)	2	70	15	-	18	-	-	-	reference for yield potential increase of GM crops?	References to yield increases in most common GMO cases will be added
Kessels (International Energy Agency Clean Coal Centre)	2	70	32	70	-	-	-	-	What is the Canadian context?	Canadian reference is Canadian Food Inspection Agency Regulatory Guidance Document 6 (Dec. 2009) Ethanol Distillers's Grains for Livestock Feed
Schmall (Petrobras S.A.)	2	70	7	70	14	2.5.3.5.1	-	-	Again should add at the end of paragraph: Policies should be established to avoid this risk and deal with novel plants for bioenergy.	Need for policies will be stressed
Tolmasquim (Empresa de Pesquisa Energética - EPE)	2	70	7	-	-	2.5.3.5.1	-	-	Sugarcane is not a traditional feed source and it's one of the most important feedstocks in fuel ethanol manufacturing in the world, and specially in Brazil. Please, add an exception in the line 7.	Added; usually in this context, sugarcane as a semiperennial has been placed with the perennials. However, the reviewer is correct that it could be confused.
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	70	6	144	18	2.5.3.5.1-2.5.3.5.4	-	-	"the logical connection of sub-sections 2.5.3.5.1-2.5.3.5.4 to section 2.5.3.5 is not clearly stated; ideally could be shortened"	Revised section will address these issues and clarify that section 2.5.3.5.3 is an issue of the conversion technology and not of production.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Coulibaly (International Institute fo Water and Environmental Engineering (2iE))	2	70	-	-	-	2.5.3 .5.2	-	-	More development is expected here	Thanks for the comment. Indeed, revised section will consolidate the two sections dealing with GMO and revise the text. References such as Firbank L, Lonsdale M, Poppy G (2005) Reassessing the environmental risks of GM crops. Nat Biotechnol 23:1475–1476 will be added.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	70	-	-	-	2.5.3 .5.2	-	-	very short, see WGBU-Report 2009 (http://www.wbgu.de/wbgu_jg2008_en.pdf) on page 148-149	Text will be modified and reference will be incorporated
Titus (Natural Resources Canada, Canadian Forest Service)	2	71	10	71	15	-	-	-	"Scientific names of species should be in italics; scientific authorities for names would also be normal practice."	Accepted
Rosinski (Electric Power Research Institute)	2	71	15	-	-	-	-	-	"should read ""known to be invasive or noxious in parts of the United States.""	Accepted
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	71	29	71	31	-	-	-	Please give a source	See Bauen, Vuille, Watson, and Vad, 2009a prepared by E4tech for the Roundtable on Sustainable Biofuels RSB and available on line at the RSB web site. http://cgse.epfl.ch/webdav/site/cgse/shared/Biofuels/Documents%20and%20Resources/09-10-08_E4Tech%20Report%20GHG%20Accounting_V4%201_08October09.pdf
Verduzco (Chevron Corporation)	2	71	16	71	18	-	-	-	Please provide a reference.	The IUCN Biofuels and Invasive guidelines (2009) is the reference that should have been cited. http://cmsdata.iucn.org/downloads/iucn_guidelines_on_biofuels_and_invasive_species_.pdf
SCOWCROFT (EURELECTRIC)	2	71	29	71	31	-	-	-	The creation of regional employment as well as economic gains are identified as the most important socio-economic impacts.	We agree with the reviewers
Vahrenholt (RWE Innogy GmbH)	2	71	29	71	31	-	-	-	The creation of regional employment as well as economic gains are identified as the most important socio-economic impacts.	We agree with the reviewers
Fulton (Deutsche Bank)	2	71	-	-	-	2.5.4 .1	-	-	General comment: Land tenure discussion needs to be brought out more specifically. Especially in light of the need to build infrastructure and modernize and use/land management practices.	The discussion on land tenure will be improved
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	72	-	-	-	2.5.4 .	-	-	TO MENTION THAT AREAS WITH SUCARCANE PRESENT THE BETTER CONDITIONS COMPARING WITH OTHER AGRICULTURAL SECTORS	Will include the issue
LEITE DRACHMANN (PETROBRAS)	2	72	19	72	20	-	-	2.5.4	"Criteria: Land-use competition and food security; Issues Addressed: Emerging local and macroeconomic competition with other land uses. The expression ""Reduced access"" to food is rather too strong, as in some cases biofuel production may even have a positive effect on food security, by increasing food availability and price competition."	The table was revised and simplified into areas of concern and Examples of Impact categories
Schmall (Petrobras S.A.)	2	72	19	72	20	-	-	2.5.4	"This table should be reviewed considering three columns: criteria, issues and analyses. For example: criteria that is correct, gender. That is wrong: land-use..The competition and food security are issues...and then we should include this analyses.Criteria: Land-use competition and food security; Issues Addressed: Emerging local and macroeconomic competition with other land uses. The expression ""Reduced access"" to food is rather too strong, as in some cases biofuel production may even have a positive effect on food security, by increasing food availability and price competition."	The table was revised and simplified into areas of concern and Examples of Impact categories
Wang (Argonne National Laboratory)	2	72	-	-	-	-	-	2.5.4	Some of the issues are not specific to bioenergy but general to agriculture (sch issues include freedom of association, access to social security, changes in power, etc. as presented in the table).	These are standard criteria developed internationally. We are only reviewing their C&I
Verhoest (LABORELEC)	2	73	17	-	-	-	-	-	""in terms of the drudgery"": no capital letter"	Accepted
Hakala (MTT Agrifood Research Finland)	2	73	22	73	22	-	-	-	"A word missing between ""some"" and ""via""?"	Accepted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	73	36	-	-	-	-	-	"Spell out DALY: ""children under five - and the loss of 38.6 millions DALY/yr (Disability Adjusted Life Years) ""	Accepted
philippe (international institute for water and environmental engineering)	2	73	29	-	-	-	-	-	biomass sulfur content iss close to 0 how it can be a air polutant? This do concern RSA and china mainly both countries using Coal	Reference to sulfur will be deleted, it refers to coal for cooking
Verhoest (LABORELEC)	2	73	35	-	-	-	-	-	diseases and not deceases	Accepted
philippe (international institute for water and environmental engineering)	2	73	7	-	-	-	-	-	rural area are not wellknow for job creation. Please provid ref and maybe specify the region. Might be true in asia certainly not in africa.	Will add a reference and in many cases, the jobs and industries created are not part of the "formal" jobs but of the informal economy
philippe (international institute for water and environmental engineering)	2	73	22	-	-	-	-	-	this figure is surprising please provide references. Indeed if the problem is serious it concern particularely people in cold weather conditions implying indoor cooking.	Will add a Ref
Kahiluoto (MTT Agrifood Research Finland)	2	73	-	-	-	2.5.4	-	-	Figures given in the executive summary would make this more concrete.	Will be more precise
Schmall (Petrobras S.A.)	2	73	36	73	36	2.5.4	-	-	First time DALY appears and should be defined as it is done later on this page on lines 42 to 43.	Accepted
Kahiluoto (MTT Agrifood Research Finland)	2	73	-	-	-	2.5.4	-	-	Overlapping with earlier text.	Actually there is no overlp as earlier section deals with rural industries
philippe (international institute for water and environmental engineering)	2	73	-	-	-	2543	1	-	please gives example	There is no line 63
Rubiera (Instituto Nacional del Carbon (CSIC))	2	74	10	74	10	-	-	-	""B/C: benefit-cost ratio""	Accepted
philippe (international institute for water and environmental engineering)	2	74	23	-	-	-	-	-	""employment for thousands of people"" please cross check this information or specify the region country!!"	The statement is right, but we will make it more specific noting the regions
SCOWCROFT (EURELECTRIC)	2	74	25	75	6	-	-	-	"IPCC report focuses on socio-economic impacts of smale scale bioenergy systems; impact of large scale systems is missing. (Also: Section 2.5.4.3.5; Page 75; Lines 13 to 14)."	Is a numeration problem, sections after 2.5.4.3.4 refer to large scale systems
Vahrenholt (RWE Innogy GmbH)	2	74	25	75	6	-	-	-	"IPCC report focuses on socio-economic impacts of smale scale bioenergy systems; impact of large scale systems is missing. (Also: Section 2.5.4.3.5; Page 75; Lines 13 to 14)."	Is a numeration problem, sections after 2.5.4.3.4 refer to large scale systems
philippe (international institute for water and environmental engineering)	2	74	10	-	-	-	-	-	coal is not biomass???	Will use an example from biomass, not coal
Verduzco (Chevron Corporation)	2	74	15	-	-	-	-	-	Compare to the price of the strove, probably ~ \$10-20?	We will include the comparison
Kessels (International Energy Agency Clean Coal Centre)	2	74	26	75	6	-	-	-	Reference needed	Ref will be added
philippe (international institute for water and environmental engineering)	2	74	20	-	-	-	-	-	this is ridiculous. ICS do not reduce the cooking time or just marginaly and people who are surviving with less tahn one \$ a day do not have leisure□ the author probably never spent more than one second with this population!	We have documented the time savings. However the reviewer is right about "leisure time" we will delete it.
Sims (Massey University)	2	74	-	-	-	-	2.5.4	-	DALY in full in caption.	Will be changed
Marques (The Plantar Group)	2	75	24	75	24	-	-	-	"add the world ""plantations"" or ""timber plantations"" after the word forest in the beginning of the sentence."	Will include native forests and plantations
Marques (The Plantar Group)	2	75	13	75	13	-	-	-	Entire section missing on the socio-economic impacts of large-scale bioenergy systems. It would be nice to see it whenever it is available.	Numbering will be corrected
Kaup (Potsdam Institute for Climate Impact Research)	2	75	39	75	40	-	-	-	Food prices are already strongly linked to energy markets (fuel for agricultural machinery and fertilizer for example)	Will be changed
Verduzco (Chevron Corporation)	2	75	8	75	12	-	-	-	Mainly locally-available plant-based oils replacing imported petroleum diesel? Describe more thoroughly.	Text will be improved
philippe (international institute for water and environmental engineering)	2	75	16	-	-	-	-	-	please defin large scale	will be added to the Glossary

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	75	23	75	25	-	-	-	Provide a reference for best management practices.	Will add ref
philippe (international institute for water and environmental engineering)	2	75	22	-	23	-	-	-	reference	Will add ref
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	75	14	-	-	-	-	-	SECTION MISSING	Numbering will be corrected
Kahiluoto (MIT Agrifood Research Finland)	2	75	-	76	-	-	-	-	The title numbering wrong. I guess it should be: 2.5.4.3.5 should be 2.5.4.4, and the next titles should be 2.5.4.4.1 and 2.5.4.4.2, and thereafter the titles 2.5.4.4.2.1 and further accordingly till 2.5.4.4.2.4. P. 76, l. 15 to 17: Why different in the longer run? l.18 to 21:	Numeration is wrong
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	75	19	75	25	-	-	-	Very general. Why are only forests mentioned as biomass source? What about land-use competition between pasture and corn, sugar cane or soy bean plantations?	Section refers to biomass use for heat and electricity; competition for liquid biofuels will be addressed later on
philippe (international institute for water and environmental engineering)	2	75	4	-	-	-	-	-	what is Panchayat ghar?	Will be explained
Kruger (South African Weather Service)	2	75	3	75	6	2.5.4 .3.3	-	-	"Refrence should be available. Explain ""Panchayat Ghar""."	Will be explained
LEITE DRACHMANN (PETROBRAS)	2	75	6	75	-	2.5.4 .3.3	-	-	"Should include : Another important application of biogas is its use as automotive fuel, after methanization (cleaning). Example: SGC (Swedish Gas Center). Furthermore, medium scale electricity production constitutes an attractive alternative for biogas in Brazil. Example: Bandeirantes Landfill Thermo plant (20 MW), Perus, SP, Brazil. This project presents remarkable social, environmental and sanitary benefits for the local population, besides its significant economical gains, from electricity sale and carbon credits commercialization through the CDM. In addition, several pig breeding farmers in Southwest Brazil (example: SADIA suppliers) have gathered in cooperatives for centralized manure biogas production. This biogas is used locally as a major feedstock for heating, electricity generation, tractors propelling, etc. The whole project provides relevant production costs savings for the farmers, with a surplus relevant revenue out of carbon credits commercialization through the CDM. "	Part of the text will be included in the tech section and here we will include the socioec impacts
Coulibaly (International Institute fo Water and Environmental Engineering (2iE))	2	75	-	-	-	2.5.4 .3.4	-	-	Too short. There should be more on that issue	Numbering will be corrected
Wang (Argonne National Laboratory)	2	75	-	-	-	2.5.4 .3.4	-	-	Why electricification with liquid biofuels?	Important for small scale farmers
Kruger (South African Weather Service)	2	75	14	75	14	2.5.4 .3.5	-	-	Section missing.	Numbering will be corrected
Londo (Energy research Centre of the Netherlands)	2	75	13	75	13	2.5.4 .3.5	-	-	Strange to see a header 'large-scale systems' in a section (2.5.4.3) focussing on small-scale! Please check overall structure.	Numbering will be corrected
Jack (Scion (New Zealand Forest Research Institute))	2	75	30	75	30	2.5.4 .3.7 1	-	-	"This is a huge and very political issue but seems to have been relegated to this small section. In addition the difference between different ""biofuel crops"" is not adressed here. Some biomass feedstocks, because of where they are gown, for example, will never be closely coupled to grain prices.The issues hererefer to ""biofuel crops"" that require arable land."	Will re-write section
Sims (Massey University)	2	75	-	-	-	2.5.4 .3.7 1	-	-	Don't think we go to 6th level numbering - just a sub-heading OK.	Numeration is wrong

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
philippe (international institute for water and environmental engineering)	2	75	-	-	-	2543 4	-	-	please cross check this info. I personally visited several plant in Mali often mentionning, this plant are not working!	Will check the information
philippe (international institute for water and environmental engineering)	2	75	-	-	-	2543 6	-	-	very theoretical	Will include more refs and case studies
Verhoest (LABORELEC)	2	75	-	-	-	-	-	2,5,4, 3,5,	Please fill in section!	Numeration is wrong
Verduzco (Chevron Corporation)	2	76	7	76	8	-	-	-	"The text reads: ""; if ongoing subsidy of the sector is required, funds will no longer be available for projects of greater social and economic promise."" Is this necessarily true?"	Sentence will be edited
Kahiluoto (MTT Agrifood Research Finland)	2	76	-	-	-	-	-	-	The whole page fairly vague - case description/studies were valuable, preferably representing different socio-ecological contexts and industrial vs. developing countries. 2.5.5 Synthesis for what?	IPCC format requested a synthesis summary at the end of each section.
Fulton (Deutsche Bank)	2	76	-	-	-	2.5.4 .3.7. 4	-	-	General comment: Too brief for such an important topic. Needs more lit review, detail the issues.	The section will be improved
philippe (international institute for water and environmental engineering)	2	76	-	-	-	255	-	-	this synthesis do not provide much evidences remain very general	The section will be improved
Marques (The Planter Group)	2	77	18	77	27	-	-	-	"The text often refers to ""charcoal"", ""fuelwood"" and other sources of biomass, without making a clear distinction on its renewability. To avoid confusion, it would be better to always to make a distinction and to refer to ""renewable charcoal/fuelwood/wood"" or ""non-renewable charcoal/fuelwood/wood. A common definition for both could be adopted and referred to in the glossary, building upon the preliminary discussion on this page (see ABRAF/AMS 2008 for a possible definition)"	Will be added to the glossary.
Gorissen (Flemish Institute for Technological Research)	2	77	1	-	-	-	-	-	"This sentence describes only a part of the system; The real world system is far more complicated. This should either be stated or an explanation should be added."	Text will be changed to include the full system.
Kahiluoto (MTT Agrifood Research Finland)	2	77	3	77	5	-	-	-	Principally this could occur, but give examples, explain, justify!	Examples will be provided and synthesis further elaborated
Schmall (Petrobras S.A.)	2	77	11	77	17	2.5.5	-	-	Once again at the end of the paragraph it should include: Brazil has a good example of that in its Biofuels Programs when it has developed a set of tools called Zoning Climate Risk and Ecological-Economic Zoning that analyze the characteristics of soil, climate, farming and environmental and social impacts on certain crops in each region or specific area. This way it can protect some biomes and regions of interest (such as areas of high conservation value, HCV), as well as encouraging production in other areas more suitable. It is possible to prevent the advance of the sugar cane by the Amazon and the Pantanal in Brazil.	Noted as tools are being developed in several countries (e.g., Brazilian Zoning Climate Risk and Ecological-Economic Zoning). However, the tools have not been in use for a long period of time and the enforcement of their implementation may have some difficulties.
Kruger (South African Weather Service)	2	77	2	77	2	2.5.5	2.5.5	-	A short discussion on Figure 2.5.5 will be useful.	Figure and caption will be improved and text modified to reflect the comments and new structure of the section.
SCOWCROFT (EURELECTRIC)	2	78	15	78	17	-	-	-	FAO expects agricultural production to rise by 1.5% a year for the next three decades, still significantly faster than projected population growth (World Bank, 2009). From our point of view, cost development of solid biomass is assessed too optimistically.	What do the reviewers mean by 'cost development' and where do the numbers appear in our text? The projected costs for lignocellulosic biomass come from published literature (in particular WW1, 2006, which is a compilation of primary data). We agree that they may be optimistic, but if the reviewers could provide other references we could include them.
Vahrenholt (RWE Innogy GmbH)	2	78	15	78	17	-	-	-	FAO expects agricultural production to rise by 1.5% a year for the next three decades, still significantly faster than projected population growth (World Bank, 2009). OK. our point of view, cost development of solid biomass is assessed too optimistically.	same as above

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Kahiluoto (MTT Agrifood Research Finland)	2	78	17	78	24	-	-	-	The expression of the last sentence is fairly mild. The whole discussion of intensification for increase in yields for bioenergy loses most of its sense if the net climate impact is zero or negative. Thus, the productivity increase has to be sustainable. IAASTD could be referred to.	OK, we will add a reference to IAASTD. A new subsection will be added in 2.2 to address the trade-offs between productivity increase and environmental impacts.
KOBAYASHI (Toyota R&D Labs. Inc.)	2	78	3	-	-	-	-	-	This section is closely related to the section 2.3 Technology, so it is better to put this section right after the section 2.3.	This outline was decided at the scoping meeting, and approved by IPCC. We cannot change it (although we agree this would improve consistency).
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY - USP)	2	78	-	-	-	2.6	-	-	TO DISCUSS EXISTING BARRIERS	Section 2.6 only should only include technological barriers. Comment will be taken on board in the revised technology tables and accompanying text. The other types of barriers are covered in 2.5.
Fulton (Deutsche Bank)	2	78	-	-	-	2.6.1	-	-	"General comment (Yield gains): DBCCA found that a doubling of yields is necessary in order to meet long-term demand for productivity, including food, feed and fuels. Source: DBCCA, ""Investing in Agriculture: Far-reaching Challenge, Significant Opportunity,"" June 2009, see page 12 (www.dbcca.com/research). See SRREN_Draft0_Review_Fulton_Mark_Material_05.pdf"	New section on food security and bioenergy will be added in 2.2 to expand on this discussion. DBCCA report may be included.
Londo (Energy research Centre of the Netherlands)	2	78	7	80	21	2.6.1	-	-	A reminder to earlier sections might be appropriate here mentioning that, depending on the extent to which these improvements are implemented, the potential for bioenergy from dedicated crops is somewhere between zero and hundreds of E.J.	OK, will be added.
Schmall (Petrobras S.A.)	2	78	11	78	12	2.6.1	-	-	Add at the end of the sentence...during the past 50 years...Brazil also have important results for sugarcane.	OK, will be added.
Gorissen (Flemish Institute for Technological Research)	2	78	-	-	-	2.6.1	-	-	In this section, the near term depletion of Phosphorus, one of the most important agricultural fertilizers is not mentioned. This is however very relevant in discussing agricultural yield gains. Please incorporate. See: http://phosphorus.global-connections.nl/	see above
Wang (Argonne National Laboratory)	2	78	-	-	-	-	2.5.5	-	This figure is not that helpful.	The figure will be redrafted and made more relevant to the subsection.
Gorissen (Flemish Institute for Technological Research)	2	78	-	-	-	-	2.5.5	-	This is a simplification of the system. LUC or climate change also impact oceans which in turn impact biomass production, climate change or land related processes. See Rockström et al 2009 nature.	The figure will be redrafted and made more relevant to the subsection. We agree that some of the statements are oversimplified.
Marques (The Plantar Group)	2	79	-	79	-	-	-	2.6.1	"The table only refers to planted forests in Europe. Add references or mention Latin America, Africa and Asia, which are the regions with the largest potential for the sustainable use of dedicated planted forests as a renewable source of energy (charcoal, timber, pellets, chips, tar, etc.)"	Planted forest is mentioned in Brazil (eucalyptus); references will be sought for Asia and Africa.
Ballesterio (National Meteorological Institute)	2	79	-	-	-	-	-	2.6.1	Is the potential yield increase taken into consideration the future climate change effect on the growing crops?	Generally not. This is addressed in section 2.6.1.3.
Sims (Massey University)	2	79	-	-	-	-	-	2.6.1	Not clear why GMO only mentioned for Corn and switchgrass.	see above, will be added for SRC
Tolmasquim (Empresa de Pesquisa Energética - EPE)	2	79	-	-	-	2.6.1	-	2.6.1	According to the data from Brazilian Ministry of Agriculture and Supply (MAPA), the average yield gain of sugarcane production in Brazil between 1975-2008 is 1.5%/year. Taking this into account, the potential yield increase in 2030 is 39%.	True. Figure will be corrected.
Kruger (South African Weather Service)	2	79	1	79	5	2.6.1	-	2.6.1	Some of the feedstock types in the table are not given in Table 2.3.1, as stated in the caption.	We did not find projections for all the feedstocks of Table 2.3.1. Table caption will be accordingly changed.
Jack (Scion (New Zealand Forest Research Institute))	2	79	1	79	5	-	-	2.6.2	Not sure why GMO is not an improvement route for planted forests.	This is true of poplar RSC, for instance. Will be added.
Kahiluoto (MTT Agrifood Research Finland)	2	80	14	80	18	-	-	-	A fairly narrow view is presented here. The increase in the residue yield hardly should be a management goal.	This avenue is suggested in one of the references (Perlack et al., 2006), but its broader relevance will be re-assessed.
Sims (Massey University)	2	80	16	-	18	-	-	-	Could result in lower yields eventually unless more N added, assuming no leguminous soy in rotation.	The Sheehan et al (2002) example is rather extreme and should not be advocated. Will be removed.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	80	16	80	18	-	-	-	Please mention also the negative effects of monocultures (biodiversity, soil degradation etc.)	The Sheehan et al (2002) example is rather extreme and should not be advocated. Will be removed.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Smith (McGill University, Macdonald Campus)	2	80	2	80	3	2.6	-	-	Heat availability is another potential environmental constraint.	OK, but heat will be mentioned here.
Pinho (Instituto de Tecnologia)	2	80	-	-	-	-	2.6.1	-	"Do the graphs mean the crops themselves or their final product (biofuel)? In the second case, it should be "palm oil" instead of "oil palm". It is difficult to see the bars for "potential yield"."	The graphs refer to the crop yields. This will be clarified, and the bars redrawn.
Tolmasquim (Empresa de Pesquisa Energética - EPE)	2	80	-	-	-	2.6.1.1	2.6.1	-	According to IBGE, 2009 (www.ibge.gov.br), the national average yield of sugarcane in Brazil was 77 t/ha in 2008. Some areas reached the yield of 150 t/ha.	The primary source of data for Figure 2.6.1. will be checked (in FAO, 2008b). The purpose of Figure is mostly to give a regional perspective.
philippe (international institute for water and environmental engineering)	2	80	-	-	-	-	261	-	I surprised by the first position of china before malaysia on the palm oil graph. The time frame would be interesting to provide to understand when this yield increase will occur.	Time frame will be specified, and primary data checked.
Treber (Germanwatch)	2	81	28	81	30	-	-	-	"are arguably the most amenable for industrial biotechnology and genetic engineering- both for the production of biofuels": this may come from the expertise of the authors - in the literature of the references I did not find it"	Reference list will be corrected
Verduzco (Chevron Corporation)	2	81	23	81	24	-	-	-	"Consider adding the following paragraph: "Harvesting of lipids and maintaining high lipid production rates under scaled-up, real-world conditions are significant challenges. However, it is unclear how large-scale production of macroalgae"	Will be referred to CA on algae
Treber (Germanwatch)	2	81	22	-	-	-	-	-	"Ross et al., 2008; is not in the reference"	Reference list will be corrected
de Campos Barbosa (Petrobras)	2	81	46	-	-	-	-	-	"Substitute: "most" to: "some". Most species are annual crops (soy, sugarbeet, cotton seeds, peanuts, ...) or perennial crops with cultivation cycles of less than 20 years (eucalyptus, sugarcane)."	OK, will do
Treber (Germanwatch)	2	81	32	81	33	-	-	-	"the scale-up challenges (already mentioned in lines 16 and 17) repeat "It is likely that biofuels from cyanobacteria, as well as from eukaryotic microalgae face significant scale-up challenges as well as unclear regulatory status"	Will be referred to CA on algae
Verduzco (Chevron Corporation)	2	81	42	81	43	-	-	-	"The text reads: "Climate change is expected to have significant impacts on biomass production, causing yields to increase or decrease by up to 20% relative to current levels" By when?"	Time frame will be specified.
Treber (Germanwatch)	2	81	18	-	-	-	-	-	(Borowitzka, 1999) is not in the reference	Reference list will be corrected
Treber (Germanwatch)	2	81	28	-	-	-	-	-	Colla et al., 2007 is not in the reference	Reference list will be corrected
Verduzco (Chevron Corporation)	2	81	34	81	40	-	-	-	Compare yields with lignocellulosic crop yields to show potential advantage of algae.	OK, but these yields are not always meaningful (for algae grown in photobioreactors for example). This information is still relevant.
Sims (Massey University)	2	81	-	82	-	-	-	-	Could tighten language in these sections.	OK, will try to be clearer and more concise.
Kahiluoto (MTT Agrifood Research Finland)	2	81	20	-	-	-	-	-	de Jong et al.: This reference is lacking in the reference list.	Reference list will be corrected
philippe (international institute for water and environmental engineering)	2	81	37	-	-	-	-	-	replace relatively by very!	Will be referred to CA on algae
Treber (Germanwatch)	2	81	9	-	-	-	-	-	the reference for (Tran et al., 2010) on page 133 is not complete	Reference list will be corrected
Kruger (South African Weather Service)	2	81	42	81	44	2.6.1.2	-	-	A time frame should be given, over how long a period can the yields increase or decrease by 20%?	Time frame will be specified.
Kahiluoto (MTT Agrifood Research Finland)	2	81	-	-	-	2.6.1.2	-	-	Also the regional significance of plant and fish biomass in eutrophied waters could be considered here.	Will be referred to CA on algae
Jack (Scion (New Zealand Forest Research Institute))	2	81	41	82	24	2.6.1.3	-	-	This section addresses the direct impact of climate change but not the indirect effects such as the potential spread of pests, increased fire risk etc If these effects are unable to be quantified they should at least be mentioned.	OK, we will seek literature references on these aspects.
de Campos Barbosa (Petrobras)	2	82	1	-	-	-	-	-	"add: "in these cases" after "should be anticipated"."	OK, will do
Schmall (Petrobras S.A.)	2	82	1	-	-	-	-	-	"add: "in these cases" after "should be anticipated"."	same as above.
Verduzco (Chevron Corporation)	2	82	23	82	24	-	-	-	"Consider changing the text: "Limitations of CO2 fertilisation due to co-developing nutrient limitations could be overcome in plantations through fertiliser input, but this presents other challenges."	OK, will do

