

## IPCC AR6 WGIII - First Order Draft Review Comments and Responses - Chapter 5

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
35877	0	0	0	0	This chapter can focus on a point referred to in Chapter 2 on poverty alleviation will not impact GHG emissions although the need for clean energy will increase. Since this chapter focuses on social aspect, it can contain this and some similar scenarios on how changes in poverty or population change can impact GHG emissions in the long run or developing a link between SDG and climate change (if possible and not covered elsewhere). Probably, this can be added to table 5.5.	Accepted. Point is worked into 5.2 with reference to Pachauri 2014 Nature Climate Change. <a href="https://www.nature.com/articles/nclimate2414">https://www.nature.com/articles/nclimate2414</a> . Also please see chapter 2. In ch 5 Now a new table that links wellbeing and SDG is included in the chapter and executive summary message is also included based on evaluation.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
39527	0	0	0	0	Throughout Chapter 5, when dietary shifts are discussed (in terms of reducing meat consumption), it seems to more often than not be referring to vegan or vegetarian diets - but to be more balanced/accurate, I suggest including more mention of dietary other patterns that can also provide climate benefits, but may still involve some animal products. For examples - see "Brent F. Kim, et al., 2019. Country-specific diet shifts to mitigate climate and water crises. Global Environmental Change, <a href="https://doi.org/10.1016/j.gloenvcha.2019.05.010">https://doi.org/10.1016/j.gloenvcha.2019.05.010</a> "	Accepted. The argument is made explicit in 5.3 when tabulating options, including diet shift ones.	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
1309	0		0		The "avoid, shift, improve" (ASI) framework is useful for this chapter, but its proposed measures include both demand- and supply side measures. Often, the two are related, e.g. when supply side measures are required to promote behaviour changes that result in lower energy use and emissions. It would be good to clarify in the chapter which aspects of the ASI framework relate to demand-side measures, which to supply side measures, and how the two are related to each other.	Accepted. The A-S-I framework takes a demand-side view, and that means even though supply-side changes are integral to overall change, we start from an (end)-user perspective, and then indicate implications and/or concurrent necessary changes on the supply side. We now work out this point in 5.1.	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
33165	0	24	3	32	Monitoring and evaluation national level commitment and implementation should be developed as a framework to oversee demand side service oriented solution.	Rejected. Not mandated. There is no governance guidance note suggesting that committed governance targets should guide assessment. This chapter looks at the overall potential, and intervention points to realize potentials.	Edris Alam	Rabdan Acadmey	United Arab Emirates
13877	0	0			Indigenous cultural norms could be added to this section to supplement information on what drives individual decision making towards less carbon intensive, more sustainable practices. Indigenous laws and stewardship obligations are strong drivers for indigenous people to exercise the mitigation requirements or options discussed in this chapter. Many examples exist of indigenous groups demonstrating sovereignty and leadership in climate mitigation, sustainable development, and sustainable economic development.	Accepted. In FOD p.29, 110ff we Chapter 5 makes already key points demonstrating leadership role of indigenous communities. It would be good to receive more specific input if we are to expand on this.	Bridget Doyle	Tsilei-Waututh Nation	Canada
1313	0				When you talk about energy services in this chapter, make sure to always highlight that this includes the demand for energy embedded in goods and services (indirect energy). Apart from food, most examples given in the chapter of how energy demand serves the satisfaction of needs relate to more direct uses of energy, e.g. for heating/cooling in homes or fuel for travel. This would help to highlight the role of reducing demand for consumer items in reducing overall demand for energy, e.g. for clothing, gadgets, tools, appliances, toys, cosmetics, furniture, etc. (consumption of these types of goods plus food make up over 50% of average household emissions in developed countries such as the UK - see Büchs, M., & Schnepf, S. V. (2013). Who emits most? Associations between socio-economic factors and UK households' home energy, transport, indirect and total CO2 emissions. Ecological Economics, 90, 114-123. doi: <a href="http://dx.doi.org/10.1016/j.ecolecon.2013.03.007">http://dx.doi.org/10.1016/j.ecolecon.2013.03.007</a>	Accepted. See response before. We explicate the embedded GHG emission dimensions, as related to energy services in 5.1. We also provide an example of embedded carbon (electric cars) in 5.3. Reference included in the text in Box 5.10	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
2989	0				Overall: There is absence of cost/benefit metrics. Costs and benefits are important for decision making. Clearly many of the discussed transformations and behavioral changes are not coming in the ordinary course of business due to costs or other barriers. Assessing these costs and quantifying other barriers would be useful aid for decision making. There may be knowledge gaps in this respect which can be reported as part of the knowledge gap section.	Taken note of. The conventional costs and benefits are discussed in this report in chapter 12. In this chapter we focus on difficulties that one need to overcome to make changes in various categories. These are also discussed in tables in 5.6 also to show how policy interventions can help in over coming them.	Mustafa Babiker	Aramco	Saudi Arabia
2991	0				overall: LCA approach to GHG consumption footprint not discussed.	Accepted. A summary graph of a meta-review of LCA and MRIO studies on GHG emission footprints is provided now in 5.3.	Mustafa Babiker	Aramco	Saudi Arabia
9515	0				It remains unclear if and to what extent the services/demand approach presented in Ch.5 are (implicitly) covered in other Chapters notably Ch.3 and Ch.5-11. Does Ch.5 extend beyond the ranges covered in the other parts of the report? Or does it present an alternative approach to exploring low-carbon futures?	Accepted. Cross chapter references are now included in revised version in various sections. This chapter complements chapter 3 and 4 in the sense that it provides a different perspective through service delivery system changes which can help in improving, shifting and avoiding high carbon demand while maintaining wellbeing for all. Who can be the actors, what might be the barriers and struggle at societal level, what are the enablers to alleviate barriers are discussed.	Tom Kram	PBL (Fellow)	Netherlands
16255	0				In Chapter 5: Demand, services and social aspects of mitigation, consider adding additional information about government institutions (e.g. militaries, governmental agencies) and the scope of the impact of their internal cultures and policies on GHG emissions. The internal cultures of governmental institutions drive climate change to a degree, and including a description of this would strengthen the chapter.	Accepted. New materials added based on available literature. Noted no literature suggested	Daniel Helman	College of Micronesia-PSM	Micronesia, Federated States of
28043	0				As a starting point for discussing energy demand, it is important to show the current state of global energy end-use demand classified by region and end-uses.	Accepted. In revised draft in section 5.2 Heterogeneity in access to and availability of services for human well-being within and across countries are shown in figure 5.3.	Yoshiyuki Shimoda	Osaka University	Japan
34499	0				This is an interesting and ambitious chapter, breaking new ground, but consequently, also carrying difficulties and risks. My impression overall is that it some excellent material but the quality is still mixed; with apologies, I have only been able to respond to the Exec Sum and intro section (and a couple of other minor specifics from a scan through). It is a chapter which needs particular sensitivity given the issues addressed, particularly from diverse cultural and philosophical perspectives, as well as different stages of economic development. The current draft in my view does have some potential to alienate readers from the entire IPCC process or at least provide 'grist to the mill' of IPCC critics. The authors should give thought to how to "road test" the SOD from this perspective. A few specific comments follow.	Accepted. Executive summary revised substantially in SOD draft. Role of demand, demand side interventions and reconfiguration of Service provision how can these three provide supplementary mitigation potential to supply side potential is explained in the chapter. Cross chapter link is now better established through Figure 5.7 and 5.6. Two way link between mitigation and wellbeing is supplemented by philosophical underpinning. How role of actors facilitates mitigation has been shown through case studies.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34501	0				1. Needs greater intellectual clarity on approaches and philosophical underpinnings relating to wellbeing. In the liberal tradition, wellbeing is subjective. If people enjoy longer showers, warmer rooms, or eating meat, on what basis can you say that doing less of these things is necessarily low cost behavior change, or even imply it is desirable? How do you know? People often complain that economics often doesn't measure things that matters – are you falling into the same trap and assuming that these enjoyments matter less than things which cost money, which seems to be implication of 'low cost' (unless you are literally taking 'cost' as purely economic/financial, and thus explicitly excluding welfare loss from your interpretation of 'cost' - in which case say so). Related, the chapter does seek to address literature on why subjective wellbeing may not be the only indicator, but it does beg the obvious question of who else has a right to define wellbeing, and how? This is a point of crucial importance for the chapter overall and its presentation. See also my Exec Sum comment on single vs multiple occupancy.	taken into account. Please see response to preceding comment	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)

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34503	0				2. Similarly, some statements that can easily be taken as cultural imperialism by well-off academics insulated from cultural diversity and sensitivities. To take one deliberately sensitive example (on both sides), how strong really is the empirical evidence that 'equal gender representation in parliaments and other processes are key leverage points that eventually lead to good governance on climate change'. How many countries even have 'equal gender representation in parliaments' to test this statement? Saudi Arabia is one of the countries expected to sign off on the IPCC report; it has only just allowed women to drive. Does the statement (ascribed, 'high confidence') strengthen or weaken the global credibility of the IPCC's focus on climate change mitigation?	Taken into account. IPCC has over time tried to see how climate action including mitigation action can be synergistic with Sustainable development and acknowledges how actions can be synergistic with multiple near term SDGs. IPCC SR1.5 clearly showed that gender goal is enhanced by actions that lead to access to modern cooking fuel, demand side options which has climate co benefits as well. Also see new figure 5.6. Revised draft included case studies from various countries to strengthen this argument of twin goals of mitigation and wellbeing and role of reconfigured service provision systems.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34505	0				3. some statements around co-benefits / greater wellbeing might need greater care or critical examination. See my Exec Sum comment on diet shifts – do you really have very high confidence (!!) that for the billion or more people in the world suffering from malnutrition, a shift to plant-based food would 'lead to healthier life' than a [maybe rare] chance to eat animal? What about all the women who suffer from iron deficiency and cannot access or afford vitamin supplement?	Taken into account. Executive summary substantially revised in SOD. Section 5.2 and also figure 5.3 shows diversity in access to various services and takes decent living standard goals and need for access to basic services for all. Case study in section 5.4 talks of dietary shifts and section 5.6 table mentions of malnutrition under struggle column.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34507	0				4. Overall I would suggest that the SOD for this chapter, more than any other, should be subject to some kind of Reader Diversity test. To offer caricatures at opposite ends of the spectrum: try it on a poor village dweller in one of the sub-Saharan Muslim countries; and try it on a signed-up libertarian from the US Republican party. That might help to distinguish what is really robust, well-communicated, and universally applicable, from mere hopes, assertions, or careless drafting from a perspective of liberal internationalist climate researchers.	Taken into account. Some suggestions for literature could have helped. Some webinar based stakeholder consultation was organised by TSU. No major actionable came in. Chapter text revised substantially. Conclusion derived from case studies around various service categories.