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Verduzco (Chevron Corporation)	2	82	15	82	17	-	-	-	"The text reads: ""The largest ecophysiological uncertainty in future production changes is the magnitude of the CO2 16 fertilisation effect on plant growth, which can cause an enhancement of net primary production of 17 around 20% under doubled free air CO2 concentration"". Consider adding: ""under controlled experimental conditions"" and add a reference."	Reference will be provided and experimental conditions specified.
Verduzco (Chevron Corporation)	2	82	6	82	7	-	-	-	"The text reads: ""Whatever the latitude, the inter-annual variability of final yields in this study rose to 20% in 2080"" Compared to when? Currently?"	The baseline (current climate) will be specified.
Kimura (Central Research Institute of Electric Power Industry)	2	82	44	99	27	-	-	-	Both learning curve and experience curve are intermingled in this chapter(p.82, l.48) and (p.98). Add clear definitions on both.	Definitions will be inserted in report glossary, and wording checked between p. 82 and p. 98
Verduzco (Chevron Corporation)	2	82	44	83	8	-	-	-	Is this at the farm-gate or forest-gate?? (Not including preprocessing, transportation, and storage)□	The costs (to be rephrased as expenses, for consistency with the rest of the Report) are forest-gate ones. This will be specified.
Wang (Argonne National Laboratory)	2	82	43	-	-	-	-	-	Should cite potential corn yield increase as well.	Corn will also be mentioned.
Schmall (Petrobras S.A.)	2	82	15	82	24	2.6.1.3	-	-	Should add at the end of the paragraph that: In Brazil, EMBRAPA is conducting a lot of experiments to answer to those questions. See: www.embrapa.gov.br	We cannot cite a Web site. We will try to find a proper reference to mention these pieces of work, otherwise no mention it.
Smith (PNNL)	2	83	13	-	-	2.6.2	-	-	The quote of 20-50% of delivered costs being due to handling and transport seems too high, particularly the upper end of this range. The only reference for this is 10 years old. Compare for example to Haq & Easterly (2006), who -- I believe -- assume a lower fraction (or at least on the low end of this range). Haq, Z., & Easterly, J. L. (2006). Agricultural Residue Availability in the United States. Applied Biochemistry and Biotechnology, 129-132, 3-21.	To peruse suggested additional references and edit.
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	83	12	-	-	-	-	-	"misprint: replace ""fossile"" for ""fossil""	Accepted
Smith (PNNL)	2	83	21	83	24	-	-	-	An additional issue is the ability of the end-use technology to handle multiple biomass feedstocks with different physical and chemical characteristics. These issues can also be very different for combustion as compared to biological conversion technologies.	Text to be revised to incorporate suggestion
Kaup (Potsdam Institute for Climate Impact Research)	2	83	28	83	32	-	-	-	Something is wrong with the Figure that is referred to in the text and the figure that is shown	Figure deleted in view of other comments following discussion. Text used instead as idea conveyed was simple.
Kaup (Potsdam Institute for Climate Impact Research)	2	83	10	-	-	-	-	-	Suggestion to add the description of 1st and 2nd generation in section 2.2.2.2	This description will be added in the glossary, and readers will be referred to it upon the first occurrence in revised text.
Jack (Scion (New Zealand Forest Research Institute))	2	83	10	84	25	2.6.2	-	-	The distributed nature of biomass is a key difference between biomass and other energy resources. There are a number of consequences of this for conversion technology development as the economies of scale of typical conversion plants are off-set by the dis-economies of scale of biomass logistics (see Scaling laws and technology development strategies for biorefineries and energy plants, Michael Jack Bioresource Technology 100, 6324-6330 (2009) and references contained within). This aspect should be mentioned here.	Text to be revised to incorporate suggestion and suggested additional references
Schmall (Petrobras S.A.)	2	83	31	83	31	-	2.6.2	-	Considering the TSU comment, this figure is good and well illustrative.	Figure deleted in view of other comments following discussion. Text used instead as idea conveyed was simple.
KOBAYASHI (Toyota R&D Labs. Inc.)	2	84	29	-	-	-	-	-	At least you should mention the existence of the data for 2006 in table 2.3.5.	tables being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Verduzco (Chevron Corporation)	2	84	1	84	2	-	-	-	Harmonize this with 2.3.2.1. Pellet making is only one form of densification.	No exhaustive listing is intended here, hence the reference to 2.3.2.1

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Wang (Argonne National Laboratory)	2	84	13	-	25	-	-	-	What is described here is not a logistics problem, it is a technology problem.	Text covers both technology and logistics. Will be separated.
Marques (The Plantar Group)	2	84	1	84	25	2.6.2	-	-	"Improve references on the potential of renewable fuelwood and renewable charcoal in different supply chains at different scales, especially at the industrial level, which is rarely mentioned in the report. Also, it is important to explore the links with the efficiency in terms of conversion technologies (e.g. carbonization processes)."	Additional text to be added as suggested to widen scope of the discussion
Coulibaly (International Institute for Water and Environmental Engineering (2iE))	2	85	-	-	-	-	-	2.6.2	"8th column: Production cost are linked to currency value. It would be convenient to replace (or have another column) with "" percentage of energy needed to produce a unit of the Energy dealt with""	Good suggestion. tables being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Klein (PIK)	2	85	-	-	-	-	-	2.6.2	"What is ""BCCS"", ""GMO""? Which technology is assumed for ""conversion of CO2 to fuel""?"	Biomass carbon capture and storage. Genetically modified organisms. CO2 fixation through microalgae, for instance, can lead to fuels. It is a carbon cycling strategy for fuels. Tables being reworked
Wang (Argonne National Laboratory)	2	85	-	-	-	-	-	2.6.2	This table needs more explanation and arrangement. First, efficiencies are not that meaningful. Second, use of different references to draw results poses a major inconsistency problem. Third, more can be said about corn ethanol production in the U.S. Fourth, glycerine is not an animal feed. Fifth, new fermentation process for butanol may be able to reduce acetone production significantly. Overall, this is an informative table. But it will be difficult for non-bioenergy people to get a good sense. Maybe the table should focus on key bioenergy production technologies.	tables being reworked; thanks for the suggestion of improved data on butanol. Industry is probably even further. The analysis done was the ABE. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Kruger (South African Weather Service)	2	85	1	89	1	2.6.3	-	2.6.2	The reference can be placed at end of table with subscripts inside table. Some cells are empty and should indicate that there is no information currently available.	Good suggestion. tables being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Londo (Energy research Centre of the Netherlands)	2	85	-	89	-	2.6.3	-	2.6.2	Very comprehensive table. I do think the message can be made clearer by strongly reducing the bulkiness and by aggregating many lines.	Good suggestion. tables being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Sims (Massey University)	2	87	16	-	19	-	-	-	Old references - (and could apply to all renewables 9 except biomass) suggest delete.	Will try to get updated references. tables being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Verhoest (LABORELEC)	2	87	-	-	-	-	-	2.6.2,	Woodpellets are also largely used in power plants. Reference: AEBIOM, A Pellet Road Map for Europe, November 2008	tables being reworked; thanks for the suggestion. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Klein (PIK)	2	88	-	-	-	-	-	2.6.2	""BIG/CC"" is not explained"	It will be. tables being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Verduzco (Chevron Corporation)	2	90	16	90	18	-	-	-	Maybe, but makes the process much more expensive and complex	Indeed, the cost and complexity will increase. However, depending on the price of diesel and carbon potential future prices the technology may become cost competitive.
Hakala (MTT Agrifood Research Finland)	2	90	29	90	29	-	-	-	Novozymes is probably not the only company making fermentation microbes, should not be referred to.	Thanks for noticing this oversight.
Hakala (MTT Agrifood Research Finland)	2	90	16	90	16	-	-	-	Something is missing from the end of this line?	Text will be completed and balance to be achieved between the various biomass energy products.
Hakala (MTT Agrifood Research Finland)	2	90	3	90	5	-	-	-	Something is missing, the text makes no sense.	text will be rewritten. It is mentioning that conversion of solid biomass for large and small applications has improved.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Londo (Energy research Centre of the Netherlands)	2	90	1	90	18	2.6.3.1	-	-	Extremely concise description of an important point for further development, also given the more elaborate discussion on biofuels. Mentioning gasification in so little space is overly short to my taste. The IEA Energy Technology Perspectives provide ample basis for a more elaborate discussion, e.g. in terms of the impacts technology breakthrough would have on costs, efficiencies and ability to handle diverse feedstocks.	The Chapter has a restriction of space. Will try to see what else can be incorporated but the scope is very broad.
Verduzco (Chevron Corporation)	2	91	1	91	2	-	-	-	""Another idea is to turn the gas into ethanol or other fuel (Lynn Grooms, 2005)."" This is energetically challenging."	Microalgae can turn CO2 into lipids and fuel precursors.
KOBAYASHI (Toyota R&D Labs. Inc.)	2	91	43	-	-	-	-	-	""its the"" mistake??"	Relaying the costs from the various studies. Unfortunately there is no time to put all costs of all processes under the same conditions and the comparisons may have different capital recovery conditions. This makes cross reference comparisons difficult. For this reason, one cannot at this point say that one set of technologies is much better than others. They are similar given the uncertainties and need to continue to be developed.
Verduzco (Chevron Corporation)	2	91	1	91	2	-	-	-	"Consider rephrasing as follows: ""One could uses CO2 to enhance the recovery of oil from depleted oilfields or sequester it, but these applications are site specific. Another idea is to turn the gas into ethanol or other fuel (Lynn Grooms, 2005)."""	Thanks for the suggestion
Hakala (MTT Agrifood Research Finland)	2	91	32	91	32	-	-	-	"Not just vegetable oil residues, but all crop residues can be used. After ""vegetable oil"", add ""and other crop residues""."	Thanks
Rubiera (Instituto Nacional del Carbon (CSIC))	2	91	1	91	2	-	-	-	"The phrase ""One experiment uses CO2 to enhance the recovery of oil from depleted oilfields"" should be clarified. CO2 is used many year ago for Enhanced Oil Recovery (EOR)"	Thanks for the comment and yes, this is a commercial technology
Tolmasquim (Empresa de Pesquisa Energética - EPE)	2	91	20	-	-	-	-	-	Biodiesel Brazilian rules just accept esters and FT don offers this chemical group.	This is a particular case of legislation. Many countries separate the esters from the hydrocarbons (e.g., renewable diesel) and those have their own legislation.
Verduzco (Chevron Corporation)	2	91	35	92	2	-	-	-	Delete paragraph. Text repeated above.	Accepted
Sims (Massey University)	2	91	7	-	11	-	-	-	Plus installation costs? Maybe need to ensure all costs quoted in tech chapters are installed costs.	We will clarify the costs used better. Series of references from the same source are clearly installed costs and nth plants.
Marbán (Instituto Nacional del Carbón (CSIC))	2	91	15	-	-	-	-	-	This might be a convenient place to include the assessments indicated in SRREN_Draft0_Review_Marban_Gregorio_Material_02.doc	Thanks for the comments
KOBAYASHI (Toyota R&D Labs. Inc.)	2	91	20	-	-	-	-	-	This paragraph and maybe next paragraph, too are better to place in section 2.3.	Indeed. The technology sections will be rewritten to separate clearly the commercial technologies and those in near commercialization from those under development.
Jack (Scion (New Zealand Forest Research Institute))	2	91	3	91	34	2.6.3.2	-	-	This section makes the assumption that a biochemical pathway results in ethanol rather than a fuel that could displace fossil diesel. This is not true. There is plenty of research into biochemical routes to biobutanol etc that could displace fossil diesel.	Reviewer is correct and text will be modified.
Jack (Scion (New Zealand Forest Research Institute))	2	91	20	91	34	2.6.3.2	-	-	This section mixes 1st and 2nd generation routes to a biofuel that could displace fossil diesel. This is very confusing to me. It is compounded by the issue raised in comment 24 above.	It has been very unfortunate that the literature started discussing generations. Since the expression can refer to technologies, fuels, and feedstocks it is indeed confusing. We will try to explain. Corn starch is a first generation feedstock but sugarcane is a feedstock for all generations of technologies.
Schmall (Petrobras S.A.)	2	91	1	91	2	2.6.3.2	-	-	When it is written: One experiment...should be changed for: One possibility is the use of CO2 to enhance the recovery of oil...etc...and the other possibility is to store CO2 in saline aquifers. The bioenergy and CCS. Another idea....etc...	Text will be generalized as there are many other examples.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	92	41	92	42	-	-	-	""...and it is possible to reduce CO2 emissions from 40,068gCO2/GJ to 12,362gCO2/GJ at the expenses of degrading the energy balance by only 3.5%."" Where does the CO2 go once it's captured? Energy balance is hard to believe. Typical parasitic load for CCS plants is 30%"	OK, will be rephrased or eliminated
Rubiera (Instituto Nacional del Carbon (CSIC))	2	92	26	92	26	-	-	-	"Replace ""devolatalization"" by ""devolatilization"""	more information on CCS is being collected
Kessels (International Energy Agency Clean Coal Centre)	2	92	29	93	8	-	-	-	CCS and biomass needs more detail	We provide data from the recent report from the National Academies on CCS technologies coupled with biomass Fischer Tropsch diesel production as well as with coal/biomass. Will expand.
Rubiera (Instituto Nacional del Carbon (CSIC))	2	92	36	92	38	-	-	-	The reference is related to carbon sequestration not to a pilot plant for CO2 capture from sugar fermentation	The carbon capture from sugar fermentation is practiced for various uses and starting to be used for CO2 capture. Will expand further
Verduzco (Chevron Corporation)	2	92	14	92	18	-	-	-	These MFC systems are at R&D stage, far from commercial	Fuel cells as a future potential technology are also being treated in Chapter 8. We will see if this can be accommodated there.
Verduzco (Chevron Corporation)	2	92	5	92	5	-	-	-	What biomass fraction?	The technologies are for catalyzing hydrolysis of the carbohydrate fraction so that the anaerobic digestion can proceed at a faster rate.
Londo (Energy research Centre of the Netherlands)	2	92	3	92	28	2.6.3	-	-	When discussing biobased gaseous fuels, I think natural gas produced from biomass through gasification and methanation deserves attention. Its contribution is potentially higher than that of methane from anaerobic digestion.	The discussion of methanation will be included as it does provide a higher content methane gas and its contribution could be higher than that of anaerobic digestion in specific places.
Jack (Scion (New Zealand Forest Research Institute))	2	92	14	92	18	2.6.3	-	-	Why is this under gaseous fuels? Fuel cells are fuel conversion technologies like the internal combustion engine.	agreed; may be these should move to the integration section
Londo (Energy research Centre of the Netherlands)	2	92	30	93	10	2.6.3	-	-	It makes perfect sense to discuss bio-CCS. At line 36, it seems logical to me to mention that some biofuel technologies show the advantage of relatively pure CO2 streams being generated in the process. This applies to all ethanol production systems and to BTL technologies. As capture is usually a significant share of total CCS costs, this could be a cost-effective option, although most of the carbon still ends up in the liquid fuel (and thereby in the atmosphere after combustion. Al in all, a slightly better microstructure in this section would add value, also clearly splitting the messages for power and heat, and for biofuels.	We provide data from the recent report from the National Academies on CCS technologies coupled with biomass Fischer Tropsch diesel production as well as with coal/biomass. Will expand.
Verduzco (Chevron Corporation)	2	93	36	93	36	-	-	-	"Is ""phenols from straw"" a common platform?"	The web site will be transferred into a footnote.
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	93	32	-	-	-	-	-	"Task 42 is one of the projects implemented within the framework of IEA Bioenergy program, through out the text information about IEA programs (Implementing Agreements) and projects is given in different ways (sometimes abbreviated name or task number is only given); the manner of presentation should be unified (also see p.263 line 4; chapter 3; p.264 line 50, p.271 line 36 and others)"	The platform is actually FT diesel AND phenols from straw (with diesel as main product). Text will be rephrased for better clarity.
KOBAYASHI (Toyota R&D Labs., Inc.)	2	93	39	-	-	-	-	-	About the TSU's comments: sometimes information on the website is very useful for readers, but it may not be the 'reference'. In that case, address of the website should be provided somewhere, maybe in the footnote.	OK, will be added.
Verduzco (Chevron Corporation)	2	93	28	92	31	-	-	-	Please rephrase for clarity.	OK, text will be rephrased or eliminated
Kahiluoto (MTT Agrifood Research Finland)	2	93	-	-	-	2.3.3	-	-	The case of ethanol production based on starch and sugar rich by-products of food processing could be mentioned (St1 Biofuels).	OK, such case will be researched and added.
Klein (PIK)	2	93	4	-	-	2.6.3	-	-	""difference is not very big"" is not a helpful term"	OK, text will be rephrased or eliminated

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Marques (The Plantar Group)	2	93	-	-	-	2.6.3.5	-	-	"Since wood/charcoal represent 80% of all primary bioenergy, it is important to mention, at least as an example, the potential of biorefineries based on wood biomass, e.g. recovering and refining tar from the wood carbonization process in modern brick-based or steel-based kilns."	same as above
Schmall (Petrobras S.A.)	2	93	32	93	44	2.6.3.5	-	-	Text is unclear. Should be re written or eliminated	References to IEA Tasks will be harmonized throughout the chapter.
Hakala (MTT Agrifood Research Finland)	2	94	7	94	7	-	-	-	In the beginning of the sentence after the ballot, replace crop with biomass, and also further in the sentence, replace crop with biomass, as also forest biomasses can be used.	Accepted
Klein (PIK)	2	94	14	16	-	-	-	-	in the future also CO2-prices	Accepted
SCOWCROFT (EURELECTRIC)	2	94	34	-	-	-	-	-	IPCC Report measures a sizable part (100-300 EJ) of the technical biomass potentials on long term (2050) in a cost range around 3 US-\$ per GJ. OK	Report projects a range
Vahrenholt (RWE Innogy GmbH)	2	94	34	-	-	-	-	-	IPCC Report measures a sizable part (100-300 EJ) of the technical biomass potentials on long term (2050) in a cost range around 3 US-\$ per GJ. OK	Report projects a range
Wang (Argonne National Laboratory)	2	94	17	-	29	-	-	-	The discussion here is with the assumption that people will have perfect market information and people can afford, neither would be true in developing countries.	Remark will be included
Klein (PIK)	2	94	7	8	-	2.7.1	-	-	cost of water is missing	Cost of water will be added although many crop systems are not irrigated but simply rain fed. There is also water in the process of conversion and this is a cost which can be minimized by good design. For instance, the thermochemical ethanol from lignocellulose biomass has one such a design.
Londo (Energy research Centre of the Netherlands)	2	94	14	94	16	2.7.1	-	-	Don't forget conversion efficiency developments here!	Accepted
Fulton (Deutsche Bank)	2	94	7	-	-	2.7.1	-	-	General Comment (Cost Trends): Land prices alluded to but discussion is missing. This is a key factor of production and requires thorough literature review to understand how land prices affect markets.	Will be mentioned but at the same time literature highlights that costs of land are generally one of the smaller factors in production costs (depending on location).
Londo (Energy research Centre of the Netherlands)	2	95	7	95	7	2.7.1	2.7.1	-	Reference missing in figure caption.	Accepted
Verhoest (LABORELEC)	2	95	-	-	-	-	-	2.7.1,	please provide reminder of the SRES scenarios. What are the units?	Accepted
Sims (Massey University)	2	95	-	-	-	-	-	2.7.1	Surely > should be < in headings?. Could put global total in bold. Why is Japan 0 if biomass is at >\$4/GJ? Check after redoing > or <.	Comment unclear; Japan would have highest production costs but land availability also very limited.
Wang (Argonne National Laboratory)	2	95	-	-	-	-	-	2.7.1	What the unit of these values, EJ or ha?	Accepted
Tolmasquim (Empresa de Pesquisa Energética - EPE)	2	95	-	-	-	2.7.1	-	2.7.1	What's the unit of area?	Accepted
Kruger (South African Weather Service)	2	95	1	95	3	2.7.1	-	2.7.1	Briefly explain the scenarios A1 and A2.	Will be done
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	95	-	-	-	-	-	2.7.1.	"In the headline it should probably be called US\$2000. Are the headlines of the columns right, or should it be ""<"" instead of "">""?"	Comment not fully clear; will check wording.
Londo (Energy research Centre of the Netherlands)	2	96	3	96	3	2.7.1	2.7.2	-	In which line are anaerobic digestion routes? In terms of feedstock it would be in the waste line, but currently it seems only to relate to waste incineration.	Will be improved; digestion indeed not clearly distinguished; will partly be dealt with in section 2.3 and 2.6.
Londo (Energy research Centre of the Netherlands)	2	97	3	97	2	2.7.1	2.7.3	-	See my remark no 40 on bio-methane through gasification. It would make sense to insert an outlook for this biofuel as well.	Large number of technologies included in sections 2.3 and 2.6; this summarizing section has to deal with a summary of main routes (will consider synfuels as general term).
Sims (Massey University)	2	97	-	-	-	-	-	2.7.3	"Sugar beet - not ""beet sugar""."	Accepted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Wang (Argonne National Laboratory)	2	97	-	-	-	-	-	2.7.3	Again, efficiencies are not a good index. Plus, some of the efficiency numbers are questionable. Results from different studies poses inconsistency problem. The table needs US data sources. Also, why is hydrogen added in this table?	Cross check will be performed with partly new figures in section 2.6. Efficiency will remain as parameter though. Hydrogen can be produced from biomass and aquatic biomass.
Kruger (South African Weather Service)	2	97	3	97	6	2.7.1	-	2.7.3	This part can be moved to form part of the caption of the table.	Table revised
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	97	-	-	-	-	-	2.7.3.	Comparison within the table is difficult because of different units (% , litres). For comparison within the report please change Euro/GJ to US\$/GJ.	Cross check will be performed with partly new figures in section 2.6. Efficiency will remain as parameter though.
Kimura (Central Research Institute of Electric Power Industry)	2	98	1	100	6	-	-	-	"Add methodological limitations (or pitfalls)of learning curve analysis: assumed system boundaries, e.g. whether production cost or price based analysis , calculated time period, etc. See Junginger, M. et.al.(2008) Junginger, M. et.al., 2008, Technological learning in the energy sector, ECN."	Accepted
Wang (Argonne National Laboratory)	2	98	8	-	-	-	-	-	Cellulosic ethanol cost projections from US DOE should be cited.	Those figures are not available from learning curve analyses. However, future projections for lignocellulose based ethanol production are dealt with in section 2.6.
KOBAYASHI (Toyota R&D Labs. Inc.)	2	98	1	-	-	-	-	-	This whole section can be provided by the box, not the section.	Comment not clear.
Klein (PIK)	2	98	4	-	-	2.7.2	-	-	"Definition of ""progress ratio"""	Accepted
Verhoest (LABORELEC)	2	98	-	-	-	-	-	2.7,4,	Explicit PR title second column	Accepted
Wang (Argonne National Laboratory)	2	98	-	-	-	-	-	2.7.4	The table is confsing. What are PR, n, and R2?	Accepted
Tolmasquim (Empresa de Pesquisa Energética - EPE)	2	98	-	-	-	2.7.1	-	2.7.4	Define the acronyms in the columns (PR and R2)	Accepted
Kruger (South African Weather Service)	2	98	9	98	13	2.7.2	-	2.7.4	While I - II are explained (lines 11-13), only II present in the table. Is the contents of the table correct?	Accepted
Verduzco (Chevron Corporation)	2	99	10	99	10	-	-	-	"How is ""strength"" defined?"	Accepted
Klein (PIK)	2	99	26	27	-	-	-	-	formulation	Accepted
Verduzco (Chevron Corporation)	2	100	10	100	11	-	-	-	""For ethanol from sugarcane (Wall Bake et al., 2009), total production costs at present are 11 approximately 340 US\$/m3 ethanol (16 US\$/GJ)"" < \$200/m3 according to Fig. 2.7.2"	Will be checked
Jara Tirapegui (Endesa Eco S.A.)	2	100	15	-	-	-	-	-	"Says ""75US\$2005"" , should be ""75 US\$2005"" ."	Accepted
Jara Tirapegui (Endesa Eco S.A.)	2	100	11	-	-	-	-	-	"Superscript correction in ""m3"""	Accepted
Jara Tirapegui (Endesa Eco S.A.)	2	100	13	-	-	-	-	-	"Superscript correction in ""m3"""	Accepted
Jara Tirapegui (Endesa Eco S.A.)	2	100	16	-	-	-	-	-	"Superscript correction in ""m3"""	Accepted
Jara Tirapegui (Endesa Eco S.A.)	2	100	17	-	-	-	-	-	"Superscript correction in ""m3"""	Accepted
de Campos Barbosa (Petrobras)	2	100	10	100	18	-	-	-	"Topics clearly show different calculation methodologies. Sugarcane ethanol cost production isn't higher than corn ethanol (reference: Goldemberg & Guardabassi; 2009; The potential for first generation ethanol production from sugarcane; Biofuels, Bioproducts and Biorefining; vol. 4, issue 1). These topics should be rephrased to avoid misunderstandings, or methodologies should be harmonized."	Data will be rechecked; possibly typing mistake or missing definition. See the final version for more detailed cost data from comparable technoeconomic analysis showing the various components of costs and variability from country to country.
Wang (Argonne National Laboratory)	2	100	15	-	-	-	-	-	\$75 per tonnes for corn seems to be wrong.	Will be checked