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34509	0				Suggest to review your use of geographical and 'north south' terms throughout. Just on the first page of Exec Sum we have 'Non-Annex I', Global South- many other terms used throughout text. To extent possible, align with the official IPCC terminology on geographical and income/developmental classifications	Accepted. Changed as per TSU guidelines	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34515	0				The title is obviously broad. In terms of the demand and services part, it could be useful to more precisely delineate into (a) level of service demand; and the influence particularly of demand consumer choices on (b) efficiency of service provision and (c) carbon intensity of service provision. (a) is extensively covered in the chapter. (b) is to an extent, and one could argue, is picked up in some of the sector chapters. I find (c) somewhat absent at least from the Exec Sum. Yet consumer agency over how things are made has been important in many areas (free trade coffee, sustainable wood, line-caught tuna). How important could consumer demand for low-carbon products be? Does this risk falling between the cracks of the structure of the IPCC report – I don't know what other chapter could address this?	Accepted. Level of demand, efficiency in service provision and scope for further mitigation discussed in section 5.3. Executive summary revised substantially. Carbon Footprint is presented for population groups in 5.2. Cross chapterlink table is now included	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34517	0				From brief skim, the chapter also seems to have little on corporate agency. Yet, some of the biggest news since AR5 and significant drivers include the 'renewables 100' multinationals committed to buying 100% renewables, and increasing numbers of major companies declaring net zero. I think some of this is touched upon in the policies chapter (13) but the role of corporate demand surely deserves some attention in Chapter 5, apologies if I missed it?	Accepted. More text in revised 5.4 now on corporate/business as an actor.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34519	0				I also didn't find any linkages to Chapter 1 and its attempts to provide useful framings which could help to locate this chapter's contribution in relation to rest of the report. Two key, broad themes highlighted in chapter 1, already picked up in some other chapters, concern (i) the need for climate policy to be embedded within the wider socio-political context of sustainable development, and (ii) the fact that transitions, needed across multiple sectors, can be usefully understood in terms of 3-level frameworks, whether viewed from socio-technical or (broadened) economic perspectives. Both would seem quite relevant to the possible framings of Chapter 5 but the linkages could be more clearly drawn. A particular contribution of this chapter is that it puts spotlight beyond the 'meso level' traditional focus on market structures, pricing and economic incentives, to look at both the 'micro level' of individual behaviours, and the macro-level processes of social change, both of which put pressure on the incumbent (mostly meso-level) formal structures or market regulation and incumbent interests and mindsets.	Accepted. The framing of chapter 5 is around (1) need for focus on demand side policy actions so untapped mitigation potential by changing system of provision of services can be achieved; So how can policy induced actions toward radical and incremental changes in service demand by categorising them in avoid, shift and improve categories (2) complexity in transition process which involves various actors and their interaction with infrastructure design and mindsets/motivation are there in 5.4, 5.5 and policy governance is in 5.6. We substantiate through case studies.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34521	0				Finally, the takeaway 'so what?' messages are not very clearly presented to my mind, though appreciate that the governance section does have substantial material (see comment there). What should government or other readers DO with all this information? See my brief thought at that section, and consider implications for Exec Sum? I should acknowledge I don't have a lot of expertise in this area, but I may be reflecting reactions that other readers (cognisant of IPCC) may have. However, I have made one contribution, focused on evaluation of potential consumption-based policy instruments, just published as part of the Climate Policy Special Issue on Carbon Consumption Accounting and Policies: <a href="http://dx.doi.org/10.1080/14693062.2020.1730151">http://dx.doi.org/10.1080/14693062.2020.1730151</a> .	Accepted. Text revised in Executive summary and the governance/policy section 5.6 newly structured. Contribution is relevant and referenced.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
9931	1	1	61	51	every community has different culture and religion, so mitigation have to consider these aspect to be social benefit and strategy.	Accepted. Section 5.4 includes discussion on culture	Taufiq Ramdani Karim	University of Mataram	Indonesia
24453	1	1	97	39	This is a suggestion for the chapter as a whole which contains a wealth of really helpful, useful, insightful content, and an awful lot of unnecessary padding. Having read the whole thing start-to-finish, I would suggest a structure of (1) services & wellbeing (2) service provisioning systems for needs satisfaction (3) inequality, DLS as floor, sufficiency as ceiling, and the space in-between (4) ASI measures for services-based mitigation.	Accepted. Implemented mostly the suggested restructuring	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
30509	1	1	98	1	It is fantastic that you have created this chapter. Some of the points I made on earlier chapters are are more deeply engaged here, though good to still engage sufficiently in other chapters where possible, to effectively cross linkages. THANK YOU.	Thank you. Taken into account. Revised text mentions more of cross chapter references.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
29439	1	1	99	1	In general, there is some redundancy regarding the reporting of the effectiveness of different ASI measures throughout the chapter. Often, similar claims are made across the chapter but only one or two references are cited each time. It's hard to design a well balanced approach between pure knowledge synthesis and putting it into context, but I think than the current draft can be more streamlined and condensed by merging some of the repetitions into shorter but stronger accounts of the knowledge base.	Taken into account. Text revised.	Stefan Pauliuk	University	Germany
1037	1	1	99	2	This is a well-written and comprehensive chapter. The general message is sound and useful.	Thank you	Harry Saunders	Carnegie Institution for Science	United States of America
1039	1	1	99	2	I have a general question about the treatment of rebound effects. I am troubled by the notion that it should be mitigated, or "carefully avoided," as in "...which must be carefully avoided through various regulatory and behavioural measures. (5.3.2, 5.3.2.1, Figure 5.10, Figure 5.11)"	Accepted. Text revised substantially. Sentence deleted	Harry Saunders	Carnegie Institution for Science	United States of America
1041	1	1	99	2	First, this appears to be in contradiction with the findings of AR1.5: "...high rebound can help in providing faster access to affordable energy (SDG 7.1) where the goal is to reduce energy poverty and unmet energy demand (see Chapter 2, Section 2.4.3)" and goes on to say "...and to address policy-related trade-offs and welfare enhancing benefits (robust evidence, high agreement) (Chakravarty et al., 2013; Chakravarty and Roy, 2016; Gillingham et al., 2016), (Chakravarty et al., 2013)."	Noted. In revised draft substantial changes have been made and rebound mentioned in various contexts in section 5.3	Harry Saunders	Carnegie Institution for Science	United States of America

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1043	1	1	99	2	<p>Second, there is a tradeoff here that it seems is being overlooked. Rebound is generally found to be welfare-creating, which suggests strong mitigation via its suppression is only part of the equation to be considered.</p> <p>This is clearly a tradeoff, especially in the case of developing countries with under-served energy needs and in need of building out the infrastructure of modernity, and in need of increased economic welfare. Elimination of energy poverty is one of the SDGs.</p> <p>References for the claim that rebound is generally seen to be welfare-creating:                      *Saunders H D. 1992. The Khazzoom–Brookes postulate and neoclassical growth. <i>Energy J.</i> 13(4):131–48                      *Hanley N, McGregor PG, Swales J, Kim J, Turner K. 2009. Do increases in energy efficiency, improve environmental quality and sustainability? <i>Ecol. Econ.</i> 68(3):692–09                      *Gillingham K, Kotchen MJ, Rapson DS, Wagner G. 2013. Energy policy: The rebound effect is overplayed. <i>Nature.</i> 36(493):475–76                      *Gillingham K., D. Rapson, and G. Wagner, 2016: The rebound effect and energy efficiency policy. <i>Review of Environmental Economics and Policy</i>, 10(1), 68–88, doi:10.1093/reen/rev017                      *Liu Y, Wei T, Park D. 2019. Macroeconomic impacts of energy productivity: a general equilibrium perspective. <i>Energy Effic.</i> 1-16</p> <p>Examples below where the treatment of rebound seems as one-sided in favor suppressing energy demand/emissions without considering welfare benefits:</p>	Accepted. Please see response to previous comment	Harry Saunders	Carnegie Institution for Science	United States of America
23103	1	1	100	1	<p>Language use:                      Use "Human Development Index" when you are talking about that and not human development.                      In this section, because of the topic, it would be great not to read "developing/developed" countries and instead high-income, middle-income, etc. Even the World Bank has plead against this terminology, which contributes to meaning lock-ins.</p>	Accepted. Text revised and regional classification is harmonised	Gibran Vita	Open University of the Netherlands	Netherlands
12599	1		100		I think the chapter as a whole has a very strong focus on the individual agent and the values and norms behind the individual behavior. Throughout the whole chapter this is repeated many times, even it is written that the ambition is to include both psychological and sociological literature. One of the strongest approaches within sociological theory of sustainable consumption builds on theories of practices, or social practices. Literature from this approach is also referenced in the text, but nowhere in the text are the main insights from the practice theory approach mentioned.	Taken note of. Text revised substantially. Please see section 5.4 and also the social science primer	Gram-Hanssen Kirsten	Aalborg University	Denmark
12601	1		100		I would suggest making at least one paragraph focusing on explaining the main insights from practice theory; including that the major challenges for a sustainable transition is that practice change towards still more consumption, based on higher norms of e.g. comfort, convenience and communication. This insight point towards that other approaches, than individual behavior change is needed to change this.	Accepted. Text revised and included now. Please see section 5.4	Gram-Hanssen Kirsten	Aalborg University	Denmark
30531	1		100		There is no mention in this chapter (that I could find) on rights-based approaches to climate action, as related to behaviour change. Yet the research (i.e.: via Human Rights Council/Special Rapporteur on Human Rights and the Environment) on the positive affect of a rights-based approach to climate mitigation projects is now significant. Please could you keep this on your radar in future drafts, and let me know if you need more information. Gaining society support increases (as you note) when the policy is experienced as fair; in turn, rights-based approaches in various sectors ground that sense of fairness to result in mitigation/adaptation approaches/policies which are experienced as more legitimate, coherent and sustainable.	Accepted Text revised to reflect the role of various social actors/groups	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
11245	1				LUICA REISCH must be LUCIA REISCH	Noted, correction has been added	Reese Gerhard	University of Koblenz-Landau	Germany
1821	2	6	2	6	sub-head 'Livability and wellbeing for all'	Rejected. As we do not see any special reason why we need to change that. Livability is outside the mandate of this working group and may be more applicable for working group II which deals with impacts and adaptation.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1823	2	8	2	8	Replace 'side' by 'based'	Reject. 'Demand based' we suppose is closer to the 'consumption based'. This is used for emission accounting purpose. As we are trying to see various services which people demand and how mitigation strategies can be targeted for service provision systems so that demand level or pattern can be changed so we decide to keep demand side and not replace by based. However, we present carbon foot print estimates for different population quartiles in section 5.2	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1825	2	10	2	10	Reframe 'Wellbeing,Sustainable Development and Mitigation'	Accepted; these terms are now defined clarified in the Social Sciences annex to Ch. 5	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1827	2	11	2	11	Reframe ' Good enough basic services and living standards'	Accepted. The Glossary and the Social Sciences annex to Ch. 5 define and discuss 'sufficiency'. Thank you for this reference.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