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Kaup (Potsdam Institute for Climate Impact Research)	2	100	10	100	18	-	-	-	I am rather sure that the production costs for Bioethanol are lower in Brazil than in the US. Please check the numbers. Production costs from sugar cane are shown to be higher 340 US\$/m ³ against 310US\$/m ³ for corn ethanol. I doubt that.	Data will be rechecked; possibly typing mistake or missing definition. See the final version for more detailed cost data from comparable technoeconomic analysis showing the various components of costs and variability from country to country.
Sims (Massey University)	2	100	7	-	9	-	-	-	Need to define ACT and BLUE scenarios (basically 550 and 450ppm respectively). Note - New ETP report due out in June 2010.	New data will be considered once available; definitions of IEA scenarios may occur elsewhere. WEO data can be made more explicit
Hakala (MTT Agrifood Research Finland)	2	100	2	100	2	-	-	-	year 2005 after US\$ should be omitted.	Accepted
Klein (PIK)	2	100	10	13	-	2.7.2	-	-	does not fit to data shown in fig 2.7.2	Will be checked
SCOWCROFT (EURELECTRIC)	2	101	19	101	24	-	-	-	Clear evidence that technological learning and related cost reductions do occur with comparable progress ratios: IPCC report emphasizes this statement for conversion systems like ethanol production, biogas and biodiesel.	OK
Vahrenholt (RWE Innogy GmbH)	2	101	19	101	24	-	-	-	Clear evidence that technological learning and related cost reductions do occur with comparable progress ratios: IPCC report emphasizes this statement for conversion systems like ethanol production, biogas and biodiesel.	OK
Dunn (GE Energy)	2	101	14	-	-	-	-	-	Is biomass competitive with coal at a \$20-30/ton carbon price? Is this consistent with Chapter 10? Why denote carbon 'tax'?	statement is not wrong, but requires specification; the chapter will revisit statement on competitiveness of options in general.
Kruger (South African Weather Service)	2	101	25	101	27	2.7.4	-	-	If a reference hasn't been given to the statement previously, it should be given here.	Agreed.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	102	17	-	-	-	-	-	""biomass (mainly wood) contributes some 10 % to the world primary energy mix"" is mentioned twice in this section (see line 12)"""	Text revised
Jara Tirapegui (Endesa Eco S.A.)	2	102	12	108	37	-	-	-	""It's not clear the unit ""EJ"""""	10 to the power of 18 J
SCOWCROFT (EURELECTRIC)	2	102	10	102	11	-	-	-	Bioenergy has a significant potential for both near- and long-term GHG emission reduction. OK.	Thank you
Vahrenholt (RWE Innogy GmbH)	2	102	10	102	11	-	-	-	Bioenergy has a significant potential for both near- and long-term GHG emission reduction. OK.	Thank you
SCOWCROFT (EURELECTRIC)	2	102	12	102	13	-	-	-	Biomass is the most important renewable energy source, providing about 10% (46 EJ) of the annual primary energy demand. OK.	Thank you
Vahrenholt (RWE Innogy GmbH)	2	102	12	102	13	-	-	-	Biomass is the most important renewable energy source, providing about 10% (46 EJ) of the annual primary energy demand. OK.	Thank you
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	102	12	-	-	-	-	-	Concerning the 46 EJ see the comment on page 5 line 4	Consistent data will be applied
KOBAYASHI (Toyota R&D Labs. Inc.)	2	102	12	-	-	-	-	-	This whole paragraph with fig. 2.8.1 can be moved to the introduction in the very first part of this chapter.	Moved to introduction
Kaup (Potsdam Institute for Climate Impact Research)	2	102	-	-	-	2.8	-	-	Maybe it should be explained that there are different methods for depicting the renewable energy at the TPES. (IEA vs. BP method □ Substitutions- vs. Wirkungsmethode siehe WBGU □ Zukunftsfähige Bioenergie)	Is an issue for SRREN as a whole; to be checked by TSU.
Londo (Energy research Centre of the Netherlands)	2	102	1	102	21	2.8	-	-	This type of text I had expected to find much earlier in the chapter, as it provides some basic info on size and relevant of the different bioenergy options.	Information will be moved to introduction
Wang (Argonne National Laboratory)	2	102	12	-	21	-	2.8.1	-	the paragraph and the figure could be moved to Section 2.2.	Moved to introduction
Marques (The Plantar Group)	2	103	13	103	13	-	-	-	""Add the word ""iron""...for IRON and steel production.""	Accepted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	103	34	105	21	-	-	-	As discussed above, the material presented in support of bioenergy potentials of the order of magnitude of 400 EJ/yr and higher was very unconvincing, in my view, in particular if implementation of these bioenergy utilization pathways is intended to help reduce GHG emissions (it might be feasible if large-scale deforestation is assumed, but this is almost certainly not beneficial in terms of mitigation). While a biomass TPES of 150 EJ/yr (Fig 2.8.2.) might be ambitious but possible, upper boundaries around 300 or even 400 EJ/yr are in my view almost certainly above a level that could be achieved in a sustainable way.	The chapter as a whole will target presentation of a range of 100-300 EJ depending on policy and a large number of preconditions. This will be based on the sharpened review of literature in subsection 2.2. and impact assessment in section 2.5. Lower estimates are already included in the reviewed literature. The comment does not provide precise argumentation why such a range would be unreasonable, but merely an opinion.
Ballesterio (National Meteorological Institute)	2	103	35	-	36	-	-	-	To include a breve explanation about scenarios related with ppm as referenced in figures 2.8.2 and 2.8.3	Included in a figure form in the final form
Ballesterio (National Meteorological Institute)	2	103	26	-	27	2.8.1.2	-	-	Incomplete idea.	Comment unclear.
Wang (Argonne National Laboratory)	2	103	-	-	-	-	2.8.1.1	-	This section could be moved to Section 2.2.	Moved to introduction
Wang (Argonne National Laboratory)	2	103	-	-	-	-	2.8.2	-	This section could be moved to Section 2.2.	Moved to introduction
Kruger (South African Weather Service)	2	104	1	104	5	2.8.2	2.8.2	-	Explain, or remove TPES in the caption of the figure.	Accepted
SCOWCROFT (EURELECTRIC)	2	105	4	105	5	-	-	-	Biomass for power is likely to increase from about 1 EJel in 2007 to about 3 EJel in 2030, mostly from CHP. OK.	Thank you
Vahrenholt (RWE Innogy GmbH)	2	105	4	105	5	-	-	-	Biomass for power is likely to increase from about 1 EJel in 2007 to about 3 EJel in 2030, mostly from CHP. OK.	Thank you
Titus (Natural Resources Canada, Canadian Forest Service)	2	105	42	105	43	2.8.3	-	-	agriculture and livestock□ □ any mention of forestry that could be brought in here, to round out the topic?	Indeed; information on forestry biomass will also be expanded in section 2.2.
Fulton (Deutsche Bank)	2	105	-	-	-	2.8.3	-	-	General Comment: Only minor discussion of learning and adoption. Needs to discuss Rogers theory of diffusion. While technology may be available, growers are slow to adopt new technologies based on a variety of psychological factors	Information on rates of change in agriculture and yield increases are going to be discussed in section 2.2.; space will be too limited to discuss more general theories on technology diffusion.
Marques (The Plantar Group)	2	106	1	108	25	-	-	2.8.1	"Not clear where and if the potential of fuelwood or renewable charcoal both from dedicated planted forests has been included in the referred table and until page 108. Is it included under ""surplus forestry"" or ""energy crops"" ? It would be important to clarify this issue, given that 80% of the total bioenergy demand comes from wood/charcoal biomass, mostly still non-renewable. Increases in the supply of feedstocks from dedicated planted forests (not only from residues)could play a key role, which is not very clear in the table and in the chapter.	Total biomass supplies presented include forest resources (and do not refer to secondary energy carriers such as charcoal). As such, currently utilised resources are included in the presented ranges.
Gorissen (Flemish Institute for Technological Research)	2	106	-	-	-	-	-	2.8.1	Earlier in the text, a WBGU report was cited stating that Biodiversity priorities may have a large impact on bioenergy potentials. However, in my opinion, biodiversity protection or promotion may surpass the traditional approach of protected areas, e.g. less intensive agricultural practices, instead of 'no go areas' maybe 'temporal limitations' prohibiting harvesting in certain periods, years etc...	Such issues will especially be discussed in section 2.5 of the chapter; in general both limitations as well as opportunities (for biodiversity) will be discussed. The latter could be the case when agroforestry systems are developed, degraded lands are regenerated and diverse planting patterns are strived for.
Wang (Argonne National Laboratory)	2	106	-	-	-	-	-	2.8.1	GHG balance should an important attribute, especially this is an IPCC special report.	This is mentioned on page 107.
Londo (Energy research Centre of the Netherlands)	2	106	-	106	-	-	-	2.8.1	Reference is lacking in caption.	Accepted
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	106	-	-	-	-	-	2.8.1.	One important issue/effect is missing: social impacts of bioenergy production. Even if it is not well studied yet it should be mentioned.	Will be discussed, but probably outside the table.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	106	-	-	-	-	-	Table 2.8.1	"Food demand is not just an issue of population growth, but even more so an issue of diet, in particular of the animal share in diets, and the average per-capita calorie supply. Reducing inequality between humans, reducing losses in the supply chain and also in households, and a more vegetarian diet could have an important impact here. The Table should also discuss the issue that raising agricultural sustainability might imply to forego some technological options to boost agricultural yields through environmentally destructive technologies (e.g., high amounts of synthetic fertilizer or noxious pesticides, N leaching to groundwater, etc.); this could, however, also have a negative impact on bioenergy potentials. Finding optimal solutions in that arena is extremely difficult, but the issue should be raised here, in my view. Integrating results from IAASTD could help to improve this section."	Those issues will especially be dealt with in section 2.5; in section 2.8 only an aggregated overview can be provided. In that section not just conflicts with increasing productivity will be discussed, but also opportunities to make agriculture less land-intensive, more (resource) efficient and ecologically more benign.
Jara Tirapegui (Endesa Eco S.A.)	2	107	-	-	-	-	2.8.4	-	"It's not clear the unit ""EJ/year"""	Energy demand per year.
Treber (Germanwatch)	2	107	-	-	-	-	2.8.4	-	"This graph is misleading as it insinuate very large technical and sustainable biomass potentials, that are far exceeding world energy demand/world biomass demand, and does not make any distinctions between rough estimates and elaborate state of the art modelling results (like, e.g., the WBGU 2008 report on sustainable land use). Suggestion: mark the upper and lower level more clearly to make sure the fact that the bars are not representing a single value, but the range of values found, is more visible. Use dots or colour intensity to visualize outliers. Do reconsider choosing underlying studies more carefully regarding realistic assumptions in the context of this chapters findings. Better: skip the graph!"	See also comment 1191; in section 2.2. a large amount of literature is dealt with and will be expanded for the SOD. The WBGU study is included and will be summarized as one of the studies that focuses on marginal & degraded lands and residues and wastes, which is useful, but other studies explore more the opportunities of more efficient land-use. The preconditions for doing so will be incorporated in sections 2.2. and 2.5 and be raised as a key factor for sustainable development of the higher ends of the potential. The graph will not be deleted.
Kammen (University of California, Berkeley)	2	107	-	-	-	-	2.8.4	-	It is not clear from the figure, and potentially misleading, to show the 2008 World Biomass Demand (blue) a both a line at ~ 50 EJ/yr and then, seemingly, an adjacent blue bar of (250 □ 50) EJ.	Figure will undergo some improvements; the figure is however clear on that the range up to 250 EJ concerns demand in the year 2050.
Ballesterio (National Meteorological Institute)	2	107	-	-	-	-	2.8.4	-	The title of this figure almost repets the same that stated as footnote for sustainable biomass.	The figure caption will undergo revision for various reasons.
Gorissen (Flemish Institute for Technological Research)	2	107	-	-	-	-	2.8.4	-	Would it be possible to include biological waste in this graph (manure municipal sewage sludge, industrial waste)?	The graph groups main resource categories. In section 2.2. more details are provided. Section 2.8 has to provide an aggregated overview on deployment.
Haberl (Institute of Social Ecology (Vienna), University of Klagenfurt)	2	107	-	-	-	-	Fig 2.8.4	-	"The technical biomass potential of 1500 EJ/yr quoted here is more than 20% higher than the entire terrestrial aboveground net primary production of plants (= total yearly biomass production of green plants) on the earth's continents or about 15% higher than the net primary production of potential vegetation, i.e. the vegetation that would exist in the absence of human land use. As stated above, humanity already harvests or destroys a sizeable proportion of the current vegetation's NPP. Moreover, if humanity were to claim all of the NPP of terrestrial vegetation for its own purposes, no (zero) trophic energy would remain in ecosystems, i.e. these would be completely destroyed. As discussed above, the evidence base presented in the report to back up your estimate of a ""sustainable biomass potential 2050"" of 200-500 EJ/yr is also weak, in my view."	See also comments 1191 and 1210. The analyses pointing to high overall biomass production for either food and/or bioenergy all assume improved management of cropping systems. Analyses on ultimate technical potentials on how much food the world can produce have been published before and the high estimates of technical potentials are in line with such studies. The overall assessment of this chapter will however point towards a range of 100-300 EJ with a clear definition of key preconditions.
SCOWCROFT (EURELECTRIC)	2	108	30	108	32	-	-	-	"Up to 2050, biomass has the potential to meet a substantial share of the world energy demand (up to 30%): Subject to agricultural management, investment infrastructure, good governance of land use and introduction of strong sustainability frameworks. (Also: Section 2.8.6; Page 111, line 2 to 6)"	This is because page 111 gives the key messages; this is one of them
Vahrenholt (RWE Innogy GmbH)	2	108	30	108	32	-	-	-	"Up to 2050, biomass has the potential to meet a substantial share of the world energy demand (up to 30%): Subject to agricultural management, investment infrastructure, good governance of land use and introduction of strong sustainability frameworks. (Also: Section 2.8.6; Page 111, line 2 to 6)"	This is because page 111 gives the key messages; this is one of them

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Kammen (University of California, Berkeley)	2	108	-	-	-	-	-	-	Role of molasses is insufficiently covered. A recent paper on the molasses cycle may be useful: Gopal, A. R., and Kammen, D. M. (2009) 'Molasses for ethanol: The economic and environmental impacts of adding a new pathway to the lifecycle greenhouse gas analysis of sugarcane ethanol', Environmental Research Letters, 4, 1-5.	This is too specific for section 2.8; section 2.3 covers use of molasses.
Titus (Natural Resources Canada, Canadian Forest Service)	2	108	40	108	45	-	-	-	This is a synthesis section. If it can be deduced that a shortfall in biomass feedstock will affect economic feasibility of various biomass applications, can any comment be made about the possibility that environmental values might be degraded through exploitation? In a shortfall situation, are companies/countries going to switch back to burning fossil fuels or move to other energy sources, or risk environmental degradation through over-exploitation of bioenergy feedstock?	Those points will be elaborated upon; in principle fit in the more negative vision and potential impacts in table 2.8.2
SCOWCROFT (EURELECTRIC)	2	109	28	109	30	-	-	-	According to IPCC baseline scenarios, biomass demand in fact may be lower than the biomass supplies. OK	Thank you
Vahrenholt (RWE Innogy GmbH)	2	109	28	109	30	-	-	-	According to IPCC baseline scenarios, biomass demand in fact may be lower than the biomass supplies. OK	Thank you
Titus (Natural Resources Canada, Canadian Forest Service)	2	109	22	109	27	-	-	-	Aren't the overall energy savings of driving electric vehicles cf. using biofuels well established? This paragraph has a negative 'either/or' tone to it: can it be rewritten to state that liquid biofuels have a role for aviation, marine and transport trucks, and solid biofuels have a role in co-generation of electricity that can then be used for electric cars?	Section will be strengthened by e.g. IEA projections on drive chains for passenger vehicles and GHG balance information of WTW studies.
Marques (The Plantar Group)	2	109	28	109	30	-	-	-	This assertion seems too strong. Supply and demand of feedstocks depend on the type of biomass at stake. In many cases, such as the industrial use of wood and renewable charcoal, the supply of feedstocks is way below the effective demand (see BRAZIL, 2008)	Both possibilities are discussed; this section needs to give a global overview.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	109	6	109	9	-	-	-	Which analyses do you refer to? Please mention the source.	See comment 1216
Kruger (South African Weather Service)	2	109	2	109	3	2.8.3	-	-	Are there any research studies available, and what does it say?	So far grey literature; we will explore the availability of scientific refs.
Sims (Massey University)	2	111	18	-	-	-	-	-	□ regionally and site-specific.	Accepted
Jara Tirapegui (Endesa Eco S.A.)	2	111	1	-	-	-	-	-	""Chapter 2"" instead ""Chapter 2""	Accepted
Marques (The Plantar Group)	2	111	14	111	17	-	-	-	"Add ""sustainable management of native or planted forests"" in the sentence as a potential alternative to supply woody biomass (not only forest residues)."	Text will see editing.
Sims (Massey University)	2	111	27	-	-	-	-	-	"Could call it BCCC instead of CCS as in ""BIGCC"". Needs text on Bio-char added."	CCS will get some more attention. Biochar will be forwarded to the SD chapter, because it is not primarily and energy option.
Sims (Massey University)	2	111	14	-	-	-	-	-	"How is ""the right"" defined?"	Accepted
de Campos Barbosa (Petrobras)	2	111	3	-	-	-	-	-	"Remove: ""but also conditional"". Potentials are, in general, conditionals."	Will assess flow of the text.
Koponen (VTT Technical Research Centre of Finland)	2	111	22	111	25	-	-	-	"The fifth bullet of the key messages presents the policy development and the sustainability criteria as a solution to the sustainability issues concerning bioenergy. However it is very difficult to create a sustainability criteria, which ensures the sustainable production and use of bioenergy, which is widely accepted and which doesn't conflict e.g. with WTO rules. E.g. European Union has published its sustainability criteria in the directive 28/2009/EC. So far, this criteria concentrates only on biofuels and bioliquids and excludes other bioenergy. Also the emissions due to indirect land use change are excluded, and there is no consensus how the ILUC issue could be handled in the criteria. At least a phrase stating the difficulty of the issue should be added."	Section 2.4 will contain much more up to date information on developments on certification, including macro-effects. The chapter as a whole will make the key point that sustainable bioenergy cannot be decoupled from making agriculture more sustainable. Text will be sharpened.
SCOWCROFT (EURELECTRIC)	2	111	30	111	32	-	-	-	Development of working bioenergy markets and facilitation of international bioenergy trade are identified as important driving forces. OK.	Thank you
Vahrenholt (RWE Innogy GmbH)	2	111	30	111	32	-	-	-	Development of working bioenergy markets and facilitation of international bioenergy trade are identified as important driving forces. OK.	Thank you
de Campos Barbosa (Petrobras)	2	111	13	111	17	-	-	-	For 80-90% GHG reduction, sugarcane ethanol should be cited, since it's already a proved option. Reference: Macedo, 2008.	More concrete systems are to be included in the key messages; this depends on allowed space allocation though.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Soimakallio (VTT Technical Research Centre of Finland)	2	111	22	111	25	-	-	-	I really would like to see some proofs for this statement. From my point of view the development of second generation biofuels cannot be accounted as bioenergy option as long as they are not utilised in practice. Furthermore, GHG benefits, other environmental impacts and social impacts of biofuels are very difficult to be quantified. At the moment, there are no measures which can ensure that production of biofuels do not cause serious environmental and social problems. Consequently, supporting the use of biofuels together with the use of sustainability criteria which cannot quantify the impacts may lead to significant harmful impacts.	Comment is generic; a wide literature base is used to show what the development perspective is of 2nd gen biofuels and to discuss impacts (section 2.5). The conclusions of chapter 2 are based on this extensive review.
Sims (Massey University)	2	111	11	12	-	-	-	-	Policy prescriptive?	No reference to policy is made; basis is found in discussion of impacts in section 2.5
Kessels (International Energy Agency Clean Coal Centre)	2	111	1	111	37	-	-	-	There is missing in this section the key message of the use of biomass with co firing at coal fired power stations	Aim is to include key technologies in the key messages as well; trade-off with available space. Co-firing will get more attention in section 2.3
Soimakallio (VTT Technical Research Centre of Finland)	2	111	3	111	3	2.8.6	-	-	Although 30% here apparently reflects the overall biomass resource potential which is likely more certain to be assessed compared to biomass potential that can be sustainably be utilised for bioenergy, I would like to see some range here, not an exact figure based on the source that is even not mentioned here.	This text concerns the key messages; referencing and argumentation towards this aggregated figure is done in preceding text. Key messages will be expanded with more details though.
LEITE DRACHMANN (PETROBRAS)	2	111	-	-	-	2.8.6	-	-	As the key messages, food security x biofuels production is na important issue, however such issue isn't relevant in some parts of the world, by this it is important to mention FAO's report.	Basically agreed; in key messages we will not add more references though.
Schmall (Petrobras S.A.)	2	111	1	111	1	2.8.6	-	-	Chapter 2 and not Cchapter 2. Replace	Accepted
Gorissen (Flemish Institute for Technological Research)	2	111	-	-	-	2.8.6	-	-	Here, I would certainly include the following key point: Using biomass for energy and other (e.g. green chemistry) purposes requires society to rethink and redesign the current land use management regime. Land is scarce and the development of a smart land use regime is therefore of vital importance to meet the global challenges ahead. Smart land use management offers great opportunities and options to improve resilience of the land under use and may offer opportunities to address a variety of challenges (biodiversity, yield, ecosystems services, rural development etc). Resilience is key to dealing with a changing climate,	Agree with this statement; text size needs to be compact though.
Soimakallio (VTT Technical Research Centre of Finland)	2	111	9	111	12	2.8.6	-	-	The objective definition of the reference use of the land or biomass is very difficult. Therefore, there is a risk that the proposed system does not function appropriately and does not avoid undesired impacts in practice.	In general true; which is why the conditionality is stressed. Depending on current land use and management & governance impacts can be both positive and negative, which is what the text aims to say.
Kim (VTT Technical Research Centre of Finland)	2	111	1	111	37	2.8.6	-	-	Too optimistic key messages concerning the GHG impacts, their uncertainties and risks. For example, C payback times may be very long compared with the urgent emission reductions required. This is a risk especially in massive bioenergy programs (scale dependency).	Comment is from LA; have discussed this in the team. C-balance depends on management just as most other key issues. Proper choice of crops in relation to land type and current vegetation can often lead to net carbon storage in addition to fossil fuel savings.
TEIXEIRA COELHO (INSTITUTTE OF ELETROTECHNICS AND ENERGY USP)	2	111	-	-	-	2.8.6	-	-	TO DISCUSS EXISTING BARRIERS FOR MORE ADVANCED TECHNOLOGIES MAINLY AIMING POLICY MAKERS	It is done in section 2.4 in the final version
Kahiluoto (MTT Agrifood Research Finland)	2	119	31	119	32	-	-	-	Fischer et al., 2009 is given twice.	Accepted
Hakala (MTT Agrifood Research Finland)	2	121	1	-	-	-	-	-	Add reference: Graham, R.L., Nelson, R., Sheehan, J., Perlack, R.D. & Wright, L.L. 2007. Current and potential U.S. corn stover supplies. Agronomy Journal 99: 1□11.	references will be added
Hakala (MTT Agrifood Research Finland)	2	121	11	-	-	-	-	-	Add reference: Hakala, K., Kontturi, M. and Pahkala, K. 2009. Field biomass as global energy source. Agricultural and Food Science 18: 347-365.	reference will be added
Hakala (MTT Agrifood Research Finland)	2	125	30	-	-	-	-	-	Add reference: Lafond, G.P., Stumborg, M., Lemke, R., May, W.E., Holzapfel, C.B. & Campbell, C.A. 2009. Quantifying straw removal through baling and measuring the long-term impact on soil quality and wheat production. Agronomy Journal 101: 529□537	references will be added

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Treber (Germanwatch)	2	126	15	126	17	-	-	-	the correct reference is in: (http://www.sciencedirect.com/science?_ob=MImg&_imagekey=B6VWN3-4XFGJJ7-2-P&_cdi=6951&_user=479010&_pii=S1096717609000871&_orig=search&_coverDate=01%2F31%2F2010&_sk=999879998&view=c&wchp=dGLzVtz-zSkWA&md5=dc3ac20fa92c2378484ac8e48d8496c1&ie=/sdarticle.pdf)	references will be added
Hakala (MTT Agrifood Research Finland)	2	135	21	-	-	-	-	-	Add reference: Wilhelm W.W., Johnson J.M.E., Karlen D.L. & Lightle D.T. 2007. Corn stover to sustain soil organic carbon further constrains biomass supply. <i>Agronomy Journal</i> 99: 1665-1667.	references will be added
Kahiluoto (MTT Agrifood Research Finland)	2	135	-	-	-	-	-	-	WBGU, 2009, referred to several times in the text, is missing in the reference list.	references will be added
Kammen (University of California, Berkeley)	2	146	-	-	37	-	-	-	The dose-response impacts of improved stoves should be quantified. A fully quantified dose-response (exposure-response) curve for a real community N=500 is available at Ezzati, M. and Kammen, D. (2001) 'Indoor air pollution from biomass combustion and acute respiratory infections in Kenya: An Exposure-response study', <i>The Lancet</i> , 358, 619 - 624 and in associated papers.	Reference will be examined
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	148	31	-	-	-	-	-	"misprint: replace ""Population"" for ""population""	The final draft of the SRREN will be processed by a professional copy-editor. All editorial comments such as this will be resolved at that time.
Smith (PNNL)	2	-	-	-	-	2.5.4	-	-	"In section 2.5.4, and elsewhere, the discussion shifts without warning to a focus on developing country circumstances. In other places the discussion is more general, and applies more broadly. These shifts are difficult for the reader and need to be better reflected in the chapter's organization."	We will explain that the report is global and therefore has to cover both developed and developing countries activities.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	"Bio-hydrocarbons are only mentioned briefly in table 2.3.5. These fuels have great potential to substitute conventional liquid fuels without modifying engines, fueling infrastructure or aircrafts (in the case of jet fuel). One example of their importance: US DOE Under-Secretary Johnson mentioned that bio-hydrocarbons production is one of the key components of the greenhouse gas reduction strategy in the United States (November 2009) Other examples available at: http://www.greencarcongress.com/biohydrocarbons/ "	Biohydrocarbons will be added to the technology table (Table 2.6.2)
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	-	-	-	"Chapter 2 does not clearly differentiate between actual costs for commercial bioenergy systems, and cost estimates for pre-commercial systems. Cost estimates for pre-commercial technologies are often underestimated. Suggest clearly stating the basis for cost estimates and whether a technology is pre-commercial. In many places in the chapter pre-commercial technologies are stated to be competitive at oil prices below recent experience. Suggest that the term competitive only be used when a technology is actually competing in the market on a level playing field, and if policies are being used for support then these should be specified. Cost advantages/disadvantages of 1st generation biofuels compared with estimates for 2nd generation systems form critical barriers/opportunities; suggest that these advantages/disadvantages be assessed taking into account state of technology maturity."	Very good comment. Differentiation between precommercial and nth plant commercial will be made. Technologies will be presented in different tables regarding their commercial and non-commercial aspects. Discussion on these tables content will follow.
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	-	-	-	"Chapter 2 largely ignores the US corn ethanol system that has been the largest biofuel system in the world. Suggest case study on the US corn ethanol system parallel with the Brazil case study."	We will improve and extend discussion on present commercial technologies. Comparison of the two countries ethanol industries will be made.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
QUILES (Ministerio de Agricultura, Ganadería y Pesca)	2	-	-	-	-	-	-	-	"DEFINITION: First generation biofuels include mature technologies for the production of bioethanol from sugar and starch crops, biodiesel and renewable diesel from oil crops and animal fats, and biomethane from the anaerobic digestion of wet biomass. Second generation biofuels encompass a broad range of novel biofuels based on new feedstocks. These include: Bioethanol and biodiesel produced from conventional technologies but based on novel starch, oil and sugar crops such as Jatropha, cassava or Miscanthus; - A range of conventional and novel biofuels (e.g. ethanol, butanol, syndiesel) produced from lignocellulosic materials (i.e. fibrous biomass such as straw, wood, and grass). These routes are based on biochemical and thermochemical technologies still at the demonstration stage. Third 3rd generation biofuels (also called advanced biofuels) generally include biofuel production routes which are at the earlier stages of research and development or are significantly further from commercialisation (e.g. biofuels from algae, hydrogen from biomass). Source: IEA BIOENERGY: ExCo: 2009:06, Bioenergy - a Sustainable and Reliable Energy Main Report"	The comment is very useful. We will accept the definitions with some change in words.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	"Effect of climate change: Incorporate climate change impacts on water availability, change of harvest seasons, available arable land, plant adaptation. Include additional information from previous IPCC reports - impact of extreme weather events on biomass/bioenergy production (e.g. Climate Change and Water, 2008 and Land Use, Land-Use Change and Forestry, 2000)"	Climate Change impacts on land use are already in the text. We will add information on CC impacts on water and consequences for biomass production.. Add extreme events impacts through earlier IPCC reports.
Marques (The Plantar Group)	2	-	-	-	-	-	-	-	"General comment on the chapter: the currently available methodologies for Clean Development Mechanism (CDM) applicable to bioenergy could be quoted and referred to, as a way of better indicating the potential of the CDM to stimulate the use of bioenergy in developing countries, especially in light of methodologies applicable to the use of woody biomass as a renewable source of energy. For example, see Approved CDM Methodologies A/R AM 0005, AM 0042, AM 082 at cdm.unfccc.int "	We will add a sentence on that but space limitation is a serious barrier.
Marques (The Plantar Group)	2	-	-	-	-	-	-	-	"General Comment on the whole chapter: 1) The text often refers to ""charcoal"" and ""fuelwood"" without making a clear distinction on its renewability. To avoid confusion, it would be better to always make a distinction and to refer to ""renewable charcoal/fuelwood/wood"" or ""non-renewable charcoal/fuelwood/wood. Definitions for both could be adopted and referred to in the glossary, building upon the preliminary discussion on page 77."	We will expand charcoal text to include industrial use.
Marques (The Plantar Group)	2	-	-	-	-	-	-	-	"General Comment on the whole chapter: 3) The report could be more balanced in terms of references to improved carbonization processes, which is one of the ways of reducing CH4 and CO2 emissions from both traditional and modern uses of woody biomass as a source of energy. Also, within such improved carbonization processes there is also the possibility of recovering tar and using it as a biofuel to replace oil and oil-based products and to implement co-generation schemes with the off-gases (see attached reference)."	More information on charcoal will be added.
Marques (The Plantar Group)	2	-	-	-	-	-	-	-	"General Comment on the whole chapter: 4) Balance the reference to trade-offs not only within the bioenergy chain (e.g. GHG benefits x potential negative environmental impacts) but also between bioenergy and replaced fuels/systems (e.g. environmental impacts of the fossil fuels, opportunity costs of replacing the fossil fuels as one of the cost components of the bioenergy potential) Good examples of this are found on section 2.5 - env/social issues - page 54, lines 10-21, page 58, lines 33-34, page 94, lines 17-18, but other parts of the texts could be improved in this respect."	We will try to include 2 or 3 references dealing with impacts due fossil energy use. Also, Chapter 8 addresses the integration with existing and evolving energy industry.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	"Impact on food security could be more empirically and in more detail dealt with. Together with the overall climate impact, impact on food security will be the bottle-neck for implementation of bioenergy. The potential to enhance food security is worthwhile discussing, especially because an important biomass/land use potential in Africa is suggested (see e.g., p. 18, Table 2.2.2). In the lack of a comprehensive empirical analysis, case studies would help to understand the complexity and context-dependence of the issue, and provide with important points to be taken into account in decision-making."	It is already discussed in section 2.5, but we will try to include a key study on that.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	"In the text: ""In the case of electricity villagers benefit from improved household lighting and also for street lighting, school, Panchayat Ghar□, and shops. "" What is Panchayat Ghar?"	Sorry. This will be removed.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	-	-	-	<p>"Ou, X.,Zhang, X., Chang, S., Guo, Q. Energy consumption and GHG emissions of six biofuel pathways by LCA in (the) People's Republic of China. Applied Energy 86 (2009) S197-S208. doi:10.1016/j.apenergy.2009.04.045</p> <p>Searchinger T., Heimlich R., Houghton R.A., Dong F., Elobeid A., Fabiosa J., Tokgoz S., Hayes D., Yu T. 2008. Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change. Science 319, 1238.</p> <p>Sheehan, J., Camobreco, V., Duffield, J., Graboski, M., Shapouri, H. Final report: life cycle inventory of biodiesel and petroleum diesel for use in an urban bus. NREL/SR-580-24089 UC Category 1503. USA; 1998. http://www.nrel.gov/docs/legosti/fy98/24089.pdf</p> <p>Soimakallio, S.; Mänen, T.; Ekholm, T.; Pahkala, K.; Mikkola, H.; Paappanen, T. 2009a. Greenhouse gas balances of transportation biofuels, electricity and heat generation in Finland Dealing with the uncertainties. Energy Policy. 2009, 37, 80-90.</p> <p>Soimakallio, S.; Antikainen, R.; Thun, R. 2009b. Assessing the sustainability of liquid biofuels from evolving technologies A Finnish approach. VTT Research notes 2482. Espoo 2009.</p> <p>Spatari, S., Bagley, D.M., MacLean, H.L. Life cycle evaluation of emerging lignocellulosic ethanol conversion technologies. Bioresource Technology 101 (2010) 654-667. doi:10.1016/j.biortech.2009.08.067</p> <p>Stichnothe, H. and Azapagic, A. Bioethanol from waste: Life cycle estimation of the greenhouse gas saving potential. Resources, Conservation and Recycling 53 (2009) 624-630. doi:10.1016/j.resconrec.2009.04.012</p> <p>Thamsiroj, T., Murphy, J.D. Is it better to import palm oil from Thailand to produce biodiesel in Ireland than to produce biodiesel from indigenous Irish rape seed? Applied Energy 86 (2009) 595-604. doi:10.1016/j.apenergy.2008.07.010</p> <p>UNEP 2009. Towards sustainable production and use of resources: Assessing biofuels. United Nations Environment Programme (UNEP) & International Panel for Sustainable Resource Management. 2009.</p> <p>Wicke, B., Dornburg, V., Junginger, M., Faaij, A. Different palm oil production systems for energy purposes and their greenhouse gas implications. Biomass and Bioenergy 32 (2008) 1322-1337. doi: 10.1016/j.biombioe.2008.04.001</p> <p>Winrock International 2009. The Impact of Expanding Biofuel Production on GHG emissions. White paper #1: Accessing and interpreting existing data. April 2009.</p> <p>Yan, X., Crookes, R.J. Life cycle analysis of energy use and greenhouse gas emissions for road transportation fuels in China, Renewable and Sustainable Energy Reviews 13 (2009) 2505-2514. doi:10.1016/j.rser.2009.06.012</p>	References proposed will be checked.
Wang (Argonne National Laboratory)	2	-	-	-	-	-	-	-	<p>"Overall, this is a very comprehensive chapter to cover a lot of materials on biomass-based energy products. A major issue is the solid fuels vs. liquid fuels from biomass. They offer very different solutions to different countries and face very different issues. Aggregation of these two general types in this chapter certainly poses a major challenge. Somehow, these two sub-types may need to be separately discussed in individual sections of this chapter."</p>	Thanks for the comment. The different uses of biomass will be discussed separately and liquid, solid and gaseous carriers will be discussed. The big tables in Ch02 will be splitted for this purpose.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	"Overall: Chapter 2 contains many small grammatical errors and much apparent repetition. It also lacks a natural flow from one section (or subsection) to the next; this could perhaps be remedied by inclusion of sentences at the beginnings and/or ends of sections/subsection to better help readers understand where the chapter is going next. Professional copy editing highly recommended to improve readability, and would probably also result in reduced length."	We recognize these limitations and will try to correct. Mainly concern will be with better transition from one sub-section to another.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	"Overall: Chapter 2 is inconsistent in its treatment of whether or not environmental sustainability of feedstock production systems is a foundational assumption or not. For example, it is not explicitly stated as an assumption at key points in Sub-section 2.2 (Resource potential), especially 2.2.2 (Assessments of the biomass resource potential) which leads into 2.2.4 (Constraints on biomass resource potential), where environmental issues are discussed under 2.2.4.1 (Constraints on residue extractions rates) □ but as a 'constraint', rather than reflection of biophysical capability. This contrasts in tone with Sub-section 2.8, where 'sustainability' is often mentioned as a caveat, or a given condition for bioenergy deployment. (Although the text in 2.8 suggests 'environmental sustainability', this is not always clear; if so, it could be explicitly stated to differentiate it from economic and social sustainability.) It would be important for this whole chapter to set a tone that explicitly recognizes the necessity for environmental sustainability in neutral tones (even if we are still in the midst of defining clear criteria for this) so that policy-makers are not tempted to engage in an ecological Ponzi scheme by trading off one environmental value (atmospheric CO2 concentration) against others (soil and water quality, biodiversity, etc.)"	We will try to be more clear in the different potentials definition.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	"Overall: Ensure that all acronyms or abbreviations used in Chapter 2 are defined on their first use. Consider inclusion of a table of acronyms and abbreviations at the outset; this could also include definitions of main terms in text, especially if common usage varies between countries or sectors."	We will be careful on that. A list of acronyms will be added to SRREN.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	"Overall: The use of pejorative terms in Chapter 2 needs addressing. Some of this may be a matter of English as a second language, but some may reflect an approach that is less than neutral. Regardless of the direction of the bias (i.e., pro-environment or pro-industry), neutral terms should be sought whenever possible (recognizing that we sometimes lack adequate, simple terms to express our meaning). Some work in favour of environmental sustainability (e.g., P.20 L.18: 'exploitation' for current biomass harvesting) but most suggest an industrial bias at the cost of environmental sustainability. Terms that might be considered pro-industry at the expense of the environment include: P.11, L.9: 'felling losses'; P.14, L.24: 'biodiversity and nature conservation requirements set restrictions'; P.15, Table 2.2.1 & P.16, L.23: 'unexploited forest growth'; P.16, L.19: 'soil conservation' as a 'competing use' for a commodity; P.19 L.13: yield as a 'restriction'; P.20, Section 2.2.4 & P.12 L.30 & P.24 L.7: environmental issues as 'constraints'; P.69 L.17: '□biodiversity impacts may still arise in the real world.'"	The text will be reviewed by professional editors before final version is issued..
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	"Overall: There is a great deal of repetition in Chapter 2. This may partly be because of the great deal of sub-dividing of sections and sub-sections. Elimination of some of this repetition will likely require restructuring of the outline. For example, if there were a single comprehensive section on environmental impacts in agriculture and forestry then all the other sections could refer back to it without repeating the issue all over again. It should only need saying once in the entire chapter that some amount of agricultural and forestry harvesting residue retention is required because organic matter is important for soil C, soil nutrients, and above-and below-ground biodiversity so that on-site and off-site environmental values are retained; all the space saved by elimination of repetition of this simple concept could then be used to give a more comprehensive and complete review on environmental sustainability, pointing readers to at least the key review articles in agriculture and forestry. (It is, for example, notable that there is no mention of use of forest harvesting residue as a roadbed for extraction equipment to prevent physical soil damage such as compaction and soil displacement leading to rutting.)"	Repetition is our major concern and will be avoided. The major structure of the chapters were defined by IPCC Board and is out of authors' control.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Soimakallio (VTT Technical Research Centre of Finland)	2								<p>"References cited in the comments #1 - #17 :</p> <p>ADEME (Agence de l'environnement et de la maitrise de l'nergie) 2006. Bilan rgique et sions de GES des carburants et biocarburants conventionnels. Paris. 2006.</p> <p>California Air Resources Board. Detailed California-Modified GREET Pathway for Transportation Fuels: version 2.1 (2009) http://www.arb.ca.gov/fuels/lcfs/lcfs.htm</p> <p>Department for Transport. Carbon and Sustainability Reporting Within the Renewable Transport Fuel Obligation, Requirements and Guidance, Government Recommendation to the Office of the Renewable Fuels Agency. January 2008, London http://www.dft.gov.uk/pgr/roads/environment/rfo/govrecrfa.pdf</p> <p>de Santi, G. (Ed.), Edwards, R.; Szekeres, S.; Neuwahl, F.; Mahieu, V. 2008. Biofuels in the European Context: Facts and Uncertainties. European Commission Joint Research Centre, JRC. 2008.</p> <p>Doornbosch, R. and Steenblik, R. Biofuels: Is the cure worse than the disease. Round Table on Sustainable Development. OECD, Paris 2007.</p> <p>Edwards R., Lariv, Mahieu V., Rouveiolles P. Well-to-wheels analysis of future automotive fuels and powertrains in the European context. CONCAWE EUCAR JRC -report. Version 3.0, November 2008. http://ies.jrc.ec.europa.eu/uploads/media/WTT%20App%20v30%20181108.pdf</p> <p>Fargione, J., Hill, J., Tilman, D., Polasky, S., Hawthorne, P. 2008. Land Clearing and the Biofuel Carbon Debt. Science 319, 1235 (2008).</p> <p>Farrel, A.E., Plevin, R.J., Turner, B.T., Jones, A.D., O'Hare, M., Kammen, D.M. Ethanol Can Contribute to Energy and Environmental Goals. Science 311, 506 (2006).</p> <p>Fehrenbach H. GHG accounting methodology and default data according to the biomass sustainability ordinance (BSO). 53rd meeting of the renewable energy working party, Technology and policy seminar, Sustainability of renewables, IEA-2nd April 2008- Paris, http://www.iea.org/Textbase/work/2008/rewp/Fehrenbach.pdf</p> <p>Fischer, G., Hizsnyik, E., Prieler, S., Shah, M., van Velthuisen H. 2009. BIOFUELS and FOOD SECURITY Implications of an accelerated biofuels production. Summary of the OFID study prepared by IIASA.</p> <p>Fritsche, U.R., Wiegmann, K. Treibhausgasbilanzen und kumulierter Primnergieverbrauch von Bioenergie- Konversionspfaden unter Berücksichtigung möglicher Landnutzungsänderungen, 2008, http://www.wbgu.de/wbgu_jg2008_ex04.pdf</p> <p>Gnansounou, E., Dauriat, A., Villegas, J., Panichelli, L. Life cycle assessment of biofuels: Energy and greenhouse gas balances. Bioresource Technology, Volume 100, Issue 21, November 2009, Pages 4919-4930. doi: 10.1016/j.biortech.2009.05.067</p> <p>Huo, H., Wang, M., Bloyd, C., Putsche, V. Life-cycle assessment of energy use and greenhouse gas emissions of soybean-derived biodiesel and renewable fuels. Environmental Science and Technology. 2009. 43, 750-765. doi: 10.1021/es8011436</p> <p>Kalogo, Y., Habibi, S., Maclean, H. L., Joshi, S.V. Environmental Implications of Municipal Solid Waste-Derived Ethanol. Environmental Science & Technology. Vol. 41. no. 1. 2007. doi:10.1021/es061117b</p> <p>Kendall, A., Chang, B., Sharpe, B. 2009. Accounting for Time-Dependent Effects in Biofuel Life Cycle Greenhouse Gas Emissions Calculations. Environmental Science & Technology. 2009, (43), 7142-7147</p> <p>Majer, S., Mueller-Langer, F., Zeller, V., Kaltschmitt, M. Implications of biodiesel production and utilisation on global climate A literature review. European Journal of Lipid Science and Technology. 2009, 111, 747-762. doi: 10.1002/ejlt.200900045</p> <p>Niukkanen, S. 2008. Greenhouse gas and energy intensity of product chain: case transport fuel. Master's thesis. Helsinki University of Technology, Finland.</p> <p>OECD Biofuel support policies: an economic assessment, 2008"</p>	References proposed will be checked.

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 OECD Biofuel support policies: an economic assessment, 2008"

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Sims (Massey University)	2	-	6	-	7	-	-	-	"Refs are 2001 and 1999 - ""present knowledge"" doesn't fit."	Comment not clear.
Treber (Germanwatch)	2	-	-	-	-	-	-	-	"The biofuel chapter does mention all relevant constraints and risks, but in very inconsistent way by presenting very large figures and potentials first, and then only later discussing issues like food security, competition for land and water etc. By presenting the facts this way the latter might tend to be neglected. There is a high emphasis on the role of 'proper policies' for sustainability and even climate change mitigation effectiveness, but actually successful policies have so far not been established."	The procedure selected is to present the theoretical potential first and then adding constraints. This is normal approach in most of the available literature. The major drivers for the potential are appropriate policies. We discuss the main goal of them but there is not yet global policies in effect.
Kyte (E.ON AG)	2	-	-	-	-	-	-	-	"The chapter does not contain a view on the industrial potential of biomass exploitation in large scale power, which is an important aspect to the application of biomass in energy supply. Generally the pure citing of data leaves the reader unguided on the potential implications on the different sectors. To enrich the text and make it more valuable to a professional reader more analytical elements would add value."	More on that will be added for present technologies (e.g large size steam boilers) and for future technologies (biomass gasification and combined power and heat production).
El-Hinnawi (National Research Centre)	2	-	-	-	-	-	-	-	"The chapter should be restructured and revised. It should address the present and future development of bioenergy in the world to mitigate climate change and to promote sustainable development. As presented, it is skewed towards the situation in developed countries. The problems of traditional fuels (fuelwood, agricultural residues, etc) in developing countries should be discussed in more detail. Also the sections on technology, environmental impacts and technology improvements should be integrated and divided according to technologies (each technology has its own set of problems, and this should be made clear). More data should be given on emissions from each technology and how far this technology will help mitigation of climate change. Several important publications are not referred to, for example : H.Fehrenbach et al. ""Criteria for a sustainable use of bioenergy on a global scale"", Texte 30 (2008), Umweltbundesamt, Berlin. and M. Memmler et al. "" Emissionsbilanz erneuerbarer Energieträger"" Umweltbundesamt, Berlin (2009)."	The reference will be checked. We will include at least 2 Boxes with case studies from developing countries. The total number of technologies for biomass is very large and due to space limitations we can't discuss one by one. This is the reason why we decided to build the large tables in section 2.3 and 2.6 and just add comments and numerical information on each technology. Nevertheless, we will use more space to discuss the most relevant aspects of technologies listed in the 2 long tables. Other publications from the group are cited.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	"The difference in the context and solutions between industrialized and developing countries could be more explicitly addressed. More generally the importance of regional and local characters are often referred too in the chapter. E.g., case studies representing varying examples of industrial and developing countries would enlighten the issue. "	Key case studies for developing countries will be added.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	"The material flows linked to energy carriers and the issue of recycling would deserve clearly more attention. Especially this concerns nutrients such as nitrogen (N) and phosphorus (P), and carbon (C) with a high environmental impact and resource value. "	Agricultural induced GHG emissions are already discussed in Ch02. Nutrient flows are covered too.
Shi (Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry)	2	-	-	-	-	-	-	-	1 EJ=10 ¹⁸ J	Not clear the purpose of the comment. No action taken.
Avenhaus (Potsdam Institute for Climate Impact Research (PIK))	2	-	-	-	-	-	-	-	A clearer structure, more references and a clear division between different bioenergy types (liquid, solid, fuel, heat, power) and their different advantages and disadvantages would be helpful for understanding. A clear overall energy balance of all bioenergy types would be nice.	The major structure can't be modified by authors. Nevertheless, we are changing structure in a few subsectors. The technologies listed in the big tables in section 2.3 and 2.6 will be distributed to more than 1 table to differentiate between major bioenergy categories. Energy balances are already presented in Figures but more will be added.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Gorissen (Flemish Institute for Technological Research)	2	-	-	-	-	-	-	-	A general comment to the whole chapter of bioenergy is the fact that the biophysical constraints and boundaries of our planet do not receive adequate attention in this chapter. We would therefore suggest to integrate the concept 'ecosystem services' in this chapter. Biomass, both in the natural and human-made landscapes, plays - next to productive services - also essential roles in the supporting (e.g. nutrient cycling), regulating (e.g. disease regulation) and cultural (e.g. aesthetic) ecosystem services. For instance, through land cover, biomass plays a vital role in climate regulation (see Sampaio et al 2007. Regional climate change over eastern Amazonia caused by pasture and soybean cropland expansion. Geophys Res Lett 34). Conversely, reforestation of degraded land (with short rotation wood for instance) might also influence local climate by influencing precipitation.	Reference will be checked. Most of the points highlighted are already discussed. But local climate change due deforestation has to be added.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	<input type="checkbox"/> Acronyms and models should be briefly explained and referenced	Na acronyms list will be added to SRREN. Ch10 will provide further information on models.
Gorissen (Flemish Institute for Technological Research)	2	-	-	-	-	-	-	-	Adaptability and resilience of the land under use will be of vital importance to safeguard agricultural productivity in the future. Bioenergy - if done right - may play an important role in improving resilience. This should also be addressed in this chapter. For instance, see: Reaping the benefits (RTB report). Science and the sustainable intensification of global agriculture. The Royal Society 2009.	Reference will be checked but the issue is already discussed.
Schmall (Petrobras S.A.)	2	-	-	-	-	-	-	-	Add text about the positive effect of lowering price when the production protein and carbohydrates is associated with production of oil (e.g. soybean).	Coproducts will be highlighted
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	<input type="checkbox"/> Adopt a better reference system. Asterisks reference system in tables is very confusing. We suggest using numbers instead	The reference system will be changed and the big tables on Ch02 splitted and improved.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	Agricultural management has been mentioned as a key condition for bioenergy potential and sustainability impacts, but has got relatively little attention. In addition, suggestions on it are often based on a narrow view ignoring the overall climate impact, and even more the overall sustainability. E.g., increase of fertilizer inputs and irrigation are often offered as solutions with possibly a reservation in terms of mitigation impact or in terms of water/food/energy security, but with few attempts to constructive conclusions. Perennial cropping systems are repeatedly referred too but vaguely specified. IAASTD - the recent global assessment on agriculture (the reference is included) - could be utilised here.	More on perennials will be added. More discussion on Yield vs. Fertilizer use will be added.
Balletero (National Meteorological Institute)	2	-	-	-	-	-	-	-	All acronyms have to be defined the first time they appear. Costs have to be referenced to an unique kind of currency (just US\$)	A glossary for SRREN will be added. Regarding the currency issue this has already been defined. All cost in 2005US\$.
Gorissen (Flemish Institute for Technological Research)	2	-	-	-	-	-	-	-	Also, more emphasis should be put on the role of sustainable land management. Smart management of land use offers options to mitigate climate change (carbon sink), to improve land productivity and resilience, to promote rural development and biodiversity and to maintain vital ecosystem services. An important reference in this regard is: Connections between MASLM and the Climate Change and Biodiversity Conventions Ch7 Volume II in <input type="checkbox"/> Understanding Desertification and Land Degradation Trends <input type="checkbox"/> White Papers for the First UNCCD Scientific Conference, Buenos Aires, Argentina 22-24 September 2009.	Reference will be checked.
Savolainen (VTT Technical Research Centre of Finland)	2	-	-	-	-	-	-	-	As the SRREN report considers renewable energy sources and climate change, the greenhouse gas emissions and greenhouse impact on renewable energy sources should be considered in the report in detail. Biomass based option also include a wide variation of technologies and practices and they also utilize land and irrigation water which are used for other purposes like food production also. Therefore much longer part of the chapter text must be reserved for the assessment of greenhouse impact and side effects of biomass use. Otherwise the report might be criticized for not giving the whole picture of biomass options and their impacts.	CC impacts on biomass is already discussed and RE impacts on CC also.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	By-products, wastes, untapped agricultural biomass and by-flows would deserve more exploration relative to dedicated energy crops. Most of the chapter concentrates almost exclusively on the latter ones even if the former ones have a significant immediate potential and little problems in terms of sustainability and food security. The agricultural by-flows include the biomass harvested from vegetated buffer zones, set-aside land and aquatic biomass such as plants and fish (and algae) in waters eutrophicated due to nutrient loads from agriculture.	We will add more on the availability of residues in section 2.2 and more on technologies to deal with them in sections 2.3 and 2.6, as well as in logistics (2.6 and 2.3)

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Gorissen (Flemish Institute for Technological Research)	2	-	-	-	-	-	-	-	Chapter 2: I want to congratulate the authors for their effort in the challenging task of shaping a comprehensive and profound picture on the topic of bioenergy. This draft chapter paints a nice picture of the complexity of the topic and most relevant issues are already present. To improve completeness, I suggest to include a few more perspectives in the general remarks below. My suggestions are not intended to make the whole more complex or difficult. On the contrary, the shift from fossil to renewable resources should be regarded as an opportunity to rethink, redesign and reorient all relevant viewpoints, regimes, institutions and practices towards more sustainable systems of the future. A transition of such magnitude involves the whole of civil society and the biophysical constraints and boundaries of our planet. Hence to improve comprehensiveness, I would advise to include the following perspectives: environmental economics, transition management, change management.	Unfortunately we are short in space to include so many relevant aspects.
Sugiyama (CRIEPI)	2	-	-	-	-	-	-	-	cofiring of biomass in coal power plant should be covered more extensively	We will add more text on that.
Kessels (International Energy Agency Clean Coal Centre)	2	-	-	-	-	-	-	-	General Comment on report: There is a lot of repetition which needs to be edited out. The chapter quotes different IEA WEO and needs to explain why this is so? Need to standardise metrics used across chapters	Repetition is our major concern and will be avoided. Literature references will be checked for name consistency.. The metric system will always be used.
Marques (The Planitar Group)	2	-	-	-	-	-	-	-	General Comment on the whole chapter: 2) The references to charcoal and wood are almost exclusively made in the context of domestic/small scale use, e.g. cooking/heating. There are very few, if any, references to vast potential of increasing the use of renewable fuelwood and renewable charcoal in several industrial supply chains, including larger scale processes based on planted forests. For example, in Brazil the use of charcoal/fuel wood for industrial/large scale purposes (iron/steel and heating) is equivalent to almost 6% of the country's energy matrix. In most countries the constraint for the larger scale use of renewable fuelwood and charcoal is not access to the end-use technology (e.g.charcoal based blast furnaces, boilers, heaters, which are all fairly accessible technologies) but rather the lack of sustainable feedstocks, such as those coming from sustainable forest management of from planted forests.This potential could be mentioned as an alternative to be investigated by all countries with a substantial potential to stimulate the establishment of renewable wood/charcoal feedstocks. The fact that biomass from wood/charcoal represents 80% of the world's bioenergy supply is also an indicator of the importance of mentioning the creation of sustainable feedstocks for fuelwood/charcoal. The chapter could send a clearer message that in spite of being traditional sources of energy, wood and charcoal can be modernized (use in large industrial chains, tar recovery, co-generation with the carbonization off-gases, etc.).	Charcoal for industrial use will be added to the text.
Marques (The Planitar Group)	2	-	-	-	-	-	-	-	General comment on the whole chapter: The tables referring to the GHG implications of different end-uses of renewable wood and renewable charcoal could be improved by including the following potential climate benefits: (i) net GHG removals through the stocks of planted forests (ii) CH4 emission reductions through improved carbonization (charcoal production) processes, (iii) potential recovery of tar during the carbonization process and its subsequent use to replace oil-based products (iv) co-generation using the off-gases of the carbonization process (v) CO2 emission reductions in the blast furnace, using renewable charcoal instead of non-renewable charcoal or coal coke (vi) co-generation with the off-gases of the blast furnace (vii) bio-CCS with the off-gases of the blast furnace. A case-study mentioning all of these points could be quoted in the report (see attached references BRAZIL 2008, AMS/ABRAF 2008)	More on charcoal will be added.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	Generally a relatively balanced chapter covering most important dimensions of the issue, with mainly well-justified key messages. The exceptions are commented below.	Once each particular comment is listed we will provide an answer.
Coulibaly (International Institute fo Water and Environmental Engineering (2iE))	2	-	-	-	-	-	-	-	I find cancellation difficult in the 2nd chapter. It is better leave it as is	Thanks. No action required.
Marbán (Instituto Nacional del Carbón (CSIC))	2	-	-	-	-	-	-	-	I miss in the whole chapter more references to biomethanol as potential biofuel for transport. See SRREN_Draft0_Review_Marban_Gregorio_Material_02.doc for understanding the need of including more comments to this biofuel	Methanol will be added to the technologies being discussed.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	<input type="checkbox"/> Information needs to be proofread	We already have references for most of the statements. Nevertheless, a few ones require attention from the authors to attend the comment.
KOBAYASHI (Toyota R&D Labs. Inc.)	2	-	-	-	-	-	-	-	It is very difficult to read through this chapter, because many related sections are separated apart and because of this, we can find some duplications. So if you reconsider the structure of this chapter, I think you can shorten the length of this chapter, and at the same time it becomes more easier to read.	The major chapters structure was defined by the IPCC country representatives and can't be changed by authors. Nevertheless, sub-sections can be managed and we will try to do that on them.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	Many references are several times in the list, many mentioned in text are not in the list.	Accepted
Fulton (Deutsche Bank)	2	-	-	-	-	-	-	-	Need to distinguish the potential for heating and cooling clearly as a very large opportunity and spell out what that entails. Co-fired biomass opportunity under estimated. Biomass with CCS very interesting.	Biomass used for cooling will be added to the technology list in section 2.6. This is dealt with in Chapter 8 as well.
Kirkinen (Sitra, the Finnish Innovation Fund)	2	-	-	-	-	-	-	-	Overall comment: the greenhouse impacts of biofuels and renewable energy sources should be more extensively discussed since the report is a Special Report on Climate Change and Renewable Energy Sources. There are no clear enough figure or table, where the greenhouse impacts (and uncertainties) of different biofuels and renewable energy sources were presented. Since this issue is broadly discussed, it should be covered here more detailed as well as some presentation of the impacts (according to the current knowledge) should be provided.	Ch02 provides a table (Table 2.5.1) where economic and environmental impacts are listed. After that the discussion covers each one of these impacts.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	Overall: Chapter 2 sometimes has an overly intensive focus on agriculture, and more focus on forestry systems is warranted in places. In other places, bioenergy or biofuels are discussed in general terms but it is fairly clear that it is only about agriculture. The entire chapter should be carefully re-checked to ensure that text is explicit about agriculture vs. forestry. Furthermore, the chapter should be re-checked to ensure that treatment of both sectors is as even-handed as possible and that there is not an accidental agrocentric bias (e.g., only 2.5 lines for Sub-section 2.2.6.4?).	We will expand discussion on biomass from perennials.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	Overall: It is not always evident that the division of sections and subsections in Chapter 2 down to 6 levels in places (e.g., 2.5.4.3.7.2) is always helpful. Approach will depend on differences in temperament between 'splitters' and 'lumpers' amongst the authors. However, some thought should be given to the extent to which some of the finer levels of splitting could be aggregated. More thought could also be given to how to make the multitude of sub-sections flow into each other for a smoother read <input type="checkbox"/> some sections are more successful at this than others. In the least successful sections, the headings seem to be like cells in a table that an author filled in, depending on the structure rather than the transmission of thoughts in the text to connect the sections in a continuous flow of ideas and concepts.	We will use up to 4 digits.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	Overall: The extent to which statements in Chapter 2 are backed by citations and references varies from section to section. It could be useful to re-check the entire chapter to ensure that all major and key points are backed by citations, and that there is some consistency in frequency and use <input type="checkbox"/> from peer-reviewed journals, whenever possible.	More references will be added.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	-	Overall: There is great variation in writing style amongst sections in Chapter 2. Some sections are rather 'choppy', and some (e.g., especially parts of 2.5) read much more smoothly.	Authors will make an effort in improving text quality. The final document will be professionally reviewed for editorial issues.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	Paragraph numbering should be harmonised, with preferably less than 3 subnumbers (e.g. 2.1.1.1, not more). In many cases one could use bold titles under a numbered title, as e.g. on page 33.	We will use up to 4 digits.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	Please check for repetition, e.g. Table 2.3.5 on p. 37-42 is the same as Table 2.6.2. on p. 85-89.	In reality the tables are different. Table 2.3.5 deals with present available technologies. Table 2.6.2 is for technologies available by 2030.
Kimura (Central Research Institute of Electric Power Industry)	2	-	-	-	-	-	-	-	Political and institutional barriers are most important than costs and technological issues in Japan. In spite of the high ultimate potentials of woody bioenergy, 775PJ, it supplies only 58PJ. See: Asano, K., 2009. A research of bioenergy prototype scenarios in Japan, CRIEPI Research Report Y08003, Central Research Institute of Electric Power Industry.	In Ch02 we already discussed extensively political and institutional constraints. We will check for further text addition.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	References in the reference list should be written in concise manner (uniformly).	Accepted
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	References in the text should be harmonised (with or without comma between year and name etc.).	Accepted
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	References to e.g. manuscripts and congress presentations (without abstract reference) should be omitted.	Accepted
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	Social impacts are too narrowly discussed mainly in terms of the socio-economic issues such as employment and regional economic development, and social acceptance.	We already have a section on social issues but the aspects identified in the comment will be added (employments and regional economic development).
contaldi (ISPRA, Institute for Environmental Protection and Research)	2	-	-	-	-	-	-	-	The chapter give valuable information on a very extended list of technologies, I do not suggest cuts.	Thanks. No action required.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	The focus is in the future scenarios, while the immediate potential and options could be more tackled with. Mitigation is needed immediately and bioenergy, especially utilising the presently untapped biomass offers a significant potential to that.	More on present technologies will be added. But the issue must also be considered by Ch10.
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	-	-	The IPCC SRREN FOD particularly focuses on biomass liquefaction and gasification. Biomass gasification with CO ₂ capture, for example, is highlighted as the technological process with the highest potential for GHG emission reductions, but the report does not comment on neither the technical nor the economic facts. From our point of view, RWE should point out that biomass is primarily to be used for the production of heat and electricity. The energy density of biomass can significantly be raised by pelletising and torrefaction, thus enabling the worldwide supply of also large-scale generation units. Its does not make any sense to produce oil from biomass for its later combustion in power plants. Due to significantly lower production costs and substantially higher rates of efficiency, coal or natural gas should be used as raw material for petrol and heavy fuel oil. We do not expect any competition with food production and supply (exception: sugar cane based ethanol). Concerning power generation from biomass using steam boilers, primary importance should be attached to efficiency improvements. In biomass-fired power plants or plants using co-firing, efficiency rates over 40% can be reached (in case of gasification, outcome values are lower while specific investment costs are even higher at the same time). Compared with combustion, the advantages of gasification are doubtful. The vision of global bioenergy trading implies the existence of a market for biomass commodities where pellets and biochar produced by torrefaction can be traded. We advise RWE to promote the establishment of accordant specifications, standards etc.	New technologies will be added in Sections 2.3 - Present available tech. and in section 2.6 - Future available tech. In particular we will include biomass liquefaction and improve dis cussion on biomass gasification.t
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	-	-	-	The major driver for the increasing use of bioenergy should by the aim to mitigate global warming. However, there are numerous recent studies (e.g. Searchinger et al. 2008, UNEP 2009, Winrock 2009, Fargione et al. 2009, Soimakallio et al. 2009a, b, Kendall et al. 2009) concluding that GHG benefits through bioenergy and biofuels are subject to various and significant uncertainties, and may be even significantly negative. Also other environmental and social problems due to expanding production of biofuels have been raised by many recent studies (e.g. Doornbosch & Steenblik 2008, UNEP 2009, Fischer et al. 2009., de Santi et al. 2008, Soimakallio et al. 2009b). Considering above mentioned facts, the climate, other environmental and social aspects related to bioenergy are handled too cursory and not comprehensively in the report. The contribution of these issues in the report should be clearly extended.	This issue is already discussed in Section 2.5 but we will add more on that. considering that are literature presenting negative and positive views on this issue.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	The text needs language revision in most parts.	The next draft will be professionally reviewed for editing.
Popp (PIK)	2	-	-	-	-	-	-	-	There ar many (too many?) citations from Fischer. In the reference list there are more than one Fischer 2009 listed.	Accepted
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	There is currently a debate over whether open ponds or photo-bio-reactors will be most effective and economic..	No space to discuss all technologies.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	<input type="checkbox"/> There is too much information. Prioritize, condense and reorganize	We will do that.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	-	Usage of abbreviations should be harmonised, e.g. for example should always be abbreviated as e.g. and land use change as LUC, etc. throughout the chapter.	Editorial revision will be performed for next draft.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	-	☐ Verify data accuracy and quote results from other studies, including IPCC assessment reports	We will cross-check data more carefully with AR4.
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5	-	-	"Suggest that section 2.5 provide a quantitative assessment of the literature on the trade-offs between bioenergy and food. For example, analyses have been done that suggest an important relation. For example, see: von Braun, IFPRI 2008; Rosegrant (IFPRI), 2008, Biofuels and grain prices: impacts and policy responses, testimony for the US Senate Committee on Homeland Security and Governmental Affairs, Washington DC."	Reviewer reference will be added. In addition, given the importance of the subject, a special writeup will be made on this topic.
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5	-	-	"Suggest that section 5 provide a quantitative assessment of the literature the competition for land for bioenergy and its effects on land and agricultural product prices. Suggest literature assessed include Wise et al, Science 2009, Implications of Limiting CO2 Concentrations for Land Use and Energy"	Reviewer provided reference is cited however the discussion will be more complete in the revised writeup.
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	2.7	-	-	"With respect to today's cost structure, the measured cost range seems too optimistic in context of high efficient bioenergies with industrial standard: In Germany, today's cost for: a) Maize (being the most important feedstock for biogas production yet) is around 10 US-\$ per GJ; b) Raw biogas 20 to 25 US-\$ per GJ; c) Biogas feed-in into gas grid 30 to 35 US-\$ per GJ (own data and own conclusions)."	In reality we must quote all costs in 2005US\$, and they are quoted as such in the text. Second, we must use average from figures collected from the literature in a few years, since as all agricultural goods we can take a snapshot in one particular bad year. Nevertheless, we will check our values.
REUTOV (FEDERAL AGENCY FOR SCIENCE AND INNOVATION (RUSSIA))	2	-	-	-	-	2.1.1 .- 2.1.2	-	-	Sections 2.1.1 and 2.1.2. should be merged: the information about previous IPCC reports is justified only if it sets the background to the new effort undertaken by IPCC.	We will keep the division because Section 2.1.2 will be expanded to explain the relation between bioenergy, and agriculture and forestry development.
Ei-Hinnawi (National Research Centre)	2	-	-	-	-	2.1.2	-	-	delete	Unclear, no reasons given
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	2.1.2	-	-	For uniformity, mention section numbers for all sections referred to here.	The comment isn't clear.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.1.2	-	-	Should this come as part of the introduction and hence follow directly at P. 9, L. 50, and without a new sub-section heading? If the sub-heading is kept, then put it before current 2.1.1 (Previous IPCC Assessments)? It seems curious to read through 2.1.1 and then find an outline of the chapter	We believe that the way 2.1.1 and 2.1.2 are sequenced is correct. By describing previous IPCC results we present what already has been performed by IPFF. Then, section 2.1.2 follows, trying to explain what will be additional contribution from SRREN. Furthermore, Section 2.1.2 will be expanded to explain the relation between bioenergy, and agriculture and forestry development.
Gorissen (Flemish Institute for Technological Research)	2	-	-	-	-	2.2	-	-	Again, what is missing in this part about resource potential is the 'bigger picture' perspective: biomass can be considered as a provisioning ecosystem service (See Millennium Ecosystem Analysis report, TEEB report). However, biomass plays also crucial roles in providing other (regulating, supporting, cultural) ecosystem services. Trade-offs beyond soil and downstream water effects might also be possible but are not mentioned. Invasive alien species might for instance decrease natural species richness thereby decreasing nutrient cycling and thus decreasing resilience of the land to climatic variation. While all system dynamics related to biomass are not transparent yet, it might be worthwhile to mention at least this complexity so that the reader knows that biomass is part of a wider system. It would also help to emphasize the advantages of bioenergy systems in obtaining synergies (combined provision of food, energy and ecosystem services). See: Porter J., Costanza R., Sandhu H., Sigsgaard L. and Wratten S. The value of producing food, energy and ecosystem services within an agro-ecosystem. <i>Ambio</i> 2009, 38: 186-193.	Most of these issues are discussed later in the section, and particularly in the impacts section 2.5. However, the aspect of tradeoffs being the core element of decisions to be made will be emphasised in the revisions