39317	2	11	2	11	Can you add more references on the theme of sufficiency, recognizing that such measures contribute to 'avoid' and 'shift' strategies (rather than improve)? For a recent review of how research can inform policy-making, see: Toulouse, E., Sahakian, M., Lorek, S., Bohnenberger, K., Bierwirth, A., & Leuser, L. (2019). Energy sufficiency: how can research better help and inform policy-making? Paper presented at the ECEEE SUMMER STUDY PROCEEDINGS, Hyères, France.	Accepted. The Social Sciences annex to Ch. 5 defines and discusses 'sufficiency'. Thank you for this reference.	Marlyne Sahakian	University of Geneva	Switzerland

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1829	2	12	2	12	DLS ...Avoid abbreviations in heads	Accepted. These headlines have been revised and the discussion of Decent Living Standards now appears in the Social Science annex.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1831	2	13	2	13	reframe 'Equity and Climate Change'	Accepted. These terms are now clarified and discussed in the Social Sciences annex.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1833	2	15	2	15	ASI...Avoid abbreviations in heads	Noted.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1835	2	19	2	19	Substitute 'Institutions' for 'Agency'	Rejected - term "agency" is used in a different sense of the word	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1837	2	21	2	21	values and lifestyles'	Noted. Section heads changed in the new draft. So no longer valid	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1839	2	26	2	26	Reframe 'People-Centric Climate Action'	Taken into account.The spirit of the comment is reflected in the chapter text .	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1841	2	29	2	29	Reframe 'agency,structure and meaning' by 'Institution, structure and governance'	Taken into account. Title revised draft takes the suggested spirit and uses the terms based on literature review.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
23001	2		5		Too many high confidence statements, sometimes associated with trivial statements ("avoiding foot waste reduces GHG emissions") and some not based on a credible review of the literature. More rigorous standard of evidence is required, including checking the literature for contradictory conclusions.	Accepted. Executive summary thoroughly revised.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
42115	2				this is a general point - I really liked the chapter: its breadth and vision. In my view it is incredibly important we move to a demand focused global system. There were some very good sections which had a clear story and point that was being made. Basically by the time I had got to page 31 and section 5.3 I was wondering what the story of the chapter is. I also felt sometimes I was losing the point of sections. The basic 4 sections of the chapter are good but sometimes quite what the point of each section is relative to the story of the chapter got lost. It also felt long.	Accepted. Chapter has been restructured to make story line clear.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
42117	2				another general point is that there needs to be clear links with chapter 13 (my chapter). So I think 5 is good because it says that X y and z are needed but it says it in a way as if it is easy to get those policies. Ch 13 def needs to make it clearer how hard it is to get the policies we all know are needed actually in place.	Accepted. Cross chapter link substantially improved.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
42139	2				the chapter moves from arguments of well being / decent standard of living for all through to quite technical discussions of mapping the opportunities etc through to policy etc. It reads quite differently in different sections - I wonder if instead of only having 4 main sections you had a few more? it might make it easier for the story to come across.	Accepted. Structure and content revised substantially	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
45581	3	1	3	1	shorten the number of paragraphs here. Many are obvious. Those which aren't are buried.	Accepted. Text revised	Daniel Crow	International Energy Agency	France
30513	3	1	3	2	It could help to begin with a summary/perspective opening, as was often used effectively in the SRCL, in this case concerning current population vs 30 years ago (for example), and % increase in demand in relation to 30 years ago in main sectors (meat consumption, energy, etc), to give perspective on what we are talking about. For example, a quote by Professor Jackson that rocked the world: The global economy is almost five times the size it was half a century ago and has already been accompanied by the degradation of an estimated 60% of the world's ecosystems.	Accepted. Revised thoroughly	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
33567	3	1	3	25	This is a well written ES with a clear storyline. However, the focus is largely on the mitigation potential of various options and there is very little information on what is being done the extent to which this is contributing to global mitigation ambition. Such phrasing is important to avoid a story that gives the impression that mitigation is largely a future consideration.	Accepted. Revised messages include examples. Revised draft mentions of impact on human wellbeing of various mitigation options that have been evaluated.	Debra Roberts	EThekwin Municipality	South Africa
42701	3	2	3	3	The statement is correct, but the logic of the narrative should be the other way around. E.g. "Climate change mitigation solutions should co-prioritise emissions reductions and human wellbeing, including the services that underpin it. This makes a focus on people and demand-side solutions key," (or something to that effect)	Accepted. Text substantially changed in revised second order draft.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42703	3	4	3	4	The feasibility of the Gruebler et al. [2018] scenario is questionable, with a main concern being the assumptions about decoupling rates which are vastly in excess of any historical precedent (and kicking in immanently). See the work of Paul E. Brockway and colleagues, including forthcoming papers. Their findings imply that demand cuts would either need to be much deeper still, or that their scenario is unlikely to allow for anything close to the economic growth rates they assume. Would be more accurate to say: "Ambitious low-energy demand-side scenarios suggest that wellbeing could be maintained or improved while reducing global final energy demand [...]."	Accepted. The revised text reconstructed the messages.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
11985	3	6	3	10	Please consider providing a short description or an example of a demand-side service-oriented solution, for easier understanding	Accepted. Text appropriately changed	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
42705	3	9	3	9	DLS don't set minimum energy requirements, but they can be translated into minimum energy requirements (with a lot of assumptions).	Accepted. Text appropriately changed reflecting the literature.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
45873	3	10	3	10	please recall on pioneering attempt to define minimum requirements of energy use: GOLDENBERG, J., JOHANSSON, T. B., REDDY, A. K. N. & WILLIAMS, R. H., Energy for a sustainable world, John Wiley, New York, 1988.	Accepted. Reference included.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
42707	3	11	3	12	vary' is descriptive, when the statement here really is normative. Should say something like: "Demand-side service-oriented solutions need to be context-sensitive according to living conditions and culture, and hence may vary between and within countries and regions."	Taken into account. Regional variation reflected better now.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
13163	3	12	3	12	(+) values; (-) global variations; (+) different national pathways substantially based on the role of infrastructure that pre-determines behaviour or activity based view of consumption - "Household time use, carbon footprint and urban form:A review of potential contributions of everyday living to the 1.5 degree target" (2018) Dominik Wiedhofer, Barbara Smetschka, Lewis Akenji, Mikko Jalas and Helmut Haberl, 'CurrentOpinion in environmental Sustainability', 2018 30:7-17.	Executive summary statements thoroughly revised. Literature here not added as not core to the messages. Suggested citation included in section 5.3.1.1.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledge on Climate Change, Ministry of Science and Technology, Government of India, Visiting status at Tsinghua University, Beijing	India

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13165	3	13	3	13	(+) with high per-capita emissions	accepted. ES statements thoroughly revised.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13167	3	14	3	14	(-) many (+) most	accepted. ES statements thoroughly revised.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13169	3	15	3	15	(-) especially non-commercial ..... Marginalised people; (+) as populations move from rural to urbakn areas	Noted. ES statements thoroughly revised based on avilable literature.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
44409	3	18	3	18	Despite tradition of the term in some literature, the notion of good governance is morally charged, and not a neutral and scientific notion of governance which, on the other hand, can be qualified by any of its multiple forms. It undergirds a program of bureaucratic and societal reform, and not everyone regards good governance as a self-evident positive contribution to public welfare. This can lead to certain governance arrangements becoming regarded as good in and of themselves rather than as reflections of particular (and contestable) political worldviews. Mitchell, J.K. (2015). Governance of Megacity Disaster Risks: Confronting the Contradictions. In Fra.Paleo, U. (ed.) Risk Governance. The Articulation of Hazard, Politics and Ecology. Dordrecht: Springer. pp. 413-439.	Noted. Reference has been added. Governance is addressed in the Glossary and in the Social Science Primer appended to Ch. 5. We avoid and/or contextualize the use of the phrase "good governance".	Urbano Fra Paleo	University of Extremadura	Spain
37269	3	19	3	21	Hard to make a blanket statement that this is true of all and any climate policies "... climate policies lead to better wellbeing for all"	Taken note of. Same as the comment # 14.	Michiel Schaeffer	Climate Analytics	Netherlands
13171	3	20	3	20	(+) social equity; (+) comparable levels of wellbeing	Noted. ES statements substantially changed so no longer valid.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13173	3	20	3	20	(+) gender equity; (+) increase in incomes	Noted. ES statements substantially changed so no longer valid.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13175	3	20	3	20	(+) for all; (+) societal	Noted. ES statements substantially changed so no longer valid.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
42709	3	22	3	22	eventually lead to' is deterministic, and I don't think this can be said with any certainty. It would be more appropriate to say something like "... are key leverage points that dramatically increase the potential for [or: are very favourable for] good governance on climate change".	Noted. ES statements substantially changed so no longer valid.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
1441	3	24	3	24	"Demand-side service-oriented solutions" is an important term in this chapter, but the use of this term is not consistent. Some places with ", " between "demand-side" and "service-oriented". Please keep consistent.	Accepted. ES statements Revised substantially so the sentence no longer valid. In the chapter also the concepts are now carefully defined including glossary term.	JUNGUO LIU	Southern University of Science and Technology	China
38297	3	24	3	24	such "as" heating?	Noted	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
34471	3	24	3	25	"Behaviours sufficiency" should be added to "demand-size-service-oriented....."	Noted. ES statements thoroughly revised based on section revisions and avilable literature.	Emmanuel RAUZIER	NGO Association negaWatt	France
12827	3	24	3	32	While the inclusion of this chapter in the report is an excellent development, it is important that it (1) avoids talk that appears to place excessive blame on consumers rather than producers and regulators and (2) speaks generally of people or populations when it in fact is only referring to a small segment of the human population that has the means and freedom to change their behaviour.	Accepted. Revised sections have been substantially revised including intertwinedness of individual response dependent on structure and designs. ES statements changed substantially	Dina Townsend	University of Witwatersrand	Austria
34469	3	24	3	32	The exemples mentioned are linked with individual behaviours. Collective behaviours and social organisation is necessary for people to feel inside an active collective motion and for the measures to be efficient. See ECF publication : <a href="https://europeanclimate.org/content/uploads/2019/11/09-18-net-zero-by-2050-from-whether-to-how.pdf">https://europeanclimate.org/content/uploads/2019/11/09-18-net-zero-by-2050-from-whether-to-how.pdf</a>	Noted. ES statements changed substantially. Reference included in 5.4	Emmanuel RAUZIER	NGO Association negaWatt	France
38189	3	24	3	32	This section focusses too much on individual behavior instead of social patterns which are driven by infrastructures. As shown in <a href="https://www.carbone4.com/wp-content/uploads/2019/06/Publication-Carbone-4-Faire-sa-part-pouvoir-responsabilite-climat.pdf">https://www.carbone4.com/wp-content/uploads/2019/06/Publication-Carbone-4-Faire-sa-part-pouvoir-responsabilite-climat.pdf</a> , the contribution of behavior is rather limited if citizens are not offered the relevant infrastructures to change their behavior. See also: <a href="https://europeanclimate.org/content/uploads/2019/11/09-18-net-zero-by-2050-from-whether-to-how.pdf">https://europeanclimate.org/content/uploads/2019/11/09-18-net-zero-by-2050-from-whether-to-how.pdf</a>	Accepted. Revised sections have been substantially revised (including intertwinedness of individual response dependent on structure and designs. ES statements changed substantially. Ref included in 5.4	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
37271	3	25	3	25	"... such as heating and cooling set-point..."	Accepted. ES statements thoroughly revised.	Michiel Schaeffer	Climate Analytics	Netherlands
42711	3	25	3	25	these shifts need not be initiated as behaviour changes but can be, and probably require, regulatory / policy changes	Accepted. Revised sections have been substantially revised including actors/groups. ES statements changed substantially	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
22723	3	25	3	26	"Low cost behaviour changes such as ... shifts to public transit". I am not sure I would define shifts to public transit is an appropriate example of "low cost" measure. Liao et al.'s (2020) comparative study shows that PT takes on average twice as much time as car travel anywhere but in the most central areas of four cities worldwide. REFERENCES: Liao, Y., Gil, J., Pereira, R. H., Yeh, S., & Veredel, V. (2020). Disparities in travel times between car and transit: Spatiotemporal patterns in cities. Scientific Reports, 10(1), 1-12.	Noted. ES changed, and this sentence didn't survive.	Giulio Mattioli	TU Dortmund University	Germany
23065	3	25	3	28	Shorter showers and recycling are featured as top five low-cost behavioral changes in executive summary. These are the kind of misconceptions about effective action that we should try to re-educate the public about. This can be done by introducing the nuances of life-cycle impacts vs direct impacts.  It would be important to have a more clear and hierarchical list in here. Fundamental in this part or within the chapter is to clearly distinguish the amount of direct carbon (or energy) emitted by end user (about 20%) vs carbon embodied upstream in supply chain (roughly 80%).  Relevant studies:  Herendeen, Robert and Tanaka, Jerry, (1976), Energy cost of living, Energy, 1, issue 2, p. 165-178, <a href="https://EconPapers.repec.org/RePEc:eee:energy:v:1:y:1976:i:2:p:165-178">https://EconPapers.repec.org/RePEc:eee:energy:v:1:y:1976:i:2:p:165-178</a> .  Pachauri, S. and D. Spreng. 2002. Direct and indirect energy requirements of households in India. Energy Policy 30(6): 511-523.  Pachauri, S. 2007. An energy analysis of household consumption: Changing patterns of direct and indirect use in India. Berlin: Springer-Verlag.  Ivanova, D., K. Stadler, K. Steen-Olsen, R. Wood, G. Vita, A. Tukker, and E. G. Hertwich. 2016. Environmental impact assessment of household consumption. Journal of Industrial Ecology 20(3): 526- 536  From the lens of direct vs indirect, and because we are talking about household actions i.e. under the control of individuals "control". That is, given there is public transport or recycling infrastructure in that given country. In many countries this is not even an option.  I would suggest consciously revise this list and spell it out as much as possible to truly reflect the top 10 universal actions. E.g. reducing and reusing are higher priority than recycling. Shifting to active travel (cycling and walking) is even more effective and less costly than public transport. Shifting towards plant-based diets instead of "less meat intensive diets" is also more affordable and effective. In general, reducing consumption of clothes, household chemicals, electronic devices, household appliances, reducing food surplus and waste are the lowest cost and most effective. Consider to separate low-cost actions in the executive summary by shift (or low-carbon consumption) and by avoid (sufficiency).  Example literature ranking impact of low and high cost behavioral changes:  Girod, B., van Vuuren, D. P., & Hertwich, E. G. (2014). Climate policy through changing consumption choices: Options and obstacles for reducing greenhouse gas emissions. Global	Accepted. Executive summary text revised thorough. . Literature suggested considered appropriately within the sections (specifically in 5.4).	Gibran Vita	Open University of the Netherlands	Netherlands
45875	3	26	3	26	please after "shifts to public transit" add "and active mobility" or "and soft-mobility"	Noted. ES statements changed substantially so sentence does not exist.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
1315	3	27	3	27	You state here that behaviour changes could save 3GtCO2e by 2050 - state what % this is of total required emissions reduction. Also discuss how this has been calculated in the main text in the chapter (I couldn't find anything on this there). In table 5.5 which is referred to here, Avoid, Shift and Improve measures are considered, so strictly speaking more than just behaviour change - adjust the text here to reflect this?	Noted. ES statements changed substantially so sentence does not exist. New sentence added to reflect revised sections text.	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
18077	3	27	3	27	Does the figure 3 GtCO2eq savings refer to an annual flux? Please clarify	Noted. ES statements changed substantially so sentence does not exist. New sentence added to reflect revised sections text.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
30515	3	27	3	27	Critical to have consumption(material, purchasing) in some way included, as most economic systems are dependant on unsustainable material consumption on a planet with limited natural resources, and we need the IPCC research collation to engage on unsustainable economic systems as a climate change driver, as few governments raise this issue.	Noted. ES statements changed substantially so sentence does not exist. New sentence added to reflect revised sections text. IPCC does not do own research but tries to make assessment based on available literature.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
13177	3	28	3	28	(+) in high emission pathways	Noted. ES statements changed substantially so sentence does not exist. New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
3209	3	29	3	29	Please, explain the meaning of ASI approach - this abbreviation for Avoid-Shift-Improve (ASI) approach is used here for the first time.	Noted. ES statements changed substantially so sentence does not exist.	Klaus Radunsky	retired from Umweltbundesamt	Austria
11911	3	29	3	29	Please spell out/define ASI when first used	Noted. ES statements changed substantially so sentence does not exist.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
30511	3	29	3	29	You use ALS on page 3 but do not explain what it means until page 4.	Noted. ES statements changed substantially so sentence does not exist.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
33569	3	29	3	29	Write ASI in full since this is the first usage in this chapter.	Noted. ES statements changed substantially so sentence does not exist.	Debra Roberts	EThekwin Municipality	South Africa
37273	3	29	3	29	define "ASI"	Noted. ES statements changed substantially so sentence does not exist.	Michiel Schaeffer	Climate Analytics	Netherlands
38191	3	29	3	29	ASI should be spelled out and defined	Noted. ES statements changed substantially so sentence does not exist.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
37275	3	30	3	30	awkward phrasing: "Models with lifestyle case indicated..."	Noted. ES statements changed substantially so sentence does not exist.	Michiel Schaeffer	Climate Analytics	Netherlands
10059	3	30	3	32	It would be helpful to generalize this statement or add more explanation to assumptions in the "SSP2 Reference Scenario".	Noted. ES statements changed substantially so sentence does not exist.	Jia Li	U.S. Environmental Protection Agency	United States of America
13179	3	33	3	33	(-) decent; (+) comparable	Noted. ES statements changed substantially so sentence does not exist.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
42713	3	33	3	34	meaning unclear: Are DLS currently met through different pathways of which only some are low-emissions compatible? Or can they theoretically be met through different pathways of which only some are low-emissions compatible? Or can only some but not all DLS be met in a low-emissions pathway, even theoretically?	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
11913	3	33	3	40	Please consider simplifying the technical language in this paragraph, and explain what is meant by 'exergy analysis'	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
29995	3	36	3	36	Large should be largely	Noted. ES statements changed substantially so senetence does not exist.	Brett Cohen	The Green House consultants	South Africa
35633	3	36	3	38	I am not sure that this is neither correct nor relevant in this context.	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	Göran Finnveden	KTH Royal Institute of Technology	Sweden
34473	3	41	3	45	Figures given are very interesting but it would be relevant to separate clearly what is linked with efficiency and what is linked with efficiency	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	Emmanuel RAUZIER	NGO Association negaWatt	France
38193	3	41	3	45	Figures provided in this paragraph combine at the same time those related to sufficiency and efficiency measures and not just to efficiency gains as stated. It will be good to distinguish between the two types of savings (sufficiency versus efficiency), see references proposed in comment 1. Furthermore, the paragraph refers to savings in both buildings and mobility which is good as they are interlinked. However, this should be stated in the 1st sentence.	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
2179	3	43	3	43	Please, add the following sentence: "New concrete mix designs will allow to increase the carbon dioxide uptake by cement-based materials (Sanjuán et al 2019), such as concrete made with GGBFS-cements (Andrade and Sanjuán 2018)". Sanjuán, M.Á.; Estévez, E.; Argiz, C. Carbon Dioxide Absorption by Blast-Furnace Slag Mortars in Function of the Curing Intensity. Energies 2019, 12(12), 2346; <a href="https://doi.org/10.3390/en12122346">https://doi.org/10.3390/en12122346</a>  Andrade C, Sanjuán MA. Updating Carbon Storage Capacity of Spanish Cements. Sustainability 2018;10:4806. <a href="https://doi.org/10.3390/su10124806">https://doi.org/10.3390/su10124806</a>	Noted. ES statements changed substantially so senetence does not exist.	Miguel Angel Sanjuán	Technical University of Madrid	Spain
44269	3	43	3	43	It is suggested to change from Passive House to Net Zero Energy Buildings,	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	BERTOLDI PAOLO	European Commission	Italy
12497	3	45	3	45	Please, add the following sentence: "Low-carbon concrete mix designs which are able to increase carbon dioxide uptake by mortars and concretes with 8 EJ (blended cements carbon dioxide absorption, carbon dioxide uptake estimation by mortars and concretes)". Sanjuán, M.Á.; Estévez, E.; Argiz, C. Carbon Dioxide Absorption by Blast-Furnace Slag Mortars in Function of the Curing Intensity. Energies 2019, 12(12), 2346; <a href="https://doi.org/10.3390/en12122346">https://doi.org/10.3390/en12122346</a> Andrade C, Sanjuán MA. Updating Carbon Storage Capacity of Spanish Cements. Sustainability 2018;10:4806. <a href="https://doi.org/10.3390/su10124806">https://doi.org/10.3390/su10124806</a> Xi, F.; Davis, S.J.; Clais, P.; Crawford-Brown, D.; Guan, D.; Pade, C.; Shi, T.; Syddall, M.; Lv, J.; Ji, L.; et al. Substantial global carbon uptake by cement carbonation. Nat. Geosci. 2016, 9, 880–883. <a href="https://doi.org/10.1038/NGEO2840">https://doi.org/10.1038/NGEO2840</a> Pade, C.; Guimaraes, M. The CO2 uptake of concrete in a 100 year perspective. Cem. Concr. Res. 2007, 37, 1348–1356. <a href="https://doi.org/10.1016/j.cemconres.2007.06.009">https://doi.org/10.1016/j.cemconres.2007.06.009</a> Gajda, J.; Miller, F.M. Concrete as a Sink for Atmospheric Carbon Dioxide: A Literature Review and Estimation of CO2 Absorption by Portland Cement Concrete. R&D Serial N_2255, 1st ed.; PCA: Chicago, IL, USA, 2000. Galán, I.; Andrade, C.; Mora, P.; Sanjuán, M.A. Sequestration of CO2 by Concrete Carbonation. Environ. Sci. Technol. 2010, 44, 3181–3186. <a href="https://doi.org/10.1021/es903581d">https://doi.org/10.1021/es903581d</a> Andrade, C.; Sanjuán, M.A.; Rebolledo, N. Reliability calibration by carbonation exposure class deemed-to-satisfy prescriptions of Spanish concretes. Concreto Construções 2018, 91, 97–102. Available online: <a href="http://libracon.org.br/Site_revista/Concreto_Construcoes/ebook/edicao91/files/assets/basic-html/index.html#102">http://libracon.org.br/Site_revista/Concreto_Construcoes/ebook/edicao91/files/assets/basic-html/index.html#102</a> (accessed on 16 October 2019). Sanjuán, M.Á.; Andrade, C.; Mora, P.; Zaragoza, A. Carbon Dioxide Uptake by Cement-Based Materials: A Spanish Case Study. Appl. Sci. 2020, 10, 339. <a href="https://doi.org/10.3390/app10010339">https://doi.org/10.3390/app10010339</a>	Taken note of. The comment is more relevant for Industry chapter of this report an outside the direct purview of this chapter.	MORA PERIS PEDRO	Profesor Titular de Universidad de la ETSI Minas y Energía de la Universidad Politécnica de Madrid	Spain