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	2.2	-	-	At large, chapter 2.2 describes the experience also made by RWE Innogy Cogen concerning the following aspects: assessment of potential, assessment of profitability concerning mobilisation, limitations of potential due to limits in supply with forest residues (nutrient discharge), limitations of the intensification of agriculture and forestry, scarce irrigation. The authors describe many uncertainties concerning the assessment of potential and demand further investigation. The vague results have to be judged qualitatively and NOT quantitatively.	Yes, agree.
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	2.2	-	-	At large, chapter 2.2 describes the experience of our members concerning the following aspects: assessment of potential, assessment of profitability concerning mobilisation, limitations of potential due to limits in supply with forest residues (nutrient discharge), limitations of the intensification of agriculture and forestry, scarce irrigation. The authors describe many uncertainties concerning the assessment of potential and demand further investigation. The vague results have to be judged qualitatively and NOT quantitatively.	Yes, agree.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.2.2	-	-	"No comment in this section on potential for increased productivity through intensive forest management, with multiple benefits re: C (increased sequestration; increased roundwood for forest products (including bioenergy); increased availability of harvesting residue)? Paquette and Messier (2009) Front. Ecol. Environ. point out that plantations need not be biological deserts; they refer readers to Seymour & Hunter re: land zonation for different intensities of forest management called the triad approach (see also Messier et al. 2009. For. Chron. 85: 885-896 for practical application of triad approach); see Markewitz (2006) For. Ecol. Manage. 236:153-161 for review of silviculture and C issues; fertilization alone can create a 7- to 15-fold net increase on return of C invested in fertilization cf. new growth. The potential for inter-related benefits <input type="checkbox"/> including biomass feedstock and C sequestration <input type="checkbox"/> through intensive forest management should not be ignored. "	Have added a CA on forestry to discuss forestry dimensions more.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.2.2	-	-	An introductory paragraph that more explicitly defines the different biomass potentials (as used by Smeets & Fajj and others) would be useful, and perhaps avoid some repetition later. In fact, it is possible that this whole section could be organized by the different potentials, rather than current structure of section.	Noted for revisions.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.2.2	-	-	No comment in this section on salvage potential after natural disturbances in forests (e.g., Kurz et al.)? Are data on forest fires and insect/disease losses available at an international scale?	Not viewed as a major factor, there are many additional smaller factors
Verduzco (Chevron Corporation)	2	-	-	-	-	2.2.2	-	-	"The title of this section is ""contribution from residues, processing by flows and waste"". There is no mention of the contributions of urban waste/MSW/animal waste."	Noted for revisions.
McCormick (International Union for Conservation of Nature (IUCN))	2	-	-	-	-	2.2.2	-	-	the section does not mention the contribution of sewage sludge biomass. Anaerobic digestion of sewage sludge, raw wastewater with high content on organic matter can be a feedstock for biogas production. Moreover, manures from animal farming alone or in codigestion with organic waste is a potential source of bioenergy that can be used at the point of production .	Manure and organic wastes mentioned in several places, will be added to table, noted for revisions
Verduzco (Chevron Corporation)	2	-	-	-	-	2.2.2	-	-	The potential contribution from agroforestry should be mentioned in here too or/and added to table 2.2.2	Have added a CA on forestry to discuss forestry dimensions more.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.2.4	-	-	"We recommend including a section on policy constraints on biomass production. Some policies have placed significant constraints on biomass availability. For instance, in the United States the current EISA definition of renewable biomass excludes: Agricultural land cleared or cultivated after December 19, 2007, feedstocks from intercropping, all thinning materials and woody residues from federal forests, some woody feedstocks from private forests and a wide array of feedstocks from municipal solid waste. None of these feedstocks are qualified to obtain the biomass ""credits"" that can be used to comply with biofuel volume obligations. Other political constraints include GMO prohibitions and lands designated for conservation programs."	This section is on potentials, not volumes that can be realised; such constraints are looked at later in the chapter
Popp (PIK)	2	-	-	-	-	2.2.4	-	-	Climate Change impacts are not mentioned as a constraint to bioenergy potentials. That should be included as an extra subchapter or more highlighted in the text. (in 2.2.6.2 there is an extra chapter)	Noted for revisions, though the impacts seem to be smaller than most other factors, except in regions with drying

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.2.4	-	-	Constraints' is pejorative, especially when considering biophysical and environmental issues (line 21). 'Constraints' are usually things that can be removed, or that writers desire to be removed. What is the philosophy behind Section 2.2.4 (and especially 2.2.4.1) □ that the authors do not accept land capability and environmental issues as innate properties? Or do they see them as issues that can be over-ridden because of demand for bioenergy? It is essential that neutral terms be sought and used □ unless something truly is a constraint (and can therefore be fixed or removed under appropriate circumstances, such as lack of capital for investment in bioenergy, lack of operational technology, etc.)	Will look for use of neutral terms throughout for SOD, point in noted; but the word constraint is also used in mathematics to describe the conditions under which certain solutions are found, and that is not pejorative. Depends on context.
Popp (PIK)	2	-	-	-	-	2.2.4	-	-	Food prices should be included as a separate chapter for constraints on potentials	Will add a section on intensification dimensions on the food side for SOD, impacts discussed in 2.5
Wang (Argonne National Laboratory)	2	-	-	-	-	2.2.4	-	-	This section is too long. It is more on agricultural constraints, which is not directly relevant to bioenergy. It does not offer a balanced point of view on technology potential for overcoming the constraints.	Agricultural constraints are a major limitation of bioenergy production because they limit available land. Energy, food and biodiversity conservation are competing interests for land.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.2.4.2	-	-	"See earlier comments on potential to increase managed forest productivity through intensive silviculture re: Section 2.2.2. No comment in Section 2.2.4.2 on potential for increased productivity through intensive forest management, with multiple benefits re: C (increased sequestration; increased roundwood for forest products (including bioenergy); increased availability of harvesting residue)? Perhaps after line 36? Paquette and Messier (2009) Front. Ecol. Environ. point out that plantations need not be biological deserts; they refer readers to Seymour & Hunter re: land zonation for different intensities of forest management called the triad approach (see also Messier et al. 2009. For. Chron. 85: 885-896 for practical application of triad approach); see Markewitz (2006) For. Ecol. Manage. 236:153-161 for review of silviculture and C issues; fertilization alone can create a 7- to 15-fold net increase on return of C invested in fertilization cf. new growth. The potential for inter-related benefits □ including biomass feedstock and C sequestration □ through intensive forest management should not be ignored."	Have added a CA on forestry to discuss forestry dimensions more.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.2.5	-	-	"Not a lot of attention had been paid to the fact that most bioenergy resources are located far from population (energy consumption) centers. Moving all the biomass energy will be a significant challenge (physically and economically)."	This section is on potentials, not volumes that can be realised; such constraints are looked at later in the chapter
El-Hinnawi (National Research Centre)	2	-	-	-	-	2.2.5	-	-	delete	Unclear, no reasons given
El-Hinnawi (National Research Centre)	2	-	-	-	-	2.2.6	-	-	delete	We believe that the way 2.1.1 and 2.1.2 are sequenced is correct. By describing previous IPCC results we present what already has been performed by IPFF. Then, section 2.1.2 follows, trying to explain what will be additional contribution from SRREN. Furthermore, Section 2.1.2 will be expanded to explain the relation between bioenergy, and agriculture and forestry development.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.2.6	-	-	How much of this section is repetitive and was stated earlier?	Noted for revisions.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.2.6.1	-	-	This section can be combined with Section 2.2.4.3.	Depth of numbering will be reduced in SOD
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.2.6.2	-	-	"No comment on climate change impacts on forests in this sub-section? Increased stand-ending natural disturbance is one outcome for many extensive managed forests as ecotones, insects, diseases, and fire hazard ratings shift; this may greatly increase salvage opportunities."	Noted for revisions, though the impacts seem to be smaller than most other factors, except in regions with drying
Wang (Argonne National Laboratory)	2	-	-	-	-	2.2.6.3	-	-	This section can be combined with Section 2.2.4.	Depth of numbering will be reduced in SOD

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	-	-	-	-	2.2.6.3	-	-	We recommend to be consistent throughout the text-always use the same acronym for genetically modified organisms (either GM or GMO)	Noted for revisions, TSU will check final text for consistency
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.2.6.4	-	-	Far too trite an examination of this important topic. It warrants perhaps 1/3 of a page.	Noted for revisions.
Schmall (Petrobras S.A.)	2	-	-	-	-	2.2.6.4	-	-	That part would be explored better. It's probably one of the best choice to increase the food and energy production with biodiversity benefits and soil carbon conservation.	Noted for revisions.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.2.6.4	-	-	This section can be combined with Section 2.2.4.2.	Depth of numbering will be reduced in SOD
Wang (Argonne National Laboratory)	2	-	-	-	-	2.2.6.5	-	-	This section can be combined with Section 2.2.4.	Depth of numbering will be reduced in SOD
Popp (PIK)	2	-	-	-	-	2.2.6.6	-	-	No citations at all.	Noted for revisions.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.2.6.6	-	-	This section can be combined with Section 2.2.4.	Depth of numbering will be reduced in SOD
Londo (Energy research Centre of the Netherlands)	2	-	-	-	-	2.3	-	-	Overall, the technology section is still of very insufficient quality and needs considerable reworking. I think the IEA Bioenergy Review that the doc frequently refers to contains a comprehensive technology chapter that is a good basis for this.	This is mostly a comment, which will be taken on board for the rewrite. All subsections will be overhauled and made more focused and easier to read.
El-Hinnawi (National Research Centre)	2	-	-	-	-	2.3	-	-	should be completely re-written (suggestion : SRREN_Draft0_Review_El-Hinnawi_Essam_Material_02.doc)	See above responses.
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	2.3	-	-	There are no comments on co-firing using biomass (pellets, wood chips). No mention of promising methods for biochar production (torrefaction) like the Topell-method, for example, in which RWE Innogy holds a share. Conclusions have to be judged qualitatively rather than quantitatively. Many of the mentioned biofuels are not in the focus of RWE Innogy Cogen. Data concerning investment and generation costs partly not comprehensible.	Co-firing will be added, as will torrefaction (although in section 2.6)
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	2.3	-	-	There are no comments on co-firing using biomass (pellets, wood chips). No mention of promising methods for biochar production (torrefaction) like the Topell-method, for example. Conclusions have to be judged qualitatively rather than quantitatively. Data concerning investment and generation costs partly not comprehensible.	Indeed, cofiring will be highlighted as a commercial technology. Also, several methods for densification will be discussed.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.3	-	-	This section needs significant revisions and expansion. Instead of covering everything, it could concentrated on power and liquid fuel technologies.	Chapter 2 covers all forms of bioenergy, there is already quite an emphasis on liquid biofuels (but still gaps on power, which will be filled in the new version). The description of processes will be shortened and appear in summary tables, categorized according to main end-use.
Klein (PIK)	2	-	-	-	-	2.3	-	-	To me the chapter seems to be too little informative for scientists and too detailed for non-scientists. The key message is not clear.	Good point. See above responses for the overall rewrite. In terms of target audience: the Report is not a textbook and thus information that is too general will be skipped (non-conversant readers will be referred to actual textbook chapters we already cite). There is a key message on technology at the end of the chapter, but this subsection will be re-edited to align better with this message. The difficulty also comes from the imposed separation between present and future technologies.
Klein (PIK)	2	-	-	-	-	2.3.	-	-	Definition of first- and second generation biomass is missing	Definition will be inserted
Popp (PIK)	2	-	-	-	-	2.3.1	-	-	I think that 2.2 'Resource potentials' could be merged with 2.3.1 feedstock.	True, we will do accordingly.
Klein (PIK)	2	-	-	-	-	2.3.1.2	-	-	Competition for water is not mentioned	Negative effects of bioenergy/agriculture interactions will be added.
Smith (PNNL)	2	-	-	-	-	2.3.1.2	-	-	This duplicates some of the themes in section 2.2.1 Introduction (the integrated studies quoted in this earlier section specifically address these interactions)	Both subsections will be merged.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Verduzco (Chevron Corporation)	2	-	-	-	-	2.3.2	-	-	"Add information about chain of custody issues - Certification and standardization organizations are grappling with the challenge of documenting the sustainability of a feedstock or bioenergy product and ensuring that the sustainability certification is attached to the product throughout the value chain. IPIECA is working on a document that describes CoC options to support the expansion of sustainable biofuels. Document will be available to the public in March 2010. Also, it would be useful to include information about the energy intensity of these processes."	Additional information to be added, and suggested new IPIECA document suggested will be perused when available.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.3.2.1	-	-	We recommend to include a paragraph describing why preconditioning is important. Information can include percentage of biomass lost in transportation with and without preprocessing and feedstock losses related to weather conditions.	Additional information to be added
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	2.3.2.2	-	-	This section could be removed without causing any harm, insignificant information.	Comments 12 and 22 will need to be handles in tandem as they suggest different approaches to the same text.
Klein (PIK)	2	-	-	-	-	2.3.2.2	-	-	This section seems extremely selective and not informative to me: what about global biomass transport? It would be interesting to learn something about how much biomass is tranpoted using which technology	Comments 12 and 22 will need to be handles in tandem as they suggest different approaches to the same text.
Smith (PNNL)	2	-	-	-	-	2.3.3	-	-	Point should be made here or elsewhere that combustion and gasification technologies are potentially highly flexible with respect to fuel source. It is not clear if biological technologies can be as flexible.	will be included
Klein (PIK)	2	-	-	-	-	2.3.3.1	-	-	Biomass liquefaction: Fischer-Topsch should be mentioned	will be mentioned
Klein (PIK)	2	-	-	-	-	2.3.3.1	-	-	Grate combustion and fluidised bed combustion are different technologies	will be explained seperately
Klein (PIK)	2	-	-	-	-	2.3.3.3	-	-	""Green power"" is not a technical or scientific term"	will be replaced by renewable power
Klein (PIK)	2	-	-	-	-	2.3.3.3	-	-	""cogeneration"" (heat and power) should be mentioned"	Cogeneration is mentioned and the examples given in the appropriate industries. See final version for costs of cogeneration systems.
El-Hinnawi (National Research Centre)	2	-	-	-	-	2.4	-	-	"This section should be entitled "" Market development and constraints"". Subsections 2.4.1, 2.4.2,2.4.3,2.4.4 and 2.4.5 should be deleted. Sub-sections 2.4.6 and 2.4.7 should be combined. "	draft was incomplete and will be rewritten
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	2.4	-	-	Biogas is not in the focus of RWE Cogen, only anaerobic digestion. Cook stoves: efficiency improvement effective (e.g. Clean Development Mechanism (CDM) project of RWE Power in Zambia). Smale-scale bioenergy initiatives not in the focus of RWE Innogy Cogen. Concerning policies, only the USA and some Asian states are referred to, but NOT Europe (in spite of European leadership ambitions in this sector).	draft was incomplete and will be rewritten
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	2.4	-	-	Concerning policies, only the USA and some Asian states are referred to, but NOT Europe (in spite of European leadership ambitions in this sector).	draft was incomplete and will be rewritten
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4	-	-	In general, I found this section to be difficult to follow. I often had to look back at the section headings to make any sense of what was being written. Sometimes, even that wasn't enough... I would recommend a re-write of this section.	indeed, the draft was incomplete and will be re-written. Thanks
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	2.4	-	-	IPCC report restricts the promotion of biogas on large scale to China and India.	draft was incomplete and will be rewritten
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	2.4	-	-	IPCC report restricts the promotion of biogas on large scale to China and India.	draft was incomplete and will be rewritten
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4	-	-	Section 2.4 lacks a focus. It duplicates with other sections. It is incomplete for what is covered.	draft was incomplete and will be rewritten

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Smith (PNNL)	2	-	-	-	-	2.4.2	-	-	<p>"Biogas is never clearly defined (a reader could confuse this with gasification at this point). A box early in the report with basic definitions would be helpful. A phrase such as ""for example from a waste digester"" in the introductory portion of this section would be helpful too.</p> <p>The organization of this section is confusing. The section starts with ""barriers"", but then the text states more fundamental problems (for example, ""The capital cost, maintenance, and management support required have been higher than expected.""). These latter points (which are deal-killers regardless of what ""barriers"" are in place) should be discussed first. More discussion about these more fundamental issues is warranted instead of discussing the role of NGOs, which are just one of many ways this technology might be developed. (irrelevant in developing countries, for example, where these technologies could also have widespread application.)</p> <p>The structure of this section (types of technologies and grouping) is inconsistent with the structure of the previous section (which barely mentions cookstoves at all, for example, and has ""Anaerobic digestion"" as a heading whereas here the heading is ""biogas"").</p> <p>I would expect to see a section entitled ""Status of Market and Industry Development"" to have some summary of penetration, amount of fuel used in different technologies (or number of people using these), fraction of services supplied by biomass, or some such measures. If such figures are not available (although I have seen some such in the past) then this should be mentioned, as this would be a critical data gap.</p>	Thanks for the comments. The section was incomplete for the FOD. It will be redrafted and the organization improved. Indeed, penetration will be discussed and addressed in the scenarios.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.2	-	-	<p>"I recommend renaming this section. The current title ""biogas technology"" is not appropriate. This section only discusses barriers and that in turn the development of energy from biogas. A better title would be ""Biogas Technology Barriers"". One very important barrier that was overlooked was the role of local and state authorities to grant permits, provide financial support and approve laws and regulations that supported the implementation of this technology."</p>	draft was incomplete. The section will be redrafted. The authors were addressing small systems for developing countries to increase efficiency of traditional biomass.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.2	-	-	The content may be too narrow for the whole report.	draft was incomplete. Section will be redrafted and the scope is now relevant to the whole chapter.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.3	-	-	I suggest deleting this section. It seems to be out of place and there is already enough information about cookstoves throughout the document.	Policies for small scale systems are often different than those for large scale. They impact significantly developing countries. The draft, however, was incomplete and will be redrafted.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.3	-	-	The content may be too narrow for the whole report.	draft was incomplete. Section will be redrafted and the scope is now relevant to the whole chapter.
Jannuzzi (University of Campinas)	2	-	-	-	-	2.4.3	-	-	There is na extensive literature analysing the successes and failures of improved cooking stoves. I think work done by GTZ HERA network, HEDON should be mentioned. Cleaner biomass fuels can also be used for cooking - ethanol (liquid or gel). See Project GAIA, also Energy for Sustainable Development Volume 8, Issue 3, September 2004	Reviewer references will be added. Thanks
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.4	-	-	"The bullets in this section are very cryptic. It is not clear what the message is. For instance: ""Locale and productive energy and-uses develop virtuous circles""- What is a virtuous circle? Another example: ""Collaboration in the market change is key at startup""-Who should collaborate?"	draft was incomplete. Section will be redrafted.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.4.4	-	-	Are small-scale bioenergy initiatives also relevant in developed countries? See Richter et al. 2009. Science 323:1432-1433.	Good point. Thanks. Reviewer reference will be added
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.4	-	-	Small-scale bioenergy initiatives are not technology, they are a study. This subsection does not belong to this section.	Policies for small scale systems are often different than those for large scale. They impact significantly developing countries. The draft, however, was incomplete and will be redrafted.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Schmall (Petrobras S.A.)	2	-	-	-	-	2.4.5	-	-	"Add a section about Latin American Programs, containing at least Brazilian Ethanol (Pr□cool) and Biodiesel Program (PNPB) and Argentinas Biodiesel Program based on sunflower. Include this paragraph: ""As is done in Brazil, feedstock production for biofuels should be focused on facilitate the recovery of degraded areas by cultivating perennial crops (as it is done in the Northern Brazil) and using of wastelands (as those in the Brazilian Northeast) and degraded pastures in the Brazilian South-Central.""	will be included
Schmall (Petrobras S.A.)	2	-	-	-	-	2.4.5	-	-	"Add a section about Latin American Programs, containing at least Brazilian Ethanol (Pr□cool) and Biodiesel Program (PNPB) and Argentinas Biodiesel Program based on sunflower. Include this paragraph: ""Brazil has developed a set of tools called Climate Risk Zoning and Ecological-Economic Zoning that consider the adaptability based soil and climate characteristics, besides socio-environmental impacts, on each county and/or specific area for all economical crops. Thus it□s possible to encourage the production in other areas most profitable and protect some biomes and regions of interest (like areas of High Conservation Value) such as disallow sugarcane in the Amazon and the Pantanal in Brazil.""	Policies will be included. While these and other policies exist, the implementation is not as easy to achieve. See our previous comments on how oversight of implementation can be difficult even with available zoning and targets for forest protection in specific biomes in Brazil.
Schmall (Petrobras S.A.)	2	-	-	-	-	2.4.5	-	-	"Add a section about Latin American Programs, containing at least Brazilian Ethanol (Pr□cool) and Biodiesel Program (PNPB) and Argentinas Biodiesel Program based on sunflower. Include this paragraph: ""In 2002, Brazil created the National Plan for the Eradication of Slave Labor, the goal is to combine efforts to prevent, suppress and eradicate forced labor, illegal labor of children and adolescents, crimes against the organization of work and other violence to the health rights of workers, especially in rural areas. Companies and individuals fined by exploitation of slave labor suffer legal sanctions and are included in a register of public access.""	will be included
Schmall (Petrobras S.A.)	2	-	-	-	-	2.4.5	-	-	"Add a section about Latin American Programs, containing at least Brazilian Ethanol (Pr□cool) and Biodiesel Program (PNPB) and Argentinas Biodiesel Program based on sunflower. Include this paragraph: ""The Agricultural Zoning of oilseed crops conducted in the Brazilian northeast has provided the survey of indicated crops for degraded semiarid areas and adapted to the family agriculture following the PNPB criteria, which aims to ensure social, environmental and economic sustainability.""	will be included
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.4.5	-	-	"This section covers policy tools that are more specific to bioenergy compared with, e.g., those that would put a price on carbon. Suggest changing the title to replace 'relevant' to 'targeted'.	excellent suggestion. Thanks
Schmall (Petrobras S.A.)	2	-	-	-	-	2.4.5	-	-	Add a section about E.U. Bioenergies Programs and another about Latin American Programs, containing at least Brazilian Ethanol (Pr□cool) and Biodiesel Program (PNPB) and Argentinas Biodiesel Program based on sunflower.	will be included
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.5	-	-	If the intention of this section is to summarize international bioenergy policies, the section is far from complete. Many countries are not included here.	indeed, the draft was incomplete. Section will be redrafted.
Visconti (Inter-American Development Bank)	2	-	-	-	-	2.4.5	-	-	This section should be further developed. At the end recent policies, especially in EU and US setting up targets for biofuels use have moved forward the biofuels market. In addition to GBEP, it would be worth to include a sub para related to EU Directive 2009/28/CE as well as a reference to 2007 US Energy Bill and EPA GHG standards, as well as UK Renewable Transport Fuel Obligation (RTFO).	Indeed, the draft was incomplete. Section will be redrafted and policies of several countries will be added. Reviewer references will be added.
Pálvölgyi (Budapest University of Technology and Economics)	2	-	-	-	-	2.4.5	-	-	It would be useful to insert a short text on the existing EU's biofuel policy	will be included. A peer reviewer provided a very up-to-date summary for our use.
QUILES (Ministerio de Agricultura, Ganadería y Pesca)	2	-	-	-	-	2.4.5.1	-	-	Adds Breaf Resume GBEP Reports 2008, 2009 and Overview on GBEP Futures activities. See: SRREN_Draft1_Review_Ernesto_Quiles_Material_01.doc	Thanks for providing a good summary for our use.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.5.1	-	-	GBEP is not a policy, it is a program of coordination. This subsection does not belong to this section.	text will be corrected. Thank you
McCormick (International Union for Conservation of Nature (IUCN))	2	-	-	-	-	2.4.5.2	-	-	"I suggest for this part a review of ""regional policies"" as the subtitle suggest "	section will be redrafted and multiple country policies will be highlighted