13181	3	45	3	45	(+) a modal shift to electric transport, including public transport, has the highest potential for emission reduction worldwide, and worldviews play a major role in sustainable mobility - 'The role of worldviews in the governance of sustainable mobility', (2020), Frank Chuang, Ed Manly Arthur Petersen, PNAS 4034 - 4042 Feb 25 2020 vol 117 No. 8.	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text. Reference included in 5.4.1.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
45877	3	45	3	45	please after "public transport" add: "active mobility - walking, cycling -" or "and soft-mobility"	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
42715	3	46	3	46	development', if not further qualified, is vague and ambivalent: the term has different connotations in different academic communities. Need to be specific what is meant.	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
38195	3	46	3	48	This needs to be further developed. A paragraph should have at least 3 sentences according to OECD drafting rules	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
13183	3	47	3	47	(-) decent; (+) comparable	Noted. ES statements changed substantially so senetence does not exist. New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India

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37277	3	47	3	47	sounds like Global South is stealing from richer countries: "take back some of the energy savings"	Noted. ES statements changed substantially so sentence does not exist. New sentence added to reflect revised sections text.	Michiel Schaeffer	Climate Analytics	Netherlands
13185	3	48	3	48	(-) faster; (+) effectively.	Noted. ES statements changed substantially so sentence does not exist. New sentence added to reflect revised sections text	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
26133	3		3		I would expect to see a general abstract of this chapter in the beginning of executive summary besides the item-by-item statements.	Accepted. Added.	Wenling Liu	Beijing Institute of Technology	China
24349	3	2	4	47	Key terms need defining for the Executive Summary to be intelligible, including: services, agency, structure, meaning, Avoid, Shift, Improve	Accepted. Now glossary terms. Social primer and revised section texts include them	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
30917	3	1	5	25	Generally speaking the writing in the Executive Summary is very succinct yet I'm not certain its very readable?	Noted. ES statements changed substantially	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
779	3	1	6	1	In the summary (and more generally in the chapter), there is little to link with Chapter 3 and 4 approach and results. Yet, it would be very useful to explain how this Chapter 5 allows us to contextualize, understand, complete or even discuss the findings of the literature reviews of chapters 3 and 4, notably through its discussion of limits of the traditional framework (GDP, IAM...) for thinking about demand.	Noted. Chapter 1 is the framing chapter which reconciles the approaches used in the report. This chapter includes the papproaches used in this chapter	MATHEU SAUJOT	IDDR	France
6561	3	1	6	25	Overall, the writing in the executive summary should be clearer, simpler and less vague. Even with a PhD in psychology, I had to summary paragraphs several times to understand them. These paragraphs use passive language and many unnecessary extra words to convey each idea (e.g., "Collective action and organization is crucial to shift the possibility space of public policy on climate change mitigation" could be simplified by removing several words). They also use too much jargon that requires the reader to be an expert in the specific topic being discussed (e.g., "Behavioral change, not embedded in structural change, will contribute little to climate change mitigation" - this also has the additional confusion of multiple negatives within one sentence). I urge the editors to diligently ensure that the executive summary reads clearly and easily as it is the most likely section to be read by most readers.	Accepted. ES statements Revised substantially.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
35739	3	1	6	25	The issue of economies' systemic dependence on growth, which is a key barrier to effective demand-side measures is not included in the executive summary. More on this in further comments	Noted. ES statements changed substantially	Miklós Antal	Eötvös Loránd University	Hungary
30529	3	1	6	50	What would help in the overall summary, are frequent perspectives on the rate of change in consumption behaviour over the decades, to have perspective on what we all assume we 'need' to live. Also missing in the overall summary, are travel choices. And it is hard to imagine this absent, when we are living in a time of unprecedented assumptions about how we travel, how often, and to where. The % emissions related to air travel, the statistics of how many flights per person v.s 30 years ago, or % of cars that individuals in wealthier populations think they should have, the loss of public transport in many relatively wealthy countries ... these could be valuable statistics from collated research and their absence is strange for such an important chapter on behavior.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
1311	3		6		Parts of the executive summary may be difficult to understand for readers who are not familiar with specific concepts. One concept that is core to the chapter, but which may be understood in very different ways in different disciplines, is "service", here used with the meaning of "energy service" (not "service economy", for instance). I recommend to define this term early on in the ES to avoid misunderstandings	Accepted. Executive summary thoroughly revised. Definitons are in the chapter 5.1	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
13157	3		6		Concepts are underdeveloped and values provide a foundational frame to understand societal transformation and material use and decarbonization in the context of sustainable development. [THERE WILL BE NO CONVERGENCE]	Noted. ES statements changed substantially so sentence does not exist. New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13159	3		6		With China achieving the level of wellbeing of countries with high emission pathways it is possible to compare and contrast the different pathways. It is clear that wellbeingin China, and Asia, is not increased levels of consumption and,therefore, GDP but the quality of life, reflected in level of urban services and incomes. s and pnd	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13161	3		6		The needs, aspirations and demands for wellbeing do not reflect where they are in the development process but reflect diverse trends, drivers and patterns of resource use which requires different analytical frameworks and there is no obvious business as usual scenario. what needs to be assessed is the potential of society to be transformed to support sustainable pathways.	Noted. ES statements changed substantially so sentence does not exist. New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
34511	3		6		Exec Sum overall - seems to have enormous confidence in its assessment – almost every bold statement claims at least 'high confidence' even on things that appear to an important degree to be subjective, or where the literature is thin and I suspect divergent. Even if the full author team has 'high confidence', at minimum, consider adding the "[low/medium/high]... agreement' statement which is distinct from the Confidence assessment.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
34513	3		6		Exec Sum and maybe broader: think carefully about use of TLAs. Is DLS a new one? I didn't recognise ASI (used on first page, only defined on second). LED I've got to know but other readers maybe not. TLAs are always a potential barrier to readers and give impression of a clique of experts talking to themselves.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)



IPCC AR6 WGIII - First Order Draft Review Comments and Responses - Chapter 5

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
12829	3	1	96	7	The chapter focuses on human wellbeing, an issue that is of urgent concern for impoverished and marginalised people around the world. However, much of the discussion in this chapter exclusive focuses on the small percentage of the world population who are consumers with both buying power and choice. While this segment of the population is contributing significantly to emissions, a focus on wellbeing also demands increased attention on improving the conditions of the impoverished. The discussion of food waste, for example, briefly mentions world hunger but does not investigate the implications of this for wellbeing, or climate or what addressing hunger entails. Where the discussion is exclusively concerned with those who are free to change their behaviour, this should be made clear as opposed to making general references to 'people'.	Accepted. A new table linking wellbeing aspects to mitigation options presented in section 5.2.	Dina Townsend	University of Witwatersrand	Austria
11907	3	0			Energy use and the inequality of energy use is largely missing from the exec summary, and would be a useful way to frame the importance of this chapter (how to develop sustainably).	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
11909	3	0			Please provide a definition of "service" and "service delivery system" at the outset of the chapter (in the exec. summary)	Noted. New glossary term added and section, social science primer added these terms.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
25627	3	1			The chapter motivates the need for deep reductions in consumption on the basis that there is little evidence that emissions have been absolutely decoupled from production (p.13; except for countries with very high levels of consumption, see chapter 2). The fact that decoupling is not a solution is a very important point and it should be emphasised in the Executive Summary.	Accepted. The revised message is that demand side options and changes there in has driven the decoupling story so far.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
25629	3	1			As a logical consequence of the fact that emissions cannot be absolutely decoupled from production, the chapter suggests that climate mitigation may require a reduction in demand, with the implication that this may reduce economic growth (p.99 line 1). This is a very important point that should be emphasised in the Executive Summary.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
25631	3	1			The chapter suggests that wealth distribution "simultaneously advances equity, wellbeing, and mitigation goals" (p. 23 line 35, also p.26 and passim). This important point could be mentioned in the Executive Summary.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
41373	3	2			I think it would help if the opening para of the exec sum succinctly saying what demand and service aspects of mitigation are	Accepted. Added.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
42111	3	29			ASI without its long hand - need long hand first	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
29411	3	30			"Models with lifestyle case ..." is unclear, should maybe read "Models with lifestyle changes"? Please rephrase.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Stefan Pauliuk	University	Germany
13187	4	1	4	1	(+) recognition of social tipping dynamics based on carbon neutral societies, and not carbon neutral economies, with renewable energy, carbon neutral cities and lifestyles - 'Social Tipping Dynamics for Stabilizing Earth's Climate by 2050', 2354 - 2365 PNAS Feb 4 2020 vol 117 No. 5	Noted. ES statements changed substantially. Referenced in 5.4.1	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
38197	4	1	4	4	LED should be spelled out. You refer to low demand which could also include other resources but actually you are talking about low energy demand only. Please clarify	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
18079	4	2	4	4	The paper on the LED scenario is hugely valuable for this work, but still I do not think an assessment report can rely on only one paper when drafting synthetic statements in a summary section, so I propose this needs to be corroborated on a larger literature in order to meet IPCC standards	Noted. ES statements changed substantially . New sentence added to reflect revised sections text. 5.4 now includes a table with a wide selection of scenarios.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
11915	4	5	4	5	Please consider explaining the concept of Avoid-Shift-Improve in the exec summary or include it in the glossary.	Accepted and included in glossary	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
13189	4	5	4	5	(+) high emission pathways	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
34475	4	5	4	10	The ASI approach as described by "Towards demand-side solutions for mitigating climate change University of Rose 2018" describes different measures for what is "shift". The same in Table 5.4 of the present report. Some of those measures are related to sufficiency and behaviours (ex. shift way of transportation). Other are related to efficiency and technology (ex. heat pumps in the buildings or LED lighting). We suggest the methodology described by Negawatt framework <a href="https://negawatt.org/en">https://negawatt.org/en</a>	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Emmanuel RAUZIER	NGO Association negaWatt	France
38199	4	5	4	10	The ASI approach should be AIS as it does not make any sense to use RE for running inefficient systems. See for reference the Negawatt framework <a href="https://negawatt.org/en">https://negawatt.org/en</a> and the French Energy Transition law: <a href="https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031044385">https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031044385</a>	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
13191	4	11	4	11	(-) the shared economy	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
15329	4	11	4	11	Maybe "sharing economy" instead of "shared economy"	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Simone D'Alessandro	University of Pisa	Italy
29267	4	11	4	11	This is a very important point; please link to inconclusive statements in Chapter 1	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Vanesa Castan Broto	University of Sheffield	United Kingdom (of Great Britain and Northern Ireland)
11917	4	11	4	12	This statement seems quite strong and is not fully in line with the more nuanced position taken later in the chapter. Perhaps the risks of digitalisation and the importance of management should be emphasised, rather than stating that digitalisation contributes "little, if at all" to mitigation. Also consider fusing this point with the following paragraph on regulation, as they now read as quite contrasting points.	Accepted. Digitalisation has been introduced now more coherently in the whole report linking it with chapter 5 presentations.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30517	4	11	4	14	less confusing might be - 'while circular economic (etc) could contribute significantly to mitigation, current trends contribute little'... otherwise the brain seems to absorb that the circular economy cannot contribute, even though that is not what you are saying.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
2613	4	11	4	19	A 2015 report by the World Bank ( <a href="http://www.worldbank.org/en/topic/ict/brief/connections-note-30">http://www.worldbank.org/en/topic/ict/brief/connections-note-30</a> ) estimated that there is a 20% reduction in annual global carbon emissions by 2030 through expanded application of information and communication technologies i.e. digitisation.	Noted. ES statements changed substantially . See revised section on megatrends digitization and box in Ch16 on digitization. World Bank link could not be recovered.	Michael Czerniak	Atlas Copco - Edwards	United Kingdom (of Great Britain and Northern Ireland)
12831	4	11	4	19	Discussion of economic mega trends needs to include consideration of the social impacts of these trends, especially on vulnerable groups. Although this is discussed briefly later in the report, it should also be mentioned here in the introductory paragraphs.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Dina Townsend	University of Witwatersrand	Austria
38299	4	11	4	19	assuming fossil fuels drive digitisation but what of renewables?	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
45579	4	11	4	19	this is important and little-known. Consider moving to beginning of exec summary	Noted. ES statements changed substantially .	Daniel Crow	International Energy Agency	France
42717	4	14	4	14	mention rebound effect, e.g. "... due to scale effects and rebound effects".	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
37279	4	15	4	17	subject-verb agreement; "have" not "has"	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Michiel Schaeffer	Climate Analytics	Netherlands
42719	4	17	4	19	mention in this context the concept of 'debound'; see Schneider, 2008: <a href="https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.612.9569&amp;rep=rep1&amp;type=pdf">https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.612.9569&amp;rep=rep1&amp;type=pdf</a>	Noted. ES statements changed substantially . Did not use 'debound' to limit number of different concepts.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
18081	4	17	4	21	Avoid normative language ("policy prescriptive")	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
1045	4	18	4	18	"rebound...must be carefully avoided" This seems too categorical. The tradeoff between constraining energy/emissions and economic welfare means it is far from clear this is the proper prescription. ****	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Harry Saunders	Carnegie Institution for Science	United States of America
24623	4	20	4	20	Technical support and technological assistances should be dedicated to the developing countries to reducing power losses in power grids	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Sanaz Jafarzadeh	Thermal Power Plants Holding Company	Iran
34477	4	20	4	28	Digital improvements and consumption reduction (lines 25 to 28) are relevant. But what is the relationship with sufficiency policies as indicated on lines 20 to 24 such as mobility sharing and coweringing ?	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Emmanuel RAUZIER	NGO Association negaWatt	France
44403	4	23	4	23	and e-learning, with the innovation of MOOC Pedro Isaias, Dr Piet Kommers, Dr Tomayess Issa, D. and binti Mohamed Sofiadin, A. (2014), "Sustainable development, e-learning and Web 3.0: A descriptive literature review", Journal of Information, Communication and Ethics in Society, Vol. 12 No. 3, pp. 157-176. <a href="https://doi.org/10.1108/JICES-03-2014-0018">https://doi.org/10.1108/JICES-03-2014-0018</a> S.A. Odukaibe and O.O. Olugbara 2012. Mitigating rural e-learning sustainability challenges using cloud computing technology", Lecture Notes in Electrical Engineering, 247: 497-511.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text. Reference suggestions forwarded to digitalization box in Ch. 16	Urbano Fra Paleo	University of Extremadura	Spain
42721	4	25	4	27	Should not look at watts but at watt hours of usage, otherwise we are judging an efficiency measure, when what matters is absolute use. So need to consider hours of usage here! And if possible should also consider life-cycle energy, emissions, and critical materials embedded in smartphones.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
13193	4	29	4	29	(+) in cities	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic Knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visiting status at Tsinghua University, Beijing	India
11919	4	29	4	34	Please differentiate if and how this is providing new information on GHG emissions from food waste from that provided in the SRCCL.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
37281	4	29	4	34	Partially true in industrialized countries that consumers are the main source of waste	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Michiel Schaeffer	Climate Analytics	Netherlands
42723	4	29	4	35	should mention co-benefits in terms of reducing biodiversity loss	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
15779	4	35	4	36	The WHO has recently retired its former support to the EAT Lancet diet, low in proteins, based on health issues and other reasons. For example: British Medical Journal BMJ reports WHO withdraw support for the "Planetary Diet" <a href="https://www.bmj.com/content/365/bmj.11700">https://www.bmj.com/content/365/bmj.11700</a> , so there seems to be some discussion on whether such a diet would be applicable to all the world's population and whether it is indeed healthy. I checked the WHO recommended diet at <a href="https://www.who.int/en/news-room/fact-sheets/detail/healthy-diet">https://www.who.int/en/news-room/fact-sheets/detail/healthy-diet</a> and there is no reference on recommended protein or carbohydrate intake. There are other critics who state that the "EAT Lancet report not backed by rigorous science: <a href="https://www.nutritioncoalition.us/news/eatlancet-report-one-sided">https://www.nutritioncoalition.us/news/eatlancet-report-one-sided</a> The US Dietary Guidelines, one key pillar of the EAT Lancet report, is also questioned: <a href="https://www.nutritioncoalition.us/there-is-concern-about-the-dietary-guidelines">https://www.nutritioncoalition.us/there-is-concern-about-the-dietary-guidelines</a> Stating that "low meat diets are healthier" needs to be supported by research. For example, this article states that "Unless vegans regularly consume foods that are fortified with these nutrients, appropriate supplements should be consumed. In some cases, iron and zinc status of vegans may also be of concern because of the limited bioavailability of these minerals." Others state "The reduced mortality from cancer among those not eating meat is not explained by lifestyle related risk factors, which have a low prevalence among vegetarians. No firm conclusion can be made about deaths from ischaemic heart disease. These data do not justify advice to exclude meat from the diet since there are several attributes of a vegetarian diet apart from not eating meat which might reduce the risk." cited from Risk of death from cancer and ischaemic heart disease in meat and non-meat eaters BMJ 1994; 308 doi: <a href="https://doi.org/10.1136/bmj.308.6945.1667">https://doi.org/10.1136/bmj.308.6945.1667</a> (Published 25 June 1994) BMJ 1994;308:1667 <a href="https://www.bmj.com/content/308/6945/1667.abstract">https://www.bmj.com/content/308/6945/1667.abstract</a> Meat producing countries are starting to use silvopastoral systems (SPS) for sustainable carbon neutral meat production. Some countries have published articles and set themselves targets to achieve carbon neutral meat production.	Noted. These references on sustainable food systems have been added in the SOD, but dietary influences on health are beyond the scope of this chapter. Meat in diets, human health and emissions are treated much more fully in Chapter 7.	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnológico de Buenos Aires	Argentina

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15779	4	35	4	36	comment continued: For example, the Australian Beef Sustainability states that "In 2017 the Australian red meat industry set an ambitious target to be carbon neutral by 2030." and that "A new indicator has been added to the 2019 Annual Update to publicly track the industry's CN30 (Carbon Neutral by 2030) initiative. Since the baseline year of 2005, the industry has reduced absolute emissions by 55.7% (for the most recent reporting period of 2016) largely through a focus on improving productivity and vegetation management practices." Sources: <a href="https://www.sustainableaustralianbeef.com.au/managing-climate-change-risk">https://www.sustainableaustralianbeef.com.au/managing-climate-change-risk</a> and also "ABSF_2019_Australian_Beef_Sustainability_Annual_Update_web.pdf" In the UK, the NFU states "The NFU has reiterated that improvements in productivity, carbon capture and renewable energy production are the most effective ways to reach agricultural net zero targets, as part of its ambition to reach net zero by 2040." reference: <a href="https://www.nfonline.com/news/latest-news/nfu-reiterates-its-net-zero-aims-for-agriculture">https://www.nfonline.com/news/latest-news/nfu-reiterates-its-net-zero-aims-for-agriculture</a> . New peer reviewed research UK and Australia, as well in Brazil, Argentina, Colombia show that migrating to carbon neutral meat production is a feasible climate change mitigation action. In Brazil, EMBRAPA has published studies which support the viability of carbon neutral beef: "http://www.alice.cnptia.embrapa.br/alice/handle/doc/1118359" and also this article: <a href="https://www.alice.cnptia.embrapa.br/bitstream/doc/1118439/1/Economicanalysisof.pdf">https://www.alice.cnptia.embrapa.br/bitstream/doc/1118439/1/Economicanalysisof.pdf</a> and this third article <a href="https://link.springer.com/article/10.1007/s10457-019-00460-x">https://link.springer.com/article/10.1007/s10457-019-00460-x</a> In USA, studies are being done in this sense, for example by Yale "Silvopastoral systems and climate change mitigation in Latin America" by Montagnini, F., Ibrahim, M., Murgueta, E. Restrepo at <a href="https://pdfs.semanticscholar.org/018b/34c7da1176d1e9134edd1aabe7a0ab98a7f.pdf">https://pdfs.semanticscholar.org/018b/34c7da1176d1e9134edd1aabe7a0ab98a7f.pdf</a> In Colombia: Charry, A., Narjes, M., Enciso, K. et al. Sustainable intensification of beef production in Colombia—Chances for product differentiation and price premiums. <i>Agric Econ</i> 7, 22 (2019). <a href="https://doi.org/10.1186/s40100-019-0143-7">https://doi.org/10.1186/s40100-019-0143-7</a> IPCC should support these meat production mitigation initiatives, because they might offer carbon neutral protein solutions to humankind.	Noted. These references on sustainable food systems have been added in the SOD, but dietary influences on health are beyond the scope of this chapter. Meat in diets, human health and emissions are treated much more fully in Chapter 7.	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnológico de Buenos Aires	Argentina
30543	4	35	4	37	"Plant-based nutrition" is not a commonly used term in the literature on dietary shifts and climate change. It is unclear exactly what the authors mean by this and is only used in this part of the chapter.	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
11921	4	35	4	38	Please consider adding an explanation for the varying estimates of GHG emissions reductions from diets in this sentence.	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
30519	4	35	4	38	Could you use % to give the layperson better understanding/perspective? The SR1.5C Chapter 4 had a statement of "dietary changes could lead to 1/5th of needed emissions for an under 2C.... This was a powerful way to describe	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
11903	4	36	4	37	Please consider removing "plant based nutrition" in this sentence, as it seems sufficient and consistent with the rest of the chapter to use the terms low meat, vegetarian and vegan diet	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
30545	4	36	4	37	The authors list 4 types of dietary shifts: "low meat diets, plant-based nutrition, vegetarian diets, or vegan diets" but only three ranges of respective GHG emissions.	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