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.4.5.2	-	-	"Suggest also including the low carbon fuel standard of California as an example: see: CARB, 'Staff Report Initial Statement of Reasons Proposed Regulation to Implement the Low Carbon Fuel Standard', Date of release March 5, 2009, Board Hearing April 23, 2009. http://www.arb.ca.gov/fuels/lcfs/030409lcfs_isor_vol1.pdf "	section will be redrafted and multiple country policies will be highlighted. Final CARB references provided will be cited (2010) instead of references during the period of development of the Standard as provided by the peer reviewer.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.5.2	-	-	"This section is very incomplete. I suggest deleting this section or making the following changes: 1-Change the introductory paragraph to something like: ""in the USA there are a number of mechanisms being tested to accelerate the widespread adoption of bioenergy. Following below are three examples..." 2 -page 48, lines 7-10: This paragraph has nothing to do with tax credits. Delete this paragraph or add additional information. 3- Out information about California's Low Carbon Fuel Standard. 4- Renewable Fuels Standard: Provide a reference."	This section was not complete. It will be redrafted and multiple country policies will be highlighted including EISA and other US policies.
Fukui (Toyota)	2	-	-	-	-	2.4.5.2	-	-	If US policies are discussed here, it needs to raise Calif. LCFS discussion.	LCFS will be added as will the EPA RFS2.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.5.2	-	-	The discussion of US biofuel policies need updates. The 2007 Energy Independence and Security Act needs to be summarized here.	This section was not complete. It will be redrafted and multiple country policies will be highlighted including EISA.
de Campos Barbosa (Petrobras)	2	-	-	-	-	2.4.5.2	-	-	The examples presented in this section are not representative. It is important to present other examples from EU, South America and Asia.	section will be redrafted and multiple country policies will be highlighted
Visconti (Inter-American Development Bank)	2	-	-	-	-	2.4.5.2	-	-	it does not make sense to have a sub para related exclusively to US. Better to delete it.	The reviewer is correct. The section was incomplete and should not have been added to the package. It will be redrafted and multiple country policies highlighted.
LEITE DRACHMANN (PETROBRAS)	2	-	26	47	2	2.4.5.2/3	-	-	"The sections describe existing policies for the US and ""selected countries"" of Asia, however there are no sections for Latin and Central America, as well as Europe and Africa. Those sections should be deleted or others considering other regions included."	The section will be redrafted and multiple country policies highlighted.
QUILES (Ministerio de Agricultura, Ganadería y Pesca)	2	-	-	-	-	2.4.5.4	-	-	Adds Breaf Resume EU policies 2009. See: SRREN_Draft1_Review_Ernesto_Quiles_Material_02.doc	Thanks for a summary of the EU initiatives and the various comments and literature.
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.4.6	-	-	"Barriers and opportunities are an important topic but this section does not reference a significant body of literature and therefore should either assess literature or be removed. Coverage I would expect in this section would include challenges for business models (or lack thereof) for rapid expansion of bioenergy. There is, for example, real experience with failed biodiesel investments (excess capacity) that indicates that at current market conditions, business models face profitability challenges □ even for existing capacity. Section 2.4.7.2 gives a good coverage of barriers even though it is intended to only deal with international trade. Suggest that 2.4.6 be largely replaced with 2.4.7.2."	good suggestion. Section will be redrafted and incorporate comments.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	2.4.6	-	-	Remove subsections, add bold titles as in section 2.4.2	section will be redrafted and 4th heading deleted.
Visconti (Inter-American Development Bank)	2	-	-	-	-	2.4.6.1	-	-	Delete this section or explain better what is the meaning of it. It is cryptic.	Section will be redrafted. Comment noted.
Pályólgyi (Budapest University of Technology and Economics)	2	-	-	-	-	2.4.6.1.	-	-	The indirect transport-related CO2 emissions should be assessed in context of domestic production vs. import/export.	Section will be redrafted. Comment noted.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.6.2	-	-	"Add information about chain of custody issues - Certification and standardization organizations are grappling with the challenge of documenting the sustainability of a feedstock or bioenergy product and ensuring that the sustainability certification is attached to the product throughout the value chain. IPIECA is working on a document that describes CoC options to support the expansion of sustainable biofuels. Document will be available to the public in March 2010. Also, it would be useful to include information about the energy intensity of these processes."	If materials are publicly available in the peer reviewed literature by the time that the SOD has to be issued, it will be included. Thanks for the information.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.6.2	-	-	"Add information about chain of custody issues - Certification and standardization organizations are grappling with the challenge of documenting the sustainability of a feedstock or bioenergy product and ensuring that the sustainability certification is attached to the product throughout the value chain. IPIECA is working on a document that describes CoC options to support the expansion of sustainable biofuels. Document will be available to the public in March 2010."	If materials are publicly available in the peer reviewed literature by the time that the SOD has to be issued, it will be included. Thanks for the information.
de Campos Barbosa (Petrobras)	2	-	-	-	-	2.4.6.2	-	-	Certification should be well balanced when compared with fossil fuels performance. Also, baseline should be well established.	Comment not clear.
Mostad (Statoil)	2	-	-	-	-	2.4.6.2	-	-	This chapter could possibly be merged with chapter 2.5.1.1	Section will be redrafted as will the chapter.
Visconti (Inter-American Development Bank)	2	-	-	-	-	2.4.6.2.	-	-	"As the sustainability certification standards and schemes for biofuels are becoming a key issue for ensuring access to markets (ex. EU market, as well as US once the EPA standards will be cleared), it would be worth to expand further in this section some challenges related to the certification of biofuels. Good sources in this regard are: Devereaux, Charan and Henry Lee. 2009. Biofuels and Certification: A Workshop at the Harvard Kennedy School of Government. CID Working Paper No.187 Joint Center for International Development and Belfer Center for Science and International Affairs Working Paper, Cambridge, MA: Harvard University available at http://www.cid.harvard.edu/cidwp/pdf/187.pdf ; and Ricardo Hausmann, Rodrigo Wagner. "Certification Strategies, Industrial Development and a Global Market for Biofuels." Discussion Paper 2009-15, Environment and Natural Resources Program, Belfer Center for Science and International Affairs and Sustainability Science Program, Center for International Development, Harvard University, October 2009. available at http://belfercenter.ksg.harvard.edu/files/Hausmann_Wagner_Biofuels_Certification_2009_web.pdf "	Thanks for the suggestions and references. They will be added if not already included in peer reviewed references.
Pálvölgyi (Budapest University of Technology and Economics)	2	-	-	-	-	2.4.6.2.	-	-	The sustainability of utilization of bioenergy should be assessed in a deeper and more comprehensive manner. On the basis of the existing literature the general criteria and the core set of indicators should be included, at least.	Section will be rewritten and the issue of classification and certification presented more clearly.
Visconti (Inter-American Development Bank)	2	-	-	-	-	2.4.6.3.	-	-	Relevant both for this section and the next one (2.4.6.4. (lowering of trade barriers) is the issue related to the classification of bioenergy according to the World Custom Organization, Harmonizing Commodity Description and Coding System (HS). While ethanol is classified in HS chapter 22 as agricultural good, biodiesel falls under HS 38 and is classified as industrial good. The different classification has impacts on tariffs bandings.levant source in this regard is: UNCTAD (2008) Making Certification Work for Sustainable Development: the Case for Biofuels, UNCTAD/DITC/TED/2008/1 available at http://www.unctad.org/en/docs/ditcted20081_en.pdf	Thanks for the suggestion and explanation. It will be included in the discussion.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.6.4	-	-	This section can be combined with Section 2.4.6.1.	section will be rewritten
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.6.4	-	-	This section is confusing. I suggest deleting it or listing all trade barriers and their potential solutions on a table. Provide references.	Good suggestion. Thanks
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.6.5	-	-	This section can be combined with Section 2.4.6.3.	section will be rewritten and duplication will be removed
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.6.5	-	-	This section needs to be re-written. The wording is confusing. The second paragraph has good information, but it needs to be proof-read.	section will be rewritten and duplication will be removed
Wang (Argonne National Laboratory)	2	-	-	-	-	2.4.7	-	-	This section may be combined with Section 2.4.6.	section will be rewritten and duplication will be removed
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	2.4.7.1	-	-	Instead of numbering sub-paragraphs, use bold text without numbering, as in section 2.4.7.2	section will be rewritten
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.7.1	-	-	This section needs to be re-written. The wording is choppy and confusing. Also, I would suggest adding information about potential use of cap and trade and CDM projects as a mechanism to increase sustainable bioenergy production.	section will be rewritten and CDM examples will be given.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Smith (PNNL)	2	-	-	-	-	2.4.7.2	-	-	"Some of the ""barriers"" material in the biogas section seems duplicative of material here. General material should be here, issues specific to biogas could remain in that section"	section will be rewritten and duplication will be removed
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.7.2	-	-	"This section needs to be re-written. The wording is confusing. For instance, page 52, line 13: ""Competition with fossil fuel on a direct production cost basis."" This sentence is incomplete. Also, I suggest adding information about technology transfer issues. For instance, some of the research on high yield crops and energy efficient bioconversion processes are funded by industry and protected by intellectual property rights. There is a need for a mechanism that facilitates technology flows."	The section will be rewritten as it was an incomplete draft. Thanks for bringing up several issues that need to be included.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.4.7.2	-	-	I did not notice any direct attention paid to the fact that much of the global potential for biomass production is located far from population centers (where energy is consumed). This suggests a significant barrier, in terms of transferring biomass from areas of low, or no infrastructure, to modern cities. Also, biomass sourcing and scalability of production technology are important barriers not addressed here.	Maps showing biomass distribution will be shown. The reviewer is correct relative to large scale systems. However, developing countries can and use smaller systems. The report is global and needs to address both ends of the spectrum.
Schmall (Petrobras S.A.)	2	-	-	-	-	2.5	-	-	Add text about the positive effect of lowering price when the production protein and carbohydrates is associated with production of oil (e.g. soybean).	We will expand discussion on co-products.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.5	-	-	Section 2.5 is very detailed with a lot of information. The section needs better organization, may need to provide some definitive answers to some of the critical issues raised in the section.	Thanks. Section will be restructured and issues will be brought up in a more clear manner.
El-Hinnawi (National Research Centre)	2	-	-	-	-	2.5	-	-	The environmental and social impacts are technology-specific. This section should be integrated with the section on technology. Under each technology, its environmental and social impacts should be discussed.	IPCC selected the format to be the same for every technology. Although other renewables produce one (electricity) or two (+heat) products, biomass produces a myriad of products. It would have been much clearer if the reviewer suggestion could have been used.
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5	-	-	The structure of the section is unclear. Climate aspects are handled in sections 2.5.1.1.2 and 2.5.2. I suggest that the structure follows the separation between climate issues, other environmental issues and social issues.	The structure of the section will be changed to reflect the suggestions of the reviewer.
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5	-	-	There are too many difficult and very long sentences in the text. Please simplify the writing.	The final draft of the SRREN will be processed by a professional copy-editor. All editorial comments such as this will be resolved at that time.
de Campos Barbosa (Petrobras)	2	-	-	-	-	2.5	-	-	There is an important contradiction in this section. In page 57, line 18 is stated that to quantify LUC further methodology development is needed and in the same section is presented the table 2.5.3 with standard values for LUC examples. Suggestion: remove the table.	Table 2.5.3 is one scenario. There are many other scenarios and the revised report will also include the most developed through LUC and indirect LUC that U.S. EPA has developed. They are all scenarios or models. The section will also show another methodology directly following and tracing land use as it is happening. This methodology does not have the macroeconomic aspects that the other has. See EPA, 2010, Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis, EPA-420-R-10-006, February 2010, http://www.epa.gov/otaq/renewablefuels/420r10006.pdf for the most recent example of the analysis.
Shi (Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry)	2	-	-	-	-	2.5	-	-	this section should be shorten a little	Accepted
Schmall (Petrobras S.A.)	2	-	-	-	-	2.5.1.1	-	-	Mention Brazilian Ethanol and Biodiesel Programs.	Accepted
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.5.1.1	-	-	Should this section contain some comment on C&I for bioenergy feedstock production, such as PEFC, FSC, SFI, etc. for forestry? Are there agricultural equivalents that should be mentioned? For these, sustainable bioenergy feedstock production is a sub-set of overall management practices.	Certification practices will be highlighted for forestry, agriculture, and biofuels

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
McCormick (International Union for Conservation of Nature (IUCN))	2	-	-	-	-	2.5.1 .1	-	-	sustainability principles for biofuel production have also to be adapted to the geographical area in a region	Indeed, the reviewer has an extremely good point that needs to be more emphasized.
Visconti (Inter-American Development Bank)	2	-	-	-	-	2.5.1 .1.	-	-	A reference should be made also on possible trade off between environmental and social goals in the biofuels standards and impact assessment tools. What is good for environment (ex. Reduction of burning practices of sugarcane) cannot be good for social (increase of unemployment). Corrective measures should be developed.	to be addressed in the revised version
Visconti (Inter-American Development Bank)	2	-	-	-	-	2.5.1 .1.	-	-	It would be interesting to refer to the concept of meta-standards that international roundtables can play with reference to mandatory standards (EU and/or EPA). What is emerging is a big confusion due to the proliferation of standards and certification schemes for biofuels. Source: Schlegel S, Kaphengst T Cavallieri S (2008), Options to develop a Global-Standard Setting Scheme for products derived from Natural Resources (NRS).	Reviewer's point is very well taken and the issue of certification and standards will be addressed more completely. Reviewer references to be consulted.
Smith (PNNL)	2	-	-	-	-	2.5.1 .1.1	-	-	The first portion of this section discusses details of LCA more than environmental effects in general. LCAs are not the only tool that can be used, so some reorganization would make this section clearer.	to be rewritten. LCA is one tool that links with macroeconomic models. EPA, 2010, Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis, EPA-420-R-10-006, February 2010, http://www.epa.gov/otaq/renewablefuels/420r10006.pdf shows the most recent example of linking LCA with macroeconomic and other impacts.
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5.1 .1.1	-	-	The title of the section is to some extent misleading as the major part of the section handles GHG issues. Please see the comment #2.	new structure of the section will address this comment
Verduzco (Chevron Corporation)	2	-	-	-	-	2.5.1 .1.3	-	-	"Socio-economic impacts: Grower's ownership of the value chain such as partial ownership of the bioconversion facility by farmers can make operations more sustainable throughout the value chain by ensuring feedstock supply at a fair price. Rural and Social Development- Sustainable communities cannot exist in an environment of "economic monoculture" but, rather, depend on some degree of economic diversity. Biomass crop production could become the predominant activity within a specific, local area. Additional information can be found at: Lee R Lynd, Willem H van Zyl, John E McBride, Mark Laser, Consolidated bioprocessing of cellulosic biomass: an update, Current Opinion in Biotechnology, Volume 16, Issue 5, Tissue and cell engineering/Biochemical engineering, October 2005, Pages 577-583, ISSN 0958-1669, DOI: 10.1016/j.copbio.2005.08.009. (http://www.sciencedirect.com/science/article/B6VRV-4H2G8Y3-2/2/3f0c8ecaf263123fae0bf5c07a522d0f)"	the ref will be checked and the importance of diversified landscapes highlighted in the document. More recent references from the groups cited will be added.
de Campos Barbosa (Petrobras)	2	-	-	-	-	2.5.1 .1.3	-	-	"Suggestion: change the title of the section for "socio-economic aspects" since there is another section with the same title "socio-economic impacts" (2.5.4)"	Accepted
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	2.5.1 .1.3	-	-	Can be removed from here, as Section 2.5.4 deals with this.	Accepted
de Campos Barbosa (Petrobras)	2	-	-	-	-	2.5.2	-	-	"Suggestion: change the title of the section to "Environmental impacts related to climate changes effects", since this section is related to just the climate change impacts."	Accepted
Koponen (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5.2	-	-	This section describes the impacts of bioenergy on climate change. However, the title of the section is 'Environmental impacts'. To clarify this section, the title could be 'Climate change impacts' (section 2.5.3 describes other environmental impacts).	to be done
Jannuzzi (University of Campinas)	2	-	-	-	-	2.5.2	-	-	Very interesting and complex figure. I think it deserves a longer explanation in the text.	maybe to be removed. See what the captions of the figure should have been per reviewer's comments. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2	-	-	"Suggest the assessment of GHG emissions associated with biomass use be much more extensive. Unlike other renewable resources like solar and wind, the GHG benefits resulting from biomass depends strongly on the end use. There is significant evidence that use of food crops to produce biofuels results in limited or negative GHG benefits. Many of the key references are included but few are used to help analyze GHG impacts."	Reviewer has excellent comments. See File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx for the discussion of the progress of the current North American and Brazil GHG emissions in the context of producing ethanol and also heat and power for the process. Additional biofuels are possible.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Koponen (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5.2.1	-	-	"Section 2.5.2.1 provides a narrow approach to the climate change impacts of bioenergy. It does not give a general and clear review of the climate change impacts, but rather concentrates on comparison of certain technologies (Figures 2.5.1 and 2.5.2). It would be more interesting to have a general description, e.g. a better explanation of the three points (i-iii) mentioned on the rows 11-16, p.136. Also many recent critical studies on bioenergy (especially on biofuels) are ignored (e.g. JRC 2008, Bringezu et al. 2009, Soimakallio et al. 2009) Sources: JRC 2008. Biofuels in the European Context: Facts and Uncertainties. European Commission Joint Research Centre. Bringezu, S., Schmitz, H., O'Brien, M., Kauppi, L., Howarth, R.W., McNeely, J. Towards sustainable production and use of resources: Assessing biofuels. United Nations Environment Programme (UNEP) & International Panel for Sustainable Resource Management. 2009. ISBN: 978-92-807-3052-4 Soimakallio, S.; Antikainen, R.; Thun, R. Assessing the sustainability of liquid biofuels from evolving technologies □ A Finnish approach. VTT Research notes 2482. Espoo 2009."	discussion and reviewer references not already cited to be added
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.1	-	-	"This section describes how power generation and heating in general provide larger and less costly GHG reductions compared to biofuels. These uses become even more attractive when the finite quantity of biomass is considered. Suggest these comparisons be included."	Good suggestions; they will be included in the revision.
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5.2.1	-	-	"I don't see it reasonable to separately present GHG impacts for bioenergy in which land-use changes are either excluded or included. Excluding land-use changes is not a real option as all bioenergy production affects land use or land-use changes directly or indirectly. The other GHG emissions resulting from the bioenergy chain can be presented separately from land-use changes but GHG impacts should not be presented two times with the inclusion and exclusion of land-use changes."	we think they can be separated; they are factors added on to the lifecycle analyses. See the very detailed of the analyses performed by EPA which was just published. You start with the LCA with direct impacts and then build on the additional impacts through modeling but the basis is the separate system that is well defined. All others have large uncertainties. EPA, 2010, Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis, EPA-420-R-10-006, February 2010, http://www.epa.gov/otaq/renewablefuels/420r10006.pdf . In this model significant progress was made including the analyses of uncertainties in the various elements of the combination of the direct LCA. Of course, all these models need to be validated.
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.2	-	-	"Anticipated crop yield improvements will not mitigate land-use impacts of biofuels at large production scale. Crop yield improvements will occur in the absence of large-scale biofuel development. Suggest that care be taken when assessing causes for crop yield improvements. In scenario analyses, yield improvements are commonly taken as an exogenous factor, not as a result of bioenergy; e.g. see Wise et al. 2009 Science."	to be added + references in right place
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.2	-	-	"Evaluation of other environmental impacts is also important including: water, food supply, soil quality and erosion, biodiversity and air and water pollution. Suggest assessing the literature on these impact including: SCOPE International Biofuels Project, 'Biofuels: Environmental Consequences and Interactions with Changing Land Use'. 2009, http://cip.cornell.edu/biofuels/ ; UK Renewable Fuels Agency, 'The Gallagher Review of the indirect effects of biofuels production, July 2008' http://www.dft.gov.uk/rfa/db/_documents/Report_of_the_Gallagher_review.pdf ."	agreed, text will be refined. There is, though, still new results that show that these effects may be smaller than those published in July 2008. See, for instance, U.S. EPA, 2010, Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis, EPA-420-R-10-006, February 2010,

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.2	-	-	<p>"Many studies of indirect impacts of biofuels have been conducted recently. Some of these studies are included in the list of references but very few are discussed at all in the report.</p> <p>For example:</p> <p>Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Proposed Rule, 40 CFR 80, Federal Register May 26, 2009, pp 24904 □ 25143;</p> <p>USEPA, 'Draft Regulatory Impact Analysis Changes to Renewable Fuel Standards Program, May 2009, http://www.epa.gov/OMSWWW/renewablefuels/420d09001.pdf EPA Lifecycle GHG Emissions Meeting, September 30th 2008.;</p> <p>CARB, 'Staff Report Initial Statement of Reasons Proposed Regulation to Implement the Low Carbon Fuel Standard', Date of release March 5, 2009, Board Hearing April 23, 2009. http://www.arb.ca.gov/fuels/lcfs/030409lcfs_isor_vol1.pdf.</p> <p>Suggest that these references be included and all references be assessed.</p> <p>"</p>	<p>will be included -- this information was not included before because the legislation was not finalized. All examples provided by the reviewer were of legislation in process. We waited for the final publication as the numbers were in flux. In February 2010, U.S. EPA's was published and CARB's was completed (ILUC still under discussion with working group).EPA, 2010, Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis, EPA-420-R-10-006, February 2010, http://www.epa.gov/otaq/renewablefuels/420r10006.pdf; CARB, 2010. January 10, 2010, FINAL REGULATION ORDER, Subchapter 10. Climate Change, Article 4. Regulations to Achieve Greenhouse Gas Emission Reductions, Subarticle 7. Low Carbon Fuel Standard, http://www.arb.ca.gov/regact/2009/lcfs09/lcfs09.htm.</p>
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.2	-	-	<p>"Many studies of indirect impacts of biofuels have been conducted recently. Some of these studies are included in the list of references but very few are discussed at all in the report.</p> <p>For example:</p> <p>SCOPE International Biofuels Project, 'Biofuels: Environmental Consequences and Interactions with Changing Land Use'. 2009, http://cip.cornell.edu/biofuels/;</p> <p>UK Renewable Fuels Agency, The Gallagher Review of the indirect effects of biofuels production, July 2008 http://www.dft.gov.uk/rfa/_db/_documents/Report_of_the_Gallagher_review.pdf;</p> <p>Suggest that these references be included and all references be assessed.</p> <p>"</p>	<p>The Gallagher review is cited; newer references with additional information on ILUC will be added: U.S. EPA, 2010, Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis, EPA-420-R-10-006, February 2010, with significantly improved data sets and multiple models.</p>
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.2	-	-	<p>"Suggest this section assess land use issues related to tropical forests. Tropical forests are a large store of biospheric carbon and are very vulnerable to conversion to agricultural crops due to potential for high yields and low barriers to conversion: see Gibbs et al., 'Carbon Payback Times for Crop-Based Biofuel Expansion in the Tropics: the Effects of Changing Yield and Technology', Environmental Research Letters 3, 1 (2008).</p> <p>"</p>	<p>C payback figure will be included. Reference is cited.</p>
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.2	-	-	<p>"The following references should be assessed in this section: Pineiro et al., 'Set-asides can be Better Climate Investment than Corn Ethanol', Ecological Applications, 19, 277 (2009); Melillo, et. al., Indirect Emissions from Biofuels: How Important?, Science 4 December 2009: Vol. 326. no. 5958, pp. 1397 □ 1399; DeLucia et al., 'Changes in Soil Organic Carbon Under Biofuel Crops', GCB Bioenergy, 1, 75 (2009)</p> <p>"</p>	<p>Reviewer references not already cited will be added. Melillo is cited. We cite the reference "Changes in soil organic carbon under biofuel crops GCB Bioenergy Volume 1, Issue 1, Date: February 2009, Pages: 75-96" by the publication set of author names: KRISTINA J. ANDERSON-TEIXEIRA, SARAH C. DAVIS, MICHAEL D. MASTERS, EVAN H. DELUCIA.</p>

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.2	-	-	"The section does point out that conversion of natural land to cropland generally releases large amounts of CO ₂ , however, the section does not analyze the scale of the biofuel and fossil fuel industries. Current biofuel pathways use much more land per unit energy compared to fossil fuels. Any significant displacement of fossil fuels will require significant land areas leading to indirect effects. Suggest assessing the literature on integrated land use assessment for future bioenergy, e.g., Wise et al. 2009 Science; and Mellilo et al. 2009 Science."	References are already cited. Comments will be incorporated.
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.5.2.2	-	-	"This section points out the potential GHG emissions associated with land-use change but does not go into sufficient depth and assess the potential for large negative GHG impact of biofuel-related land-use change. Suggest that this topic be assessed in greater detail."	Specific ILUC box will be added explaining this topic
Kirkinen (Sitra, the Finnish Innovation Fund)	2	-	-	-	-	2.5.2.2	-	-	Next article could be referred here, eg. something similar to Table 3 would provide a simple presentation of the greenhouse impacts: Cherubini, F., Bird, N.B., Cowie, A., Jungmeier, G. Schlamadinger, B., Woess-Gallasch, S. 2009. Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations. Resources, Conservation and Recycling 53: 434-447.	Reviewer reference will be added
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5.2.2	-	-	The timing issues of GHG emissions, sinks and avoided GHG emissions should be handled in more detailed level as they are highly relevant for land-use changes and for the use of long-rotation biomass sources as energy. Kendall et al. (2009) concluded that the actual climate effects of pulse emissions (for example from land use changes) are significantly underestimated (70-80%) if annualized for many years (10-50a) when aiming to stabilize atmospheric GHG concentrations in relatively low level. Consequently, the use of static LCA method excluding the time difference is not suitable for such purposes without appropriate correction factors proposed by Kendall et al. 2009. Another option is to use dynamic indicators proposed e.g. by Kirkinen et al. 2008.	Material to be added. Reviewer references to be added.
Smith (PNNL)	2	-	-	-	-	2.5.2.3	-	-	The organization of sections 2.5.2.3 and 2.5.3 needs to be cleaned up. There is material relating to emissions in both sections, and the section titles don't relate well to the contents of the sections.	Will be reworked. Thanks
McCormick (International Union for Conservation of Nature (IUCN))	2	-	-	16	18	2.5.3	-	-	All advanced biofuel feedstocks have the potential to become invasive. This is not a reason to pursue them per se, but they must be accompanied by adequate risk assessment which takes into account the species as well as local ecosystem and management practices. Prevention is better than the cure. See IUCN Biofuels and Invasive guidelines (2009).	good comment and reference will be included http://cmsdata.iucn.org/downloads/iucn_guidelines_on_biofuels_and_invasive_species_.pdf
de Campos Barbosa (Petrobras)	2	-	-	-	-	2.5.3.1	-	-	reference missing	Bird, Cherubini and Jungmeier, 2010. IEA Bioenergy is still in press. Full reference will be added for the next draft.
Pálvölgyi (Budapest University of Technology and Economics)	2	-	-	-	-	2.5.3.1	-	-	It should be mentioned that, in case of burning biofuels from energy crop plantations cultivated by using of fertilizers, pesticides etc. may rise emissions of PAHs, dioxine etc.	noted point will be stressed