11923	4	38	4	40	Please consider incorporating material on the importance of structural changes and policy tools for behaviour change here (and in the chapter), as "motivations and new beliefs" are seldom sufficient to enable behaviour change. Consider fusing this point with the points on page 5 of the exec. summar (lines 15-20 and lines 36-39) as they all relate to behaviour change.	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
30521	4	38	4	40	Could you reflect too, the positive of how many people are already switching because it is a meaningful way to contribute against rising temperatures - citizens are more motivated than many governments give credit -	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
42725	4	39	4	39	not only behavioural change needed! Need to consider the whole system of provision, see systems of provision literature (e.g. Fine, Ben (2004) 'Debating Production-Consumption Linkages in Food Studies'. <i>Sociologia Ruralis</i> , (44) 3, pp 332-342. )	Noted. ES statements changed substantially. New sentence added to reflect revised sections text. Agreeing with the importance of getting production and consumption together. The Ben Fine reference is not helpful, as it relates to a scholarly debate, not to assessment. Our current text refers 32 times to production, thus acknowledging its importance. The actor space analysis in 5.4 involves consumers only in one of five actors, relating professionals and investors to the production side.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42727	4	41	4	41	I guess it should say: "Differences in spatial structures..."	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
22725	4	41	4	42	"Spatial structures of service provisioning result in a factor 10 difference in GHG emissions of transport ... Improved urban planning ... help avoiding kilometers travelled". There is an emerging body of literature showing that kilometers travelled and emissions from long-distance travel are higher in dense urban areas, and that that can offset the emission gains from lower levels of car travel there (especially if non-CO2 climate impacts are taken into account). For a comprehensive review see Czekiewicz, M., Heinonen, J., & Ottelin, J. (2018). Why do urbanites travel more than do others? A review of associations between urban form and long-distance leisure travel. <i>Environmental Research Letters</i> , 13(7), 073001.	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Giulio Mattioli	TU Dortmund University	Germany
30523	4	41	4	42	Is there any way you can write this in plain and simply English? So many people reading this are not native English speakers and this sentence makes one shout, 'what are they talking about?' "Spatial structures of service provisioning result in a factor 10 difference in GHG emissions of transport"	Noted. ES statements changed substantially. New sentence added to reflect revised sections text.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
13195	4	45	4	45	(+) public and shared transport, especially electric vehicles	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13197	4	48	4	48	(+) size	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
44271	4	48	4	50	There is no need to describe specific solutions but aiming at a target for very low energy consumption.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	BERTOLDI PAOLO	European Commission	Italy
2181	4	49	4	49	Please, add the following sentence after "thermal mass": " luminiscent concretes (Sanjuán et al 2020)...".	Rejected, as there was no space for specifics in the revised version.	Miguel Angel Sanjuán	Technical University of Madrid	Spain
11925	4	49	4	50	Please define/explain "space conditioning services" here.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
44273	4	50	4	51	The reduction of standby mode is one of the succe story of energy efficiency policies, what is now worrying is the on-mode energy consumption. I suggest to indicate the need for "sufficient and efficient appliances".	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	BERTOLDI PAOLO	European Commission	Italy
25633	4	11	5	11	Two sentences almost contradict: "the circular economy contribute[s] little, if at all, [to] climate change mitigation" and "In combination with pricing of energy use and GHG emission, the circular economy supports climate mitigation". If the first sentence is true, then the second sentence suggests that it is pricing that matters, and the circular economy has little to do with it.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
3211	4	51	5	2	The sentence should read: Smaller dwellings, shared housing, and building lifespan extension are all consistent with DLS and can reduce overall demand for lighting and space conditioning services and thus can reduce the overall demand for carbon-intensive building materials such as concrete and steel.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Klaus Radunsky	retired from Umweltbundesamt	Austria
23003	4	11			This statement is not supported by the underlying section. The analysis has not been conducted to allow a conclusive evaluation as to whether these trends already influence emissions. To turn the absences of conclusive evidence into a conclusive absence of an effect is not justified.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
5969	4				statement: 'Current energy and GHG emission trends related to digitalization, the shared economy, and the circular economy contribute little, if at all, climate change mitigation (high confidence).' would be an over-exaggeration. Digital economy constitutes a crucial factor in making energy sectors more effective and environmentally friendly. For instance, a promotion of Electric vehicles requires additional charging stations, in turn charging stations need to be coordinated with energy systems overall in order to avoid frequent electricity blackouts. Thus, digital technolgis for automated price discounts and premius is crucial for the development of electric vehicles. Otherwise, the shift to electric vehicles will not occur and diesel will dominate.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Belyi Andrei	University of Eastern Finland, Centre for Climate Change, Energy and Environmental Law	Estonia
42113	5	15	3	20	I would have thought this bullet should have been earlier.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
33101	5	24	3	32	Monitoring and evaluation national level commitment and implementation should be developped as a framework to oversee demand side service oriented solution.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Edris Alam	Rabdan Acadmey	United Arab Emirates
6563	5	1	5	4	This paragraph is too complex to understand and has too many acronyms.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
13199	5	3	5	3	(+) shared and	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
29997	5	5	5	5	improve should be improves	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Brett Cohen	The Green House consultants	South Africa
13201	5	5	5	15	;(+) in high emission pathways; (+) in particular in these areas	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
42729	5	7	5	8	mention importance of public ownership	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
11905	5	10	5	14	Very important paragraph. Please consider to move up to line 29 on page 4, for better context with previous paragraphs on digitalization and the circular and sharing economy	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
30525	5	10	5	14	The leading sentence in bold is not really representative of the following sentence, which is profound in what it is saying. Could that sentence be bod? Or the initial sentece better reflect what you are saying, vis a vis unsustainable production/consumption?	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
24351	5	10	5	45	The discussion of solutions, policies, and options makes little mention of standards which are one of the most effective means of changing demand-side technologies and infrastructure	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
29999	5	11	5	13	this sentence needs to be reworded to be clearer	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Brett Cohen	The Green House consultants	South Africa
30001	5	11	5	13	This message appears at first reading to be counter to the message on Page 4 line 11-12, where it states categorically that the circular economy contributes little to mitigation. I recognise that the message on page 5 refers to circular economy in combination with pricing, however it is recommended that some alignment between the two messages be achieved	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Brett Cohen	The Green House consultants	South Africa
23005	5	11	5	19	Mixing the three trends together is not advisable, especially since specific issues that are part of the trends is discussed later. Also, at several places, prominence is given to the ability of these approaches to reduce emissions in the future, so starting out their discussion with dismissing their current impact is poor communication. Consider, for example, that reducing food waste, the next bullet point, is part of the circular economy, and you make the point that it has a substantial potential to reduce GHG emissions.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
38201	5	11	5	28	See for reference: <a href="https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf">https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf</a> on the contribution of digitalisation to GHG emissions	Referenced in 5.4.3.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
11927	5	12	5	12	What is meant by 'scope' here? Do the authors mean 'reach'?	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
23011	5	12	5	14	I am not sure why you say this and what it means. What does 'out of scope' mean in this context?	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
11987	5	15	5	15	Correct "climate mitigation" to "climate change mitigation"	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
38301	5	15	5	20	excellent!	Thanks.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
38207	5	15	5	31	These two paragraphs should go up before all the paragraphs on the importance of individual behavior change.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
30853	5	15	5	39	The strength and importance of this conclusion in these statement means I would suggest it is moved earlier to before page 3 41. Having set out the importance of wellbeing and DLS, I would argue that the most fundamental conclusion presented is 'Individual component level change achieve little...' Moving these statements forward would send a clearer message to governments, organisations and citizens as to the importance of institutional and structural level action	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
13203	5	19	5	19	(+) values and	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledging on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13205	5	21	5	21	(+) values, which g as major drivers of o onto shape building and maintaining the stock of energy demnd associated with their use as major drivers of the economy and society and material use - "The global Metabolic Transition: Regional Patterns and Trends of Global Material Flows, 1950 - 2010" (2014) Anke Schfarzel, Andreas Mayer, SimoneGingrich, Nina Eisenmenger, Christian Loy, Fridolin Krausmann," Global Environmental Change", 26 (2014) 87 -97	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledging on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
18083	5	21	5	25	Avoid normative language ("policy prescriptive")	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
34479	5	21	5	25	Changing behaviour and sufficiency require regulation reinforced by pedagogical advertising	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Emmanuel RAUZIER	NGO Association negaWatt	France
13207	5	26	5	26	(+) in high emission pathways	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledging on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
35737	5	26	5	27	Some behavioural change may not look like being embedded in structural change until a point when it somehow becomes a trigger for structural or cultural change: think of avoiding flights for climate reasons - for a long time this may have looked futile, but now not flying as a consumer choice is a factor that the airline industry considers very important in its growth projections.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Miklós Antal	Eötvös Loránd University	Hungary
11929	5	26	5	28	Why is only 'energy' consumption included here? Please provide an explanation for this delineation or broaden out to cover other sectors/issues (as the points made are quite transferrable).	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
35873	5	26	5	28	Behavioral change is being considered as an important action for climate change mitigation. Behaviour causes climate change, climate change alters behaviour and behaviour alters climate change. The need for behavioral change has also been highlighted in the earlier IPCC reports (1.5). Probably, behavioural change is not going to happen easily, but the world is changing fast. If you see, how the coronavirus has entirely changed the lifestyle of people and how this will reduce climate change. Let us be open to some possibilities as all this is highly quoted in newspapers which will mention that behavioral change is not important for climate change and this will ruin the efforts of people who are trying hard to bring such a change including India which promotes sustainable lifestyle as a means to combat climate change. This is quite evident in figure 5.12 and section 5.4.1.1 & 5.4.3. Line 13-14 on Page 74 also reflect the same. Lifestyle change is a part of behavioural change. Please refer to: <a href="https://www.nature.com/articles/s41467-019-12457-2">https://www.nature.com/articles/s41467-019-12457-2</a> ; <a href="https://www.nature.com/articles/nclimate2622">https://www.nature.com/articles/nclimate2622</a> ; <a href="https://www.nature.com/articles/s41562-018-0459-4">https://www.nature.com/articles/s41562-018-0459-4</a> ; <a href="https://www.nature.com/articles/s41558-017-0031-7">https://www.nature.com/articles/s41558-017-0031-7</a> ; <a href="https://behavioralscientist.org/fight-climate-change-with-behavior-change/">https://behavioralscientist.org/fight-climate-change-with-behavior-change/</a> ; <a href="https://link.springer.com/article/10.1007/s11027-017-9763-y">https://link.springer.com/article/10.1007/s11027-017-9763-y</a> ; <a href="https://rare.org/wp-content/uploads/2019/02/2018-CCNBC-Report.pdf">https://rare.org/wp-content/uploads/2019/02/2018-CCNBC-Report.pdf</a>	Noted. ES statements changed substantially . Reference included in 5.4.1 A key conclusion of Ch5 is that "Behavioral change, not embedded in structural and cultural change, is insufficient for climate change mitigation" as reflected in the new ES.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