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Schmall (Petrobras S.A.)	2	-	-	-	-	2.5.3.2	-	-	Coment: There is a relationship between CO2 capture and Evapotranspiration (ET). In general when Evapotranspiration is high CO2 capture is also high.	We agree in principle with the reviewer statement but there still is a need to better understand and quantify biogeochemical cycles and their role in climate change and this need has lead to a proliferation of long-term eddy-flux measurements of carbon dioxide and the development of land-surface models to calculate coupled fluxes of energy, water, and carbon. See Lee, Y., and Park, S. <i>Evaluation of a modified soil-plant-atmosphere model for CO2 flux and latent heat flux in open canopies in Agricultural and Forest Meteorology Volume 143, Issues 3-4, 10 April 2007, Pages 230-241</i> There is also a suggestion that this relationship is still "work in progress" and that their mSPA model is a generic model of use to various ecosystems, so that it can be used as a tool to understand the physical process of carbon and water exchange on hourly basis and to estimate long-term carbon and water exchange in other ecosystems, given the availability of relevant parameters.
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	2.5.3.4	-	-	I already mention Phyto Decontamination in section 2.2.6.5 but maybe it would fit better here if it comes to impacts on soil resources	Accepted
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	2.5.3.5.2	-	-	Section can be removed and contents combined with Section 2.5.3.5	Section will be structured to eliminate redundancies.
Gorissen (Flemish Institute for Technological Research)	2	-	-	-	-	2.5.4.2	-	-	How about sustainability of current GDP? Do bioenergy systems provide opportunities to evolve to socio-economic sustainability 'Beyond GDP'?	Section will be rewritten and more discussion on sustainability included
Verduzco (Chevron Corporation)	2	-	-	-	-	2.5.4.2	-	-	I suggest combining this section with 2.5.1.1.3 to reduce the length of the chapter. Some of the information is redundant.	Section will be structured to eliminate redundancies.
McCormick (International Union for Conservation of Nature (IUCN))	2	-	-	-	-	2.5.4.3	-	-	"include in subtitle:"" □impacts of small and large scale systems from□.""	Small scale systems impacts are discussed in 2.5.4.3 and large systems impact in 2.5.4.3.5, which will be numbered as 2.5.4.4
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	2.5.4.3	-	-	Socio economic impacts of small-scale systems (suggestion to delete from heat and electricity) since the following sections that are under the same titel are as well about liquid biofuels (2.5.4.3.7.1 for example)	Accepted
Jannuzzi (University of Campinas)	2	-	-	-	-	2.5.4.3	-	-	Why not mention the use of liquid fuels for cooking? This is a better alternative compared to improved solid biomass cookstoves in terms of indoor air pollution. See Project GAIA http://www.projectgaia.com/ , WHO.	We will add this use.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	2.5.4.3.4	-	-	"Remove, add contents to Section 2.5.4.3.3 and change the title to ""Biogas plants and liquid biofuels"""	But the way to solve the issue is to change title in 2.5.4.3 as Socio economic impacts of small scale systems.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	2.5.4.3.5	-	-	Renummer Section to 2.5.4.4. Remove section titles 2.5.4.3.6 and 2.5.4.3.7, combine the text under the titles and remove subsection numbering, replace with bold titles as in Section 2.4.7.2	Original numeration was printed wrongly. We will correct it.
Jannuzzi (University of Campinas)	2	-	-	-	-	2.5.4.3.5	-	-	this is an important section since the whole chapter advocates for increased and larger bionenergy systems. It is missing. Large Bioenergy systems transform in great manner land uses, commerce and industry, not only locally but regionally, the chapter needs to acknowledge these transformations and give a fair account to policy makers.	We will add a sentence on that
Jannuzzi (University of Campinas)	2	-	-	-	-	2.5.4.3.7	-	-	Could this section be included into 2.5.4.3.5? This section should be improved substantially and should include the experience and results from the Brazilian ethnaol program (the positive and negative socio-economic impacts). Large biofuels programs are being started in Mozambique, Tanzania, Angola and other African countries and there has been specific concerns about employment, impacts on rural settlements and land ownership.	Good comments that will be added. Section 2.4 was not completed in the FOD.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	-	-	-	-	2.5.5	-	-	There wasn't much discussion in preceding sections on the most likely form of biomass production for fulfilling bioenergy needs. The most intensive users of energy are located in areas without enough biomass potential to satisfy all needs. The scale of the energy problem is such that much more discussion should be placed on the potential impacts of massive bioenergy plantation systems. Clean burning cooking stoves and biogas from excrement is interesting on a local level, but I think it is irresponsible to avoid writing about the potential environmental/social implications of large-scale biomass production for export. I imagine such scenarios will use enormous amounts of land in poor countries. Land rights and income from the export of biomass will be concentrated in a few connected, wealthy individuals/corporations, and the poor rural population will not gain significantly from the operations (beyond low-paying menial and seasonal employment).	The concerns from the reviewer are very valid. These are raised very well in the ongoing efforts of the Roundtable on Sustainable Biofuels. Certification schemes are under development that help the whole biomass to biofuels supply chain address what is needed for a biofuel to be exported. Entities that certify that those biofuels are sustainable would be key for the such sustainable development. EU and several countries are indeed looking into such schemes. In the UK the Renewable Transport Fuels Obligation already has the Renewable Fuels Agency, the independent sustainable fuel regulator, responsible for assessing the carbon and sustainability reporting systems for the various biofuels (locally produced or imported). See www.renewablefuelsagency.org
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	2.6	-	-	From our point of view, cost development of solid biomass is assessed too optimistically.	addressed in 1031
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	2.6	-	-	From our point of view, cost development of solid biomass is assessed too optimistically.	addressed in 1031
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	2.6	-	-	IPCC report only sees high potential of big scale biogas in the digestion of municipal solid waste in order to produce electricity (compare chapter 2.2): IPCC report lacks the evaluation of biogas feed-in into gas grid.	OK, technology will be assessed and included.
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	2.6	-	-	IPCC report only sees high potential of big scale biogas in the digestion of municipal solid waste in order to produce electricity (compare chapter 2.2): IPCC report lacks the evaluation of biogas feed-in into gas grid.	Will be added; also topic of Chapter 8 integration with the grid.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.6	-	-	Section 2.6 overall is good section. This section may be moved before the current Section 2.5.	We appreciate the positive feedback – unfortunately we cannot change the outline (although we agree with the suggestion).
EI-Hinnawi (National Research Centre)	2	-	-	-	-	2.6	-	-	Technology improvement: This should be integrated in section 2.3. Under each technology, the potential for its improvement should be given.	will be presented in the new 2.3 table on developing technologies
Verduzco (Chevron Corporation)	2	-	-	-	-	2.6.1	-	-	""Traditional breeding techniques (selection for volume and stem straightness); CO2 fertilization "" - this seems like an unlikely solution for forests (we're trying to reduce CO2 emissions!)"	This should not be interpreted as 'selection for higher response to CO2 is an avenue for improving yields' (hence the semi-column). Of course we do not mean that it is a good idea to increase atmospheric CO2 levels, but it is happening and we have to include it in our analysis.
Verduzco (Chevron Corporation)	2	-	-	-	-	2.6.1	-	-	Show current yields as baseline.	The yields are reported in Table 2.3.1., as specified in caption, and space is limited.
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.6.1	-	-	"Anticipated crop yield improvements will not mitigate land-use impacts of biofuels at large production scale. Crop yield improvements will occur in the absence of large-scale biofuel development. Suggest that care be taken when assessing causes for crop yield improvements. In scenario analyses, yield improvements are commonly taken as an exogenous factor, not as a result of bioenergy; e.g. see Wise et al. 2009 Science."	We will cite the Wise et al paper in support of this decoupling. However, the current text does not convey this message. It starts from yield improvements of staple food crops to the potential improvements of energy crops, for which specific breeding programmes exist (in parallel with those on food crops, but obviously pursuing other goals and traits).
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.6.1	-	-	Yield gains □ wasn't this dealt with, to some extent, earlier in Section 2.2.4.2 (page 21)? Which section is repetitive or redundant?	Agree. The 2 subsections (in 2.2 and 2.6) will be merged, and placed in 2.6

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.6.1.2	-	-	"Aquatic biomass □ but report says at outset that algae won□t be considered because technologies are too far from being commercial; reconcile inclusion of 2.6.1.2 with opening statements."	Algae technologies are not commercial at present (hence their positioning in 2.6). The statement at 'outset of report' does not mean that algae will not be covered, but that data is scarce and that the timeframe of their deployment is uncertain. We agree that the reference to 2030 may have to be removed to avoid giving the reader the impression that they are ruled out of the report. With more clear separation between commercial and near commercial technologies in section 2.3 the technologies in section 2.6 will be developing and there algae have a place.
Jannuzzi (University of Campinas)	2	-	-	-	-	2.6.2	-	-	I suggest that this section (logistics and supply chain) is better coordinated with chapter 8 (Integration).	Will need to peruse relevant sections in Chapter 8. Inter-chapter coordination.
Helynen (VTT)	2	-	-	-	-	2.6.3.1	-	-	One sentence connected to MSW would complement the text.	will include
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.6.3.4	-	-	"Storage of fermentation CO2 was analyzed by Kheshgi and Prince 2005 Energy where the size of CO2 streams was considered. Infrastructure costs become large for fermentation CO2 streams which are typically an order of magnitude or more smaller than power plant CCS CO2 streams. Even if capture costs may be relatively small in such cases, the system CCS costs can be high. Suggest this be noted, and that this section build from the IPCC SRCCS where scale issues were assessed and where caution was used in quoting costs for non-commercial technologies."	We will include the reference and Bio CCS analysis will be expanded.
Klein (PIK)	2	-	-	-	-	2.6.3.4	-	-	BIGCC could be mentioned as it appears in Table 2.6.2	More on BIGCC will be added since the analysis on BioCCS will be expanded.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	2.6.3.5	-	-	The nutrient and carbon flow issues inherently interlinked with bioenergy should be covered here.	OK, we will rewrite accordingly
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	2.7	-	-	"With respect to today□s cost structure, the measured cost range seems too optimistic in context of high efficient bioenergies with industrial standard: In Germany, today□s cost for: a) Maize (being the most important feedstock for biogas production yet) is around 10 US-\$ per GJ; b) Raw biogas 20 to 25 US-\$ per GJ; c) Biogas feed-in into gas grid 30 to 35 US-\$ per GJ (own data and own conclusions)."	Thanks for highlighting that the cost structure appears low. There are data from various references from different years (not current). While some attempt has been made to reconcile the data cost quality the outcome may still be lower than today's costs the reviewer mentions. We will try to get more up to date data.
Wang (Argonne National Laboratory)	2	-	-	-	-	2.7	-	-	The authors acknowledge that cost estimation is complex. The question is whether this section is needed. Maybe need to cross-check with other chapters to see how to synchronize with other chapters of the report. Nothing discussed in this section is definitive. This section may need to be moved to right after Section 2.4.	The section summarizes data for use in the remainder Chapters of the Report. It is a required component of the IPCC. It is tentative because the costs for non-commercial technologies is not well known. There are many evolving technologies simultaneously.
Mostad (Statoil)	2	-	-	-	-	2.8.4	-	-	First paragraph: reference is missing	Sources will be added
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	2.8.6	-	-	"Suggest this section be deleted. 'Policy recommendations' are policy prescriptive which is contrary to the not-policy-prescriptive IPCC role. Suggest any summary messages be included in the Executive Summary as it is good practice not to have two competing Summary or Conclusions sections."	IPCC guidance for this report is to have the key messages at the end of the Chapter. We understand the concern of the policy prescriptive recommendations. The issue with Biomass, more than any other renewable, is that policy frameworks for agriculture, forestry, biomass are needed to enable growth of the energy portion without harming food, feed, fiber, in fact, ensuring that all of the biomass uses can be done on a sustainable basis.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	2.8.6	-	-	"To what extent can some of the bullets explicitly include forestry and agriculture, to remind readers that both sectors are sources of feedstock? Bullet 2: ENGO protests in one Canadian province (NS) have so far prevented use of harvesting residue from public land for electricity generation; also recent protests in UK over wood chips for electricity generation; therefore consider 'food supplies, forest management practices, water resources' Bullet 4: include forest management"	Indeed, the reviewer has an extremely good point. On the forestry side, we have added a Contributing Author to ensure that the this aspect of the whole biomass feedstock is not overlooked.
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.8.6	-	-	Overall the key messages provided in this section are very optimistic considering many factors causing uncertainty in sustainable bioenergy potentials and GHG benefits of bioenergy identified in recent studies (e.g. sources given in comment #1). From my point of view those critical perspectives should not be excluded.	Indeed, the reviewer has an extremely good point that the chapter will strive to present positive and negative points. The structure of the chapter has been changed to more clearly state both types.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	21 to 23	-	-	I'm embarrassed because The global quality of this part is weak. It's reviewing took a lot more time than expected. I won't be in position to finalize it and to me is not feasible. I would recommend a first reviewing by A Faaij to eliminate the main uncertainties and mistakes.	The difficulty with writing this particular chapter is that the deadlines were so tight that the chapter did not have the benefit to be read by any of the authors, including the CLAs before it was sent to the IPCC. This is work of volunteers from all countries. Writing by committee is really very difficult as assignments are done and materials collected but we did not have time to ourselves do the internal peer review. This has now been solved for the next version by providing more tight deadlines and leaving time for the review by authors of the overall paper.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	221	-	-	could be shorter very general	Structure of the chapter will be changed
philippe (international institute for water and environmental engineering)	2	-	-	-	-	2241	-	-	too general there are a lot of work on this subject could have been summarised!	Structure of the chapter will be changed
philippe (international institute for water and environmental engineering)	2	-	-	-	-	226	-	-	why uncertainties and requirements are not included in the previous chapters	Uncertainties will be included throughout
philippe (international institute for water and environmental engineering)	2	-	-	-	-	2261	-	-	no thing new from 2243	Both subsections will be merged.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	2312	-	-	very theoretical and general	Subsection will be merged with 2.2.6.5, and expanded to include more examples and specific data.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	24	-	-	I don't understand the structure of this section which start with a review of technology : biogas and cookstove and then shit to more general consideration. In addition sub section are not homogeneous.	Section will be redone with recent data and current policy examples. Table will be deleted
philippe (international institute for water and environmental engineering)	2	-	-	-	-	245	-	-	GBEP presented as a relevant policy???	Section will be redone with recent data and current policy examples. GBEP will be properly explained as a coordination body.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	2452	-	-	"The world bank edited an intersing review of biofuel state of the art =in DC this report is not mention it would have been advisable to extract and actualised part of it ""Kojima, M., and Johnson, T., 2005. Potential for Biofuels for Transport in Developing Countries, ESMAP report 312/05""."	since 2005 the situation has changed as well. Section will be redone with recent data and current policy examples. Reviewer reference will be cited if the information is not already embedded in the other references
philippe (international institute for water and environmental engineering)	2	-	-	-	-	252	-	-	why not merging the section 25111 with this one ?	Will be done accordingly.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
philippe (international institute for water and environmental engineering)	2	-	-	-	-	27	-	-	the whole chapter need a complete rewriting it is even surprising that A Faaij who I understood is the coordinator had accepted this part there a lot of confusing between technologies, particularly the chp 233 the reviewing become almost impossible as this part need to be completely revised please as Andre to read this part	Regarding section 2.3.3: will be rewritten based on new Tables to present the technologies in a more concise and accurated manner.
KOBAYASHI (Toyota R&D Labs. Inc.)	2	-	-	-	-	-	2.1.1	-	Fig2.1.1 This figure contains only the pathways for current biomass usage, but it is much easier to understand the situation by including whole possible pathways in the same figure, and distinguish the current state and future possible pathways.	We will try to improve Fig 2.1.1. It would be useful to receive a reference from the reviewer.
Fulton (Deutsche Bank)	2	-	-	-	-	-	2.1.1	-	This could be expanded to show feedstocks flowing in and more detail on heating and cooling options including co-fired power and more detail on end uses. More of a value chain analysis	We will try to improve Fig 2.1.1. It would be useful to receive a reference from the reviewer.
Rosinski (Electric Power Research Institute)	2	-	-	-	-	-	2.1.1	-	This figure doesn't add much, and as this chapter is over length, it can be deleted. It also misses direct combustion of biomass.	Many other reviewers ask for improvement in the figure.
Winkler (Energy Research Centre, University of Cape Town)	2	-	-	-	-	-	2.1.1	-	This is Block Flow Diagram (BFD) does not follow the accepted the rules of BFDs: that materials should feed into processes and NOT processes feed into other processes. The figure can also be modified to incorporate info in table 2.3.4 [page 33, line 11] thereby assisting in shortening the chapter as requested in page 1, line 7	We will try to improve the Figure but it can't be too complex.
El-Hinnawi (National Research Centre)	2	-	-	-	-	-	2.1.2	-	"change "" woodfuel"" into "" Fuelwood"" . Update figure from FAOSTAT 2010"	Accepted
Rosinski (Electric Power Research Institute)	2	-	31	-	41	-	2.1.2	-	Caption is too long. Define LA	LA is Latin America.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	2.2.2	-	Figure does not include forestry, therefore make it clear in caption that this is for agriculture only. In line 2: 'assessment of agricultural bioenergy'	The plan is to add a figure on forestry and perennial plant potentials in SOD
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	2.2.3	-	"Low potential in Western Europe, because of ""food first paradigm"". (Also: Section 2.2.1; Page 13; Lines 12 to 16 and own conclusions). High potential in Latin America and sub-Saharan Africa as well as Eastern Europe and Russia (Also: Section 2.2.2.2: Page 18: lines 9 to 13). OK."	Yes, ok
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	2.2.3	-	"Low potential in Western Europe, because of ""food first paradigm"". (Also: Section 2.2.1; Page 13; Lines 12 to 16 and own conclusions). High potential in Latin America and sub-Saharan Africa as well as Eastern Europe and Russia (Also: Section 2.2.2.2: Page 18: lines 9 to 13). OK."	Yes, ok. Both high and low potentials will be shown
de Campos Barbosa (Petrobras)	2	-	-	-	-	-	2.2.3	-	Which crops were considered? It is important to have more information about Fischer (2009) in order to understand the map presented. Since there is a need to reduce the text the suggestion is remove the figure.	The intention is to expand the figure to woody and perennial crops; crops used a mentioned in the text, for details the reader needs to go to the original source - all major types were studied, details are not a lot of added value here
Pálvölgyi (Budapest University of Technology and Economics)	2	-	-	-	-	-	2.2.3	-	The map (modelled global land suitability for first generation biofuel feedstocks) reflects a politically sensitive information without the detailed description of limitations, assumptions etc. I suggest either to include more info on the underlying model or delete the Figure.	This is a well established approach and reputed source, shows general patterns. Notef for revisions but is illustrative here, not a detailed discussion of a particular study, point made is more general - reader is referred to source for additional information
KOBAYASHI (Toyota R&D Labs. Inc.)	2	-	-	-	-	-	2.2.4	-	Need explanation for 4bars.	Noted for revisions.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	2.2.4	-	Provide more information about the four scenarios depicted in the figure	Noted for revisions.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	2.2.4	-	The columns are not explained, what do they describe, including different colours?	Noted for revisions.
Mostad (Statoil)	2	-	-	-	-	2.2.4	2.2.4	-	What are the four different clomns/scenarios in this figure? This should be explained in the associated text	Noted for revisions.
de Campos Barbosa (Petrobras)	2	-	-	-	-	-	2.2.5	-	Please improve readability of graph	Figures will be reviewed and revised by TSU later.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	2.2.5	-	Provide definitions of A1, A2, B1, B2	Noted for revisions.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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Winkler (Energy Research Centre, University of Cape Town)	2	-	-	-	-	-	2.2.5	-	This Figure can be moved to Appendix, hence assist in shortening the chapter, since it only serves as an example [page 19, line 22], and does not form part of the message of that section	This figure is one of the most important ones because it provides a basis for the cost and deployment synthesis across technologies in the later chapters of the report
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	-	2.4.2	-	Indonesia: it needs to be B5 palm oil instead of E5	Section will be redone with recent data and current policy examples. Table will be deleted
Verduzco (Chevron Corporation)	2	-	-	-	-	-	2.5.1	-	Does this just focus on power plant emissions or is it a life-cycle assessment? Are the reductions on a per kWh basis? It's not clear why the co-firing data is scattered and not in a box plot.	Figure inserted in the draft was not the last version. It addresses the direct LCA GHG reduction relative to coal and the reductions are proportional to the amount of biomass in the coal for cofiring. Note file with corrected figure and caption added to the peer review file. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	2.5.1	-	Figure 2.5.1 doubtful. In electricity generation, higher efficiency is reached by power plants using co-firing of biomass than by exclusive biomass-fired power plants.	Figure inserted in the draft was not the last version. It addresses the direct LCA GHG reduction relative to coal and the reductions are proportional to the amount of biomass in the coal for cofiring. Note file with corrected figure and caption added to the peer review file. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	2.5.1	-	Figure 2.5.1 doubtful. In electricity generation, higher efficiency is reached by power plants using co-firing of biomass than by exclusive biomass-fired power plants.	Figure inserted in the draft was not the last version. It addresses the direct LCA GHG reduction relative to coal and the reductions are proportional to the amount of biomass in the coal for cofiring. Note file with corrected figure and caption added to the peer review file. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5.2	2.5.1	.1	Relative GHG emission reduction indicator presented in the Figure is not an appropriate way to measure the effectiveness of biomass utilization in climate change mitigation. As biomass and land area are limited resources, the effectiveness of various biomass utilization options should be measured in relation to biomass or land required to produce the particular GHG emission reduction. Table 2.5.2 introduces these kinds of indicators but they are not used in the example given in this figure. At least this should be mentioned in the text describing the results of the figure.	numbers using other measures will be added (definition also to be included). There was a tremendous restriction in the amount of lines that the information could have been presented. Then the authors became ambitious and tried to portray both the North American corn ethanol industry progress as well as the Brazilian industry today and tomorrow. A better description is attached. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx. The figure also addressed the fact that unless all numbers use the same boundaries the results can vary significantly. More importantly, the figure tried to demonstrate that the North American dry mill industry (about 80%) is now energy efficient and is continuously improving its process efficiency and adopting heat and power options. Most European articles cite only coal ethanol plants but those are not the majority of the ethanol produced in the United States (mostly natural gas fired).

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5.2.1	2.5.1	-	The assumptions behind the results presented in the Figure are not explained. It is unclear what is the spatial and the dynamic system boundary considered, what kind of allocation methods are used, what is the raw material for presented bioenergy options, and where the biofuels are assumed to be produced. Considering the uncertainties and sensitivities related to LCA methodologies, parameters and models, the presented example is too case-specific. The uncertainty range given in the figure is fully misleading as the background of the results is not explained and as the methodological uncertainty, for example, is probably not included in the results. Instead, I would like to see in the IPCC report a summary of the different GHG values presented for various bioenergy options in various recent studies. For example for liquid biofuels following sources present a large variety in GHG emissions: Ademe 2006, UNEP 2009, California Air Resources Board 2009, Department for Transport 2008, Edwards et al. 2008, Fargione et al. 2008, Farrel et al. 2006, Fehrenbach et al. 2008, Fritsche & Wiegmann 2008, Gnansounou et al. 2009, Huo et al. 2009, Kalogo et al. 2007, Majer et al. 2009, Nikander 2008, OECD 2008, Ou et al. 2009, Sheehan et al. 1998, Soimakallio et al. 2009a, Spataro et al. 2009, Stichnothe & Azapagic 2009, Thamsiriroj & Murphy 2009, Wicke et al. 2008, Yan & Crookes 2009.	Good suggestion. See file Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx for the explanations of the figure.
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	-	2.5.2	-	"Figure shows potential GHG and energy return of corn stover. There are significant issues with soil carbon maintenance if corn stover is used as a feedstock: see Wilhelm W.W. et. al., Corn stover to sustain soil organic carbon further constrains biomass supply, Agronomy Journal, Vol. 99, Nov/Dec 2007. Suggest soil issues be assessed."	Reviewer is correct about the issue. Figure assumes that the removal amounts are within the boundaries of the reference cited which is also cited in the new caption. Please see the file attached that explains the figure now in more detail. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Verduzco (Chevron Corporation)	2	-	-	-	-	-	2.5.2	-	Confusing plot. Define net energy ratio. Would be better to simplify so readers can digest key messages. May have one plot on historical improvements and one on potential for lignocellulosic ethanol development	See file attached with the new caption and explanation. Figure may or not be used in the report but the reviewer has a chance to see the figure and its explanation with less limitation in the number of words. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Koponen (VTT Technical Research Centre of Finland)	2	-	-	-	-	-	2.5.2	-	Figure 2.5.2 is not easy to interpret. The GHG reduction percents of various fuels depend on many assumptions made for calculations. However, the assumptions and the system boundaries used to get the results illustrated in figure 2.5.2 are not well enough presented. It is not possible to compare different GHG reduction results without this information. If this figure is used, the assumptions behind the different results should be better explained.	Reviewer is correct and the caption was rewritten to clearly indicate that the figures are comparable and the specific cases in which it is not comparable to show how the methodology used to treat the coproducts produces significantly different results for systems of multiple products (corn more than sugarcane). See file attached to explain the figure more. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	2.5.2	-	Figure 2.5.2 not comprehensible.	See file attached with the new caption and explanation. Figure may or not be used in the report but the reviewer has a chance to see the figure and its explanation with less limitation in the number of words
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	2.5.2	-	Figure 2.5.2 not comprehensible.	See file attached with the new caption and explanation. Figure may or not be used in the report but the reviewer has a chance to see the figure and its explanation with less limitation in the number of words. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	2.5.2.1	2.5.2	-	"My previous comment (#8) is relevant also for this figure. In addition, it should be clearly explained what is mentioned by the term ""net energy""."	definition will be added to glossary. File: Peer_Review_Responses_Figures 2.5.1 and 2.5.2March8.docx -- see the comments on the figure. The figure 2.5.1 was mislabeled in one box. Figure not used in final report but numbers.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	-	-	-	-	-	2.5.3	-	Suggestion: Use tons of CO2 equivalent instead of Pg of CO2 eq. Explain scenarios- TAR and WEO	Figure deleted
de Campos Barbosa (Petrobras)	2	-	-	-	-	-	2.5.3	-	Which biofuels were considered? It is important to have more information about the scenarios discussed in Fischer (2009) to understand the figure presented. Since there is a need to reduce the text the suggestion is remove the figure.	Figure deleted
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	-	2.5.3.	-	Since LUC and iLUC are such important issues it would be desirable to give a more detailed explanation here	New subsection on iLUC will be added
Verduzco (Chevron Corporation)	2	-	-	-	-	-	2.6.1	-	It would be helpful to denote whether yields listed are per bone dry tonne, or per kg oil, etc...	Accepted
Wang (Argonne National Laboratory)	2	-	-	-	-	-	2.6.1.1	-	This is a very informative section.	duplicate of above
Wang (Argonne National Laboratory)	2	-	-	-	-	-	2.6.1.2	-	This is a very informative section.	Thanks
Verduzco (Chevron Corporation)	2	-	-	-	-	-	2.6.2	-	This could be deleted.	The purpose of this Figure is to provide a regional breakdown of yield improvement possibilities (which is otherwise not present in text). Figure will be redrawn.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	2.7.1	-	Is this Figure also from Hoogwijk et al. 2009? If so, add reference.	Yes, the reference is the same of the Table Hoogwijk et al. 2009 and will be cited on the figure
Sims (Massey University)	2	-	-	-	-	-	2.7.1	-	Source?	Yes, the reference is the same of the Table Hoogwijk et al. 2009 and will be cited on the figure
Verduzco (Chevron Corporation)	2	-	-	-	-	-	2.7.5	-	Transport to where?	Estimated Production Costs of the fuels (gate)
Fulton (Deutsche Bank)	2	-	-	-	-	-	2.8.4	-	Could give more detail on the end uses, if combined with expanded 2.1.1 gives a fairly complete picture	Figure will undergo some improvements including in end use.
Koponen (VTT Technical Research Centre of Finland)	2	-	-	-	-	-	2.8.6	-	The key messages give a very positive review of bioenergy. It would be important to point out also the more critical aspects, like the uncertainty of climate change impacts of bioenergy, the dynamic issues related to the use of biomass, the direct and indirect land use change issues etc.	Yes, the reviewer is correct that we will strive to present both positive and negative points of view. On the uncertainties of climate change impacts on bioenergy there will be more materials included.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	211	-	Not clear. What is the second step of thermochemical conversion?	Unclear comment.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	221	-	I do not see the interest of this figure Industrial roundwood is not related to biomass but rather paper the position of Malaysia what exactly is considered	Figure will be removed
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	222	-	the figure do not clarify the relationship but rather the reverse	Reviewer comment unclear: no explanation given.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	225	-	Scenario are not define the figure is therefore useless	The scenarios are explained in the caption, which will be improved (SRES scenarios will be explained); the source is given for additional reference. This figure is important because it contains informations required for the synthesis across technologies later in the report.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	263	-	very weak section	Is it section 2.6.3? It will undergo major rewriting (addressed in the 2.6 comments above)
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	2.2.1	-	"In box ""Forest residues"" there is text belonging to box ""Unexploited forest growth"". Delete this text."	Done.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.2.1	"Part of the description of forest residues is repeated under unexploited forest growth. It is difficult to understand what falls under these categories. On the term ""forest growth"" usually refers to the total plant production for the forest, although it is often used in the context of tree crop growth only. Under ""forest growth"" the part about ""not required for the production of conventional forest products"" is confusing since tree residuals would be required for the production of conventional products, just not used."	Redundant text noted, meaning of terms is explained in main text and at the bottom of the table.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.2.1	"The same statements on 'unexploited forest growth' is repeated under both biomass categories 'Forest residues' and 'Unexploited forest growth'; looks like a simple cut-and-paste problem."	Was corrected.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.2.1	""unexploited forest growth' is pejorative; use neutral terminology"	Noted for revisions.
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	-	2.2.1	Biomass potential is assessed to be <50 up to 1,000 EJ per year subject to scenario assumptions. OK. (Last column)	Ok.
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	-	2.2.1	Biomass potential is assessed to be <50 up to 1,000 EJ per year subject to scenario assumptions. OK. (Last column)	Ok.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.2.1	Energy crops from agroforestry/intercropping and biomass from fire management activities don't seem to fall under any of the categories listed in the table.	The spatial patterns of production is implicit, and fire effects not a major enough element to not be included in forest growth potential
Popp (PIK)	2	-	-	-	-	-	-	2.2.1	For forest and agricultural residues a minimum potential of 30 and 15 EJ/yr is given. Does this fit to the study of Smeets and Faaji? In the text for forest residues it is stated that Zero potential.. Unclear to me	Will made clear that the table is for additional potential over current, and what sources it is based on - Smeets and Faaji are part of it, but not the main source, which is IEA
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.2.1	No comment on potential for roundwood as energy source (under right market conditions)? Increased forest productivity through intensive management where it is not currently practiced?	Table is summary, not a major factor in most scenarios in comparison to dedicated plantations, else under surplus forest growth
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.2.1	No comment on salvage from naturally disturbed forests, even in parentheses to state that it is not considered?	Only major aspects listed, more extensive discussion in text, part of surplus forest growth
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.2.1	No references for table. As a general rule throughout the chapter (and entire publication), all tables and figures should be able to 'stand alone' without reference to the text, and hence require full and clear captions that include all relevant references.	Will be added.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.2.1	Perhaps add a footnote that algae not included because technology is unlikely to mature to commercial production in near future (as stated earlier in text)?	Noted for possible inclusion in revisions
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.2.1	Residues from agriculture' and 'Forest residues' should have same style of wording for 'Biomass category'	Noted for revisions.
KOBAYASHI (Toyota R&D Labs. Inc.)	2	-	-	-	-	-	-	2.2.1	The range of estimate is so large, and the reader may be puzzled to understand the meaning.	The range is present in the literature and due to differences in assumptions and criteria; it is the purpose of the IPCC to report and discuss current knowledge. The text gives reason for these uncertainties and unknowns, not all of which are due to lack of knowledge.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.2.1.	Dung belongs to agricultural residues. See also the comment above! In Agricultural residues also: biomass from set-aside land, vegetated buffer zones, biomass from eutrophied waters (regional significance, potential unknown).	Table is summary, only major factors listed in broad categories; manure noted for addition in revisions
de Haan (Ernst Basler + Partner AG)	2	-	-	-	-	-	-	2.2.2	"caption: units in table are not ""ha"" , but rather ""million ha"""	yes
Mostad (Statoil)	2	-	-	-	-	2.2.2	-	2.2.2	The numbers shown in the table must be in Mha?	Yes.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.2.2.	Units - not ha, but mill. ha? -Should be explained as a footnote or in the text, on what kind of assumptions about food/meat demand, population growth, agricultural and forestry systems the figures are based.	yes

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Jara Tirapegui (Endesa Eco S.A.)	2	-	-	-	-	-	-	2.3.1	"Decimal numbers should be with ""points"" (i.e. ""1.2"" instead ""1,2"")"	OK, will be corrected
Wang (Argonne National Laboratory)	2	-	-	-	-	-	-	2.3.1	"Glycerin should be mentioned for biodiesel; 7 GJ/Ha for US wheat straw seems too low."	Glycerin is a by-product of biodiesel production, this table is about feedstock production. The straw yields incorporate a sustainability constraint on the removal rate of straw: will be corrected.
Klein (PIK)	2	-	-	-	-	-	-	2.3.1	"If there is no ""+"" does this mean there is now data available for this crop type or this crop does not need any management (for example ""S. rotation willow"")"	Key to crosses will be provided, and explained.
Klein (PIK)	2	-	-	-	-	-	-	2.3.1	"Reference 2 JRC 2007 for ""Shor rotation eucalyptus"": The report does not say anything about eucalyptus"	It was a mistake. Actual reference was Scolforo, 2008. Will be corrected
Klein (PIK)	2	-	-	-	-	-	-	2.3.1	"Reference 3 Bessou is only ""submitted"", is this permitted? As it is not published yet I could not check the data"	Bessou et al is now in press in a peer-reviewe journal (Agron. Sustain. Dev.)
Ei-Hinnawi (National Research Centre)	2	-	-	-	-	-	-	2.3.1	"what is "" fraction"" in Yield (GJ/ha/fraction) ? Costs (USD/GJ) which year ? Table incomplete. What about rice straw, cotton stalks, animal dung, etc). Suggest deletion of Table."	Fraction' in column heading is unclear, will be removed and explained in caption. US dollars are for 2005. Animal dung is in Table 2.6.2. Rice straw and cotton stalks may be added but the Table is already big (and does not claim to be comprehensive, merely illustrative of regional differences and feedstock ranges). This is not a ground for suppressing it (Table is judged 'quite relevant' by another reviewer).
Winkler (Energy Research Centre, University of Cape Town)	2	-	-	-	-	-	-	2.3.1	Clarify the meaning of +, ++ and +++ in the Management column of this table, as was done for table 2.3.5 [page 37, line 2]	Key to crosses will be provided, and explained.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.3.1	Meaning of symbols (+) missing	Addressed above
Helynen (VTT)	2	-	-	-	-	-	-	2.3.1	Micanthus should be Miscanthus	OK, will be corrected
Klein (PIK)	2	-	-	-	-	-	-	2.3.1	Which year do the dollars refer to?	2005 – will be added.
Jara Tirapegui (Endesa Eco S.A.)	2	-	-	-	-	-	-	2.3.2	"Decimal numbers should be with ""points"" (i.e. ""1.2"" instead ""1,2"")"	OK, will be corrected
Ei-Hinnawi (National Research Centre)	2	-	-	-	-	-	-	2.3.2	"What is odt in Energy content GJ/odt; cost in which year, reference for charcoal, black liquor. Table misleading and should be deleted."	oven dry tonne. Table will be modified to clarify what is intended.
de Campos Barbosa (Petrobras)	2	-	-	-	-	-	-	2.3.2	Cost for sugar cane bagasse seems not correct. Reference 2 has no information about bagasse energy cost. Cost column would better be revised and harmonized. By-products cost calculation should be explained. Cost, not price -if it's the case - should be calculated.	Tricky point. The reviewer is right to point at the difference between costs and prices for by-products. For some of them, only prices were available, whereas for others the number is the estimated private cost. A footnote will be added to explain what the costs cover, and what the prices represent. The overall problem is that very few data exist on costs. A reference for the cost of bagasse will be added.
Klein (PIK)	2	-	-	-	-	-	-	2.3.2	References for charcoal and black liquor are missing	References will be added.
Wang (Argonne National Laboratory)	2	-	-	-	-	-	-	2.3.2	What is odt?	odt = oven dry tonne; will be added.
Kahiluoto (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.3.2.	The unit for energy content (/odt) should be explained.	odt = oven dry tonne; will be added.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.3	"This table is not very helpful and it's missing some elements of the value chain such as planting, biomass storage and transportation of fuel. If the table is meant to be ""generic"", why are wood and charcoal included in the elements of the value chain?"	being reworked
Fukui (Toyota)	2	-	-	-	-	-	-	2.3.4	"It should be added ""liquid biofuel in vehicles"" into the ""end use"" cell of ""thermochemical conversion"". Thermochemical pass which is produced by gasification and purolysis is aimed to tranportation use. "	will include

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Winkler (Energy Research Centre, University of Cape Town)	2	-	-	-	-	-	-	2.3.4	"Most of the information in this table duplicates information in □Figure 2.1.1 [page 7, line 7]; hence the two can be combined. Please see my comments on Figure 2.1.1."	will be considered after discussion
Fukui (Toyota)	2	-	-	-	-	-	-	2.3.4	"Not limit ""Ethanol Fermentation"" in ""conversion technology"" cell of ""biochemical"". Currently, many fermentation route is considered such as buthanol(GEVO, BP), diesel(Amyris), gas fermentation (Coskata) etc."	will include
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.4	Add the following: One of the end-uses in the thermochemical conversion route is transportation (i.e. FT diesel).	will include
de Campos Barbosa (Petrobras)	2	-	-	-	-	-	-	2.3.4	To a shorter report, better remove it. Better explained in figure 2.1.1	will be considered after discussion
Wang (Argonne National Laboratory)	2	-	-	-	-	-	-	2.3.4	Transportation is one end use for thermo chemical conversion.	will include
Helynen (VTT)	2	-	-	-	-	-	-	2.3.5	""Electricity"" and ""Power"" should replaced by ""Power and heat""	will include
KOBAYASHI (Toyota R&D Labs. Inc.)	2	-	-	-	-	-	-	2.3.5	"What is the unit for production cost;EU\$? And this table is closely related to the table 2.6.2. Please consider the structure of this chapter to put these sections much closer."	The structure of the chapter is set by the IPCC for all renewable energy sources. being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.5	Biomass for direct combustion -Power & heat Combustion. Cost: Ect5-15 /kWh. High costs small scale power gen. with high-quality feedstock. Low <-- This cost statement is inconsistent and confusing.	In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc being reworked
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.5	Co-firing -Electricity -Combustion -MSW -Worldwide -Wood residue . Cost: 0.05 US\$/kWh. Units are inconsistent with the rest of the table.	In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc being reworked
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.3.5	Could be shortened, if presented vertically and references were as numbers, as in Table 2.3.1. In addition, this table is duplicated as Table 2.6.2 on p. 85-89.	being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	-	2.3.5	IPCC report only identifies high potential of big scale biogas in the digestion of municipal solid waste in order to produce electricity (compare chapter 2.2).	being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	-	2.3.5	IPCC report only identifies high potential of big scale biogas in the digestion of municipal solid waste in order to produce electricity (compare chapter 2.2).	being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.5	Production cost of ethanol from corn: 4.5RMB/kgEtOH <-- this units are inconsistent and confusing	being reworked. Will get units the same. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.5	Production of renewable biofuels in oil refineries: Utilizing existing infrastructure can lower carbon footprint of the process (compared to dedicated biofuel facilities). Is this pathway reflected on the table? For more reference: http://agr.wa.gov/bioenergy/docs/RenewableDieselWhitePaperFINAL.pdf	Thanks for the reference with additional costs. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc. being reworked

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.5	That reference system is a very confusing. I suggest using numbers instead of asterisks.	being reworked. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Wang (Argonne National Laboratory)	2	-	-	-	-	-	-	2.3.5	The efficiencies presented in the table for individual pathways are not meaningful. Some better index may be needed. This table is a laudary list. What is the key message?	Thank you for the comment. being reworked to get messages more clear. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Rosinski (Electric Power Research Institute)	2	-	-	-	-	-	-	2.3.5	This table might have a lot of good information, but it's pratically unreadable and poorly organized. It is missing several key pathways, including pellets to power, upgraded biomass for power.	In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
de Haan (Ernst Basler + Partner AG)	2	-	-	-	-	-	-	2.3.6	"table-column ""characteristics"": revise text to improved cookstoves and to gasifiers"	table being deleted and information will be included in the table of 2.3.5 being reworked
Fukui (Toyota)	2	-	-	-	-	-	-	2.3.6	"What ""SVO"" stand for?"	table being deleted and information will be included in the table of 2.3.5 being reworked SVO stands for Straight Vegetable Oil
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.6	It would be better to normalize these numbers in terms of dollars per megajoules of energy output produced by the equipment over its lifetime.	table being deleted and information will be included in the table of 2.3.5 being reworked
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	-	2.3.6	Neither technical description nor mentioning of the potential (CHP/heat/fuel) and increasing importance of biogas feed-in into gas grid in Western Europe. (Column 5)	table being deleted and information will be included in the table of 2.3.5 being reworked
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	-	2.3.6	Neither technical description nor mentioning of the potential (CHP/heat/fuel) and increasing importance of biogas feed-in into gas grid in Western Europe. (Column 5)	table being deleted and information will be included in the table of 2.3.5 being reworked
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	-	2.3.6	Same amount of specific investment costs of 0.5 to 0.8 mil. US\$ for gasifier thermal, gasifier electrical and steam boiler electrical not comprehensible.	table being deleted and information will be included in the table of 2.3.5 being reworked
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	-	2.3.6	Same amount of specific investment costs of 0.5 to 0.8 mil. US\$ for gasifier thermal, gasifier electrical and steam boiler electrical not comprehensible.	table being deleted and information will be included in the table of 2.3.5 being reworked
Helynen (VTT)	2	-	-	-	-	-	-	2.3.6	Steam boilers: Major end-use: Power and heat, Process: combustion	table being deleted and information will be included in the table of 2.3.5 being reworked
El-Hinnawi (National Research Centre)	2	-	-	-	-	-	-	2.3.6	The cost given is misleading. For biogas plants there should be a wide range, also for biodiesel and ethanol. No references are given and these cost estimates can be easily challenged. Suggest deletion.	table being deleted and information will be included in the table of 2.3.5 being reworked
Rosinski (Electric Power Research Institute)	2	-	-	-	-	-	-	2.3.6	This is an equally mystifying table--ignores (mostly) biomass combustion for electric production. Costs for boilers and gasifiers are far too low, unless they're for the boiler/gasifier alone. And then they're still too low.	table being deleted and information will be included in the table of 2.3.5 being reworked
Wang (Argonne National Laboratory)	2	-	-	-	-	-	-	2.3.6	This table is not meaningful	table being deleted and information will be included in the table of 2.3.5 being reworked
Klein (PIK)	2	-	-	-	-	-	-	2.3.6	Very different bases for the costs: some refer to capacity others to output	table being deleted and information will be included in the table of 2.3.5 being reworked
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.3.6	What are the sources of information? Provide efficiencies of steam boilers. For the bio diesel/ ethanol plants, characteristics can include efficiencies, energy balance, advantages of co-processing bio diesel in oil refineries. Provide a cost range for bio diesel/ethanol plants as opposed to one fixed number.	table being deleted and information will be included in the table of 2.3.5 being reworked
de Haan (Ernst Basler + Partner AG)	2	-	-	-	-	-	-	2.4.1	"why would ""Local artisans are told or even contracted to build stoves according to specifications"" be a ""reason for failure""? And why would ""Critical stove components are custom built."" be a ""reason for failure""?"	Table will be redone
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.4.1	Akward means of presenting information. Consider writing out in paragraph form.	Table will be redone
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.4.1	Remove right column, which just repeats the left one, except that is negative.	Table will be redone

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Wang (Argonne National Laboratory)	2	-	-	-	-	-	-	2.4.1	Some of the statements in the table are questionable: why the reason that the production of the stove by artisans or manufacturers is subsidized is a failure of stoves? Why government involvement is necessarily a failure for stoves?	Table will be redone
Kheshgi (ExxonMobil Research and Engineering Company)	2	-	-	-	-	-	-	2.4.2	"Some Asian countries are slowing down on their biofuels mandates due to economic or other issues, so the table is likely no longer correct. Suggest table be updated or revisions noted."	Section will be redone with recent data and current policy examples. Table will be deleted
Ballesterio (National Meteorological Institute)	2	-	-	-	-	-	-	2.4.2	It should be good to have the blending rate expressed uniformly, i.e. only this kind: E5, E20	Section will be redone with recent data and current policy examples. Table will be deleted
MANNEH (MINISTRY OF FINANCE AND ECONOMIC AFFAIRS)	2	-	-	-	-	-	-	2.4.2	Table 2.4.2. needs to be adjusted in order to take out un used space towards the tail end of the table.	Section will be redone with recent data and current policy examples. Table will be deleted
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.5.1	"Remove box ""Social amenities"" (third box from top, both columns)."	Section will be rewritten and redundancies solved
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.5.2	Not sure of the value of this table. We still want the most efficient and enviornmetally friendly production, greatest yields and lowest cost in all cases.	maybe to be removed
de Campos Barbosa (Petrobras)	2	-	-	-	-	-	-	2.5.3	"Grass to crop emission seems misspelled. As an example this table seems a bit confuse once it doesn't specify which crop, grass or forest it's talking about.Their conclusions are contradictory with others parts of the text, which emphasizes site specific data: ""it is preferable to use site specific data than general numbers for quantifying effects of dLUC in a specif case"" (p.63, line 45). Suggestion: remove this table. "	contradictory comments
Schmall (Petrobras S.A.)	2	-	-	-	-	-	-	2.5.3	"Replace ""-22 to -11"" by ""-22 to 11"""	Accepted
Soimakallio (VTT Technical Research Centre of Finland)	2	-	-	-	-	-	-	2.5.3	Good and illustrative table! I would like to see more this kind of illustrations providing ranges in the report	contradictory comments
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	-	-	2.5.3	Since LUC and iLUC are such important issues it would be desireable to give a more detailed explanation here	to be done using recently passed standards in the U.S. as an example.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.5.4	"Third box from top, right column, add ""water quality issues"""	change the table
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.6.1	"CO2 fertilisation applies to all crops, not just planted forest. Last but one box: Breeding for lower harvest index seems like a stupid goal considering the increasing need for food, remove ""breeding for higher residue-to-grain ratios""."	CO2 fertilization is an uncertain issue, but definitely more likely with C3 species. We agree to extend this remark to other species than planted forest, though. The grain to straw ratio issue is addressed in comment 1046
Jara Tirapegui (Endesa Eco S.A.)	2	-	-	-	-	-	-	2.6.1	"Decimal numbers should be with ""points"" (i.e. ""1.2"" instead ""1,2"")"	OK, will be corrected
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	-	2.6.1	Potential yield increase (2030) of wheat and maize equals 50% and 35%, respectively. OK. (Column 3 and 5)	OK
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	-	2.6.1	Potential yield increase (2030) of wheat and maize equals 50% and 35%, respectively. OK. (Column 3 and 5)	accepted
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	""Long-term storage of willow chips is very difficult due moisture content (55-58 %)."" What does this have to do with straw?"	table is being reworked out. Will consider reviewer's comment. Secs3_6_Template_of_Technology_Tables.doc for the new organization of the tables
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	""Solid biofuel Direct combustion Forestry/agro residues World wide."" This is common application of bioenergy, should be described furter"	table is being reworked out. Good comment. Secs3_6_Template_of_Technology_Tables.doc for the new organization of the tables
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	"(large scale) Power&heat: ""Low costs especially possible with advanced cofiring schemes and BIG/CC technology over 100-200 MWe."" Units? \$0.03-\$0.08/kWh? ""Ect3-8 /kWh. "" Difficult to gt this much biomass to the plant. Biomass plants typically < 50MWh input"	table is being reworked out. The reviewer is correct and the technologies will be separated into categories -- commercial, near commercial, and developing. Secs3_6_Template_of_Technology_Tables.doc for the new organization of the tables

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	"Biodiesel Transport Tranesterification Rape seed OECD: "" Nitrogen leakage and pesticide use are higher for annual crops than perennial crops"" This is true for corn as well."	Yes, the reviewer is correct and the statement is more general. table is being reworked out
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	"Consider replacing column 7 title by: ""Potential Technology Advancements"". Also, we suggest simplifying the table to focus on most common applications"	table is being reworked out. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	"Ethanol -Corn -USA: ""R&D improves yield/reduced the time for processing Conversion of CO2 to fuel"" Would be applicable to other fermentaion processes too. Suggest omitting because it is not practical."	table is being reworked out. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	"Ethanol from Brazil: It□s probably not possible to compare efficiencies across these different processes b/c they are so different. Also, the table states: ""Mill size, advanced power generation and optimised energy efficiency and distillation can reduce costs further in the longer term."" This is true for all ethanol production."	table is being reworked out. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	"Renewable diesel Transport Hydrogenation. Consider rewording feedstock to: ""Vegetable oil and Animal fat"". In the comments: ""Technology well known. Economy is barrier"" Specify what the limitations are."	table is being reworked out. Point well taken. These categories will be moved to commercialization and the point made that they are not commercial because of the cost of the feedstock. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
SCOWCROFT (EURELECTRIC)	2	-	-	-	-	-	-	2.6.2	Additionally, the increasing industrial standard of biogas plants throughout Western Europe is not identified. (Column 6 and 7)	table is being reworked out. Information will be added. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Vahrenholt (RWE Innogy GmbH)	2	-	-	-	-	-	-	2.6.2	Additionally, the increasing industrial standard of biogas plants throughout Western Europe is not identified. (Column 6 and 7)	Will be added.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	Cost by 2030 column: Is this always the end product cost (fuel, heat, power) or sometimes the feedtsck cost? Units need to be clear, power is on \$/kWh basis, heat and fuel on \$/GJ. Isn't standard to use 2005 \$USD? Numbers or letters would be easier to read than ****	table is being reworked out. Yes, costs will be done in US \$ of 2005. Editorial comments will be corrected.In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	Ethanol -Lignocellulosic -USA ' Why different costs shown here? Is it 7-9 or 11-14?	The difference in these costs is the process. Biochemical and thermochemical ethanol processes have been estimated. The ranges are for two different studies. The two processes continue to be developed as they are very close. Table is being reworked out. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
Helynen (VTT)	2	-	-	-	-	-	-	2.6.2	Major end use: Electricity should be replaced by Major end use: Power and heat	We agree.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.6.2	sugar cane residue pellets - There should be a different cost for heat and power	table is being reworked out. Will consider reviewer's comment. Secs3_6_Template_of_Technology_Tables.doc for the new organization of the tables
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	-	-	2.6.2	The production costs for BtL is probably too low. Reduction of chlorine and potassium... is put in twice?	table is being reworked out
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.6.2	This table is the same as 2.3.5, one of these should be removed.	table is being reworked out; table 2.6.2 is a summary for use by the other Chapters of the Report. It is a requirement. Tables will be redone and make the points more clear.
Pálvölgyi (Budapest University of Technology and Economics)	2	-	-	-	-	-	-	2.6.2.	The item of hydrogen (as biofuels) should be clarified.	table is being reworked out. The difference will be made for hydrogen as a fuel product. Secs3_6_Template_of_Technology_Tables.doc for the new organization of the tables
Klein (PIK)	2	-	-	-	-	-	-	2.7.1	"Definition of ""geographical potential"" and ""cut off costs"" is missing"	Definitions will be added.
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.7.1	Briefly describe scenarios.	Scenarios will be briefly described in the Chapter
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	-	-	2.7.1	The numbers are in Mio ha or what value?	Units will be given. Mi ha
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.7.1	What is the dimension in the column numbers? GJ?	Area -- Mi ha
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.7.2	""Low costs especially possible with advanced co-firing schemes and BIG/CC technology over 100-200 MWe."" Feedstock scale challenges"	The case proposed is cited in the longer term. No costs attached. Yes, in the case of cofiring these would be lowest costs. Will be inserted as a possibility that may be shorter term
Verduzco (Chevron Corporation)	2	-	-	-	-	-	-	2.7.2	It would be interesting to see an estimate of biomass cost if there is a price attached to CO2 emissions..... biomass as an abatement strategy for fossil CO2 emissions should increase the value of biomass (proportionally to the cost of CO2 emissions). Are the units for electricity US\$/kWh?	Units are in U.S. \$/kWh (electric or thermal). Good suggestion.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.7.2	What is kWhth?	kWh of thermal energy
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	-	-	2.7.3	The production costs for Hydrogen are very low but if you assume future technology development then it might be. The estimated production costs for biodiesel are way to high (it should be rather between 15 □ 20 Euro/GJ); additionally it says on the bottom that the costs vary from 12 □ 20 Euro/GJ. Why is the other figure then that much different.	Costs will be checked. Would the reviewer have the references for the proposed costs?
de Campos Barbosa (Petrobras)	2	-	-	-	-	-	-	2.7.4	"Please check in the table the value/error in column (PR%) and row (Corn (tonnes corn))."	The value is correct for the PR for corn production and the units are in tonnes of corn. The progress ratio is due to increased productivity of the corn plants.
Hakala (MTT Agrifood Research Finland)	2	-	-	-	-	-	-	2.7.4	Insufficient legend, below mentioned n, l and III are not mentioned in the table.	Legend will be better clarified.
Kaup (Potsdam Institute for Climate Impact Research)	2	-	-	-	-	-	-	2.7.4	Suggestion to point out more clearly what is the intention behind the table and what do the abbreviations stand for.	Accepted
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.8.1	"Use of agricultural/forestry by-products: replace 'sound' (too colloquial?) with 'adequate'; include biodiversity; therefore consider: 'Key areas for research to inform sound management include defining residue harvesting intensities that ensure sustainable levels of organic matter, soil nutrients and C, and above- and below-ground biodiversity so that on- and off-site environmental values are maintained.'"	will include more forestry and land management issues
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.8.1	Use of degraded land: any use for short-rotation woody crops, or afforestation? Why consider only agriculture?	Forestry will be added.

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Considerations by the writing team
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.8.1	Water use efficiency: makes more sense coming just above 'Competition for water'	good suggestion
Mostad (Statoil)	2	-	-	-	-	2.8.1	-	2.8.1	Source/reference should be included	Sources will be added
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.8.2	In storyline 'Largely follows A1/B1□', it is stated that 'Assumes - well working sustainability frameworks' □ should this be 'environmental sustainability frameworks'?	Will be defined.
Titus (Natural Resources Canada, Canadian Forest Service)	2	-	-	-	-	-	-	2.8.2	In storyline 'Largely follows A1/B1□', last bullet point in right-hand column, 'Positive impacts□' □ is forestry included in this?	New contributing author in forestry will be able to ensure that forestry is included throughout
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	-	221	Box forest residues why mentioning unexploited forest growth it is confusing and normally considered in an other box	Noted
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	-	231	"a lot of mistake and uncertainties What are production technology ion the title? Jatropha yield figures are totally unrealistic with today seeds and agronomic knowledge I do not know how to read the cross. Is 1 cross good or better that 3 cross Sugar cane is requiring a lot of water their fore one cross is not correct and certainly not as the same level than Jatropha cost of Jatropha is also unrealistic Jatropha is not producing wood□ for more accurate data on jatropa please read Riedacker. Palm frond are not really available technically Corn stover in us minima us lower that minima india surprising; How you can have the whole tree in co-products of fuel wood from native forest what is the primary product? Forest residues en europ represents only 10 % of fuel wood from native forest looks very low!!! "	Thank you for the detailed comments. Key to crosses will be provided. For water use, the idea was to differentiate between irrigated crops (++ or +++ for low and high needs), and + for rainfed crops. Sugar cane is rainfed in Brazil. For jatropa: reported yields vary widely for jatropa across continents and soil types, we will report a range. I am not aware of papers by Riedacker on this specie, but I will take a look to provide for this range. Jatropha trees may provide wood when plantation is removed, but this should be documented, granted. Palm fronds will be removed. The lower end of corn stover comes from Perlack et al (2006), and expresses the fact that removal rates should be kept a low levels to preserve soil organic matter. 'Whole-trees' as co-products of residues will be removed. The low productivity of forest residues in Europe reflects the same soil constraint as in the US. This constraint will be made explicit in a footnote.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	-	232	The title do not correspond to the content. Is charcoal a secondary residue ????? 2 USD/GJ for charcoal is not realistic where this figure comes from? Why rice husk from india and not Thailand Indonesia□. same price that charcoal?	Charcoal line will be removed. We did not find any data for rice husk from Thailand or Indonesia. Anyway, Table does not claim to be comprehensive, merely illustrative of regional and feedstock differences.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	-	235	need an in dept review as numerous box empty. Is it coherent to mix proven technology with r&d would have been available to split in to table already existing technology and promising technology. Having □olum dedicated to efficiency would have been interesting, important to compare thinks which are comparable. Again presenting Jatropa etherification is confusing. Mentioning a large potential of pellets from bagassein brasil is not correct the process is working perfectly however all the bagasse is already used for power generation or heat. Theer is still a large misunderstanding with charcoal. Obviously the author do not know this sector in DC. Low efficiency of combustion in small industry world wide is not true. A lot of EU country have implemented high efficiency boiler and district heating. That is true when talking about DC . There are plenty other mistake or partial comment	The reviewer has excellent points. If the reviewer has specific references for the section, they will be very welcome. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6 being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc

Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

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philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	-	236	the electric efficiency of gasification is not 60% and the price much higher than 0.8 MUSD/MW. More realistic to talk about 4M/MW the price of conventional CHP plant is also higher 2 M/MW these figure are absolutely not realistic.	It would be very helpful if the reviewer could provide the references. We collected many references from various authors and in many cases have apples and oranges comparisons. Will strive to get them more comparable. In Section 2.3, Table 2.3.5 will be split into two and the information currently on table 2.3.6 will be consolidated into 2.3.5 or 2.3.6.being reworked. See File: Secs3_6_Template_of_Technology_Tables.doc
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	-	242	references are missing are information provided regarding policies measure very weak. It could be interesting to had status or achievement as most of the referenced countries set up these policies several years ago.	This section was not completed. It will be redone and the policies will be multiple countries and some idea of their progress. See also previous comments.
philippe (international institute for water and environmental engineering)	2	-	-	-	-	-	-	262	this table is again very heterogeneous and confusing. Technical advances are very often not relevant coments	The tables in Section 2.3 will be redrafted separating the commercial technologies from the near term commercializable technologies which will remain in 2.3. All other developing technologies will be in section 2.6 now without the other technologies which will remain in 2.3. Also, the tables will separate small and large scale applications. The reviewer has excellent points. If the reviewer has specific references for the section, they will be very welcome. Secs3_6_Template_of_Technology_Tables.doc for the new organization of the tables