29269	5	26	5	31	This is a very important point; please link to discussion on behaviour change in Chapter 1	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Vanesa Castan Broto	University of Sheffield	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30873	5	26	5	31	Consider adding after end of line 31 a comment similar to: 'The motivation and capacity of individuals and collectives to Avoid and Shift are also negative impacted by external factors promoting greater consumption. Key factors here are the pro GPD growth narratives and the collective impact of the marketing of goods and services aiming to create and maintaining consumer demand' Evidence supporting this additional comment is added in the relevant section 5.4.1	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
13209	5	27	5	27	(+) around the world	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
30549	5	27	5	39	The behavioral change discussion should be broaded to discuss individual or household motivation to engage in climate-friendly behaviors, to include other non-energy consumption related behaviors that impact climate change (e.g., dietary changes)	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
46243	5	28	5	28	Motivation → motivation (capital M sounds strange there)	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Beat Brunner	Lightning MultiCom SA	Switzerland
13211	5	29	5	29	(+) are shaped by values and	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
29413	5	29	5	30	there should be a hyphen in socio-demographic, despite the line break.	Agreed and changed.	Stefan Pauliuk	University	Germany
37283	5	32	5	33	sentence does not make sense as written: "Decision making that does not follow standard rational model is prevalent in many energy-relevant contexts and require regulation beyond economic incentives" Below it is explained how individuals do not just act as rational consumers. Maybe the first sentence is clearer by just specifying which decision we're dealing with. Suggest "Consumer decision making often do not follow standard rational models in many energy-relevant contexts and influencing consumer demand requires regulation beyond economic incentives"	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Michiel Schaeffer	Climate Analytics	Netherlands
6559	5	32	5	39	The writing and grammar should be improved	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
38203	5	35	5	40	Once again teh focus is individual behavior change while this change cannot happen if the production and distribution sytems including subsidies for the production of food do not change, see references included in comment #1	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
13213	5	39	5	39	(+) extensive adoption of public transport and	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
38205	5	41	5	47	Spatial structures have a huge impact on reducing GHG from both transport and buildings	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
11931	5	42	5	45	The point about participation is substatively different from social movements, and could with benefit be separated out and expanded upon.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
12343	5	46	5	46	This sentence is quite non-descriptive. Please consider making it more descriptive.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
37285	5	47	5	47	"dedicated"	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Michiel Schaeffer	Climate Analytics	Netherlands
11933	5	48	5	49	Please explain how these groups find entry points in the political process.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
13215	5	49	5	49	(+) design and	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
38303	5	46	6	2	very true c.f Centre for Alternative Technology in Wales, UK and www.diyngo.org in Kenya, Africa	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
18833	5		55		Transition to a low carbon demand society will be effective if practical approaches in educating teenagers in schools and engaging in proactive street campaign on the benefits of low carbon technologies adoption	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Michael Ugom	University of Nigeria, Nsukka	Nigeria
23007	5	3			The suggested measures are technical in nature and I do not see that you have provided conclusive evidence in the section for improved well-being. Service intensity often entails inconvenience, such as sharing a ride or living in the same building as others. While providing opportunity to socialize, which is likely good for most of us, it is not what many prefer. In any case, if this is your conclusion, you need to make sure it is supported by the evidence you provide. Also in the subsequent lines, you should point to the connection to well-being.	Accepted. Substatial revision added in the chapter in revised draft in Section 5.2, 5.3.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
23009	5	11			This statement flat out contradicts the statement on p.4, line 12.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
29415	5	47			decicating -> dedicated	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Stefan Pauliuk	University	Germany
13217	6	1	6	1	(+) enable modified	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30855	6	3	6	3	Consider changing language: 'Threaten viability' sounds as though climate change is the damaging agent here and frames stopping these damaging business practices as a 'bad' thing. When it is appropriate that environmentally and socially damaging business models are stopped.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
18085	6	3	6	7	Unclear, needs strong revision	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
37287	6	3	6	7	text does not follow or correspond to the bold heading	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Michiel Schaeffer	Climate Analytics	Netherlands
42731	6	3	6	7	Should discuss here the threat of escalating inequality through intensified rent-extraction in a resource-constrained / lower-demand future. See Stratford, 2020 (Ecological Economics): <a href="https://www.sciencedirect.com/science/article/pii/S0921800919304203">https://www.sciencedirect.com/science/article/pii/S0921800919304203</a>	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
24993	6	4	6	5	Delete "Lobby activism ... political action."	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
13219	6	5	6	5	(+) in high emission pathways; (+) in low emission pathways [NEED TO DISTINGUISH BOTH AS THEY WILL NOT CONVERGE ]	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledge on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
11935	6	8	6	11	It would be useful to explain or provide an example of how middle actors play a crucial role in establishing low-carbon practices.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
46245	6	8	6	11	There are two reasons : 1. Ignorance → Education. 2. Financial interests of those middle actors are often not in line with sustainability (e.g. car dealers' business model revolves around car services more than car sales, and with Evs much less service is needed with fewer and longer lasting parts)→ changes of business models needed. E.g. <a href="https://electrek.co/2016/07/11/tesla-finishes-last-mystery-shoppers-study-staff-like-museum-curators/">https://electrek.co/2016/07/11/tesla-finishes-last-mystery-shoppers-study-staff-like-museum-curators/</a>	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Beat Brunner	Lightning MultiCom SA	Switzerland
13221	6	9	6	9	(+) where urban design enables	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledge on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
35875	6	12	6	15	It is natural, but the idea is to push for more. Certain policies make the citizens realise that it could be more beneficial for them just like the solar photovoltaics in India and Electric vehicles, which they could never think was their priority.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
13223	6	14	6	14	(+) sharing society	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledge on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13225	6	16	6	16	(+) comarable levels of wellbeing	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledge on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
24995	6	16	6	18	Delete "Carbon pricing works ... carbon pricing," as this does not apply to all regions/countries	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
30527	6	16	6	18	Add - 'or taxed at extraction', as part of the unfairness concern is that citizes are taxed, but not the companies making money by extracting fossil fuels. It would be good for policy makers to see this in plain language.	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
42733	6	16	6	18	Beyond political acceptability, 'fair' carbon pricing (tax & dividend or similar) is also directly relevant to human well-being because it can ensure that carbon pricing does not impoverish people or further strain or deprive poor or vulnerable communities (e.g. mobility needs).	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
46247	6	16	6	18	Adding CO2 tax on fuels when the prices decrease result in no price increase for consumers. Electricity providers do that very well since long time : They increase taxes when energy prices decrease, so that there is no protest E.g. in Lausanne, they shifted everyone by default to renewable energy when energy prices decreased, and people had to opt for fossil energy explicitly. Almost nobody did that, and the whole town switched to 100 % renewable on a January 1st. Reference: <a href="https://www.24heures.ch/vaud-regions/lausanne-region/passage-courant-vert-privé-sil-6-millions/story/26399030">https://www.24heures.ch/vaud-regions/lausanne-region/passage-courant-vert-privé-sil-6-millions/story/26399030</a> and official announcement: <a href="http://www.lausanne.ch/agenda-actualites/actualites/actualites-municipales.html?actu_id=52490">http://www.lausanne.ch/agenda-actualites/actualites/actualites-municipales.html?actu_id=52490</a>	Noted. ES statements changed substantially . New sentence added to reflect revised sections text. 2nd link was inexistent, and first link behind a pay wall so hard to verify. The power of default settings is highlighted in 5.4.1 and in Table 5.3	Beat Brunner	Lightning MultiCom SA	Switzerland

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13227	6	20	6	20	(-) larger, (+) high emissions; (-) smaller ones (+) low emission pathways	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13229	6	22	6	22	(-) diffusion; (+) based on sustainable societal values, (+) or innovation	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
13231	6	25	6	25	(+) values	Noted. ES statements changed substantially . New sentence added to reflect revised sections text.	MUKUL SANWAL	Co-Chair Expert Group Strategic knowledgeing on Climate Change, Ministry of Science and Technology, Government of India, Visting status at Tsinghua University, beijing	India
24353	6	26	6	26	Comment on the exective summary as a whole: the impression is (1) there is a large potential for service-based change with benefits for CO2 emissions, (2) there is currently little actual service-based change with benefits for CO2 emissions ... but it's not clear (3) what to do with these two basic arguments	Accepted. Revised draft includes messages with more clarity and evidence support.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
24083	7	1	7	11	This chapter should mention (for example in the introduction) the fact that changes in consumption patterns can, in some situations, lead to the fastest observed reduction of emission (much faster than new techology implementation in some cases). Sometime these changes are due to climate (or environmental) policy, sometimes to other events or measures. One environmental policy example is the reduction of the number of parking spaces in European cities that has led to fast reduction of traffic and emissions, for example in Amsterdam (see : <a href="https://www.scientificamerican.com/article/reducing-parking-cut-auto-emission/">https://www.scientificamerican.com/article/reducing-parking-cut-auto-emission/</a> ). An example from other events leading to fast reduction of emissions : the crisis situation from coronavirus outbreak has lead to measures that limited travel in several countries, with a direct impact on emissions (see : <a href="https://www.carbonbrief.org/analysis-coronavirus-has-temporarily-reduced-chinas-co2-emissions-by-a-quarter">https://www.carbonbrief.org/analysis-coronavirus-has-temporarily-reduced-chinas-co2-emissions-by-a-quarter</a> ). Propably much more detailed analysis of the impact of consumption patterns changes related to coronavirus outbreak will be available in the coming months, and should be reflected in some sections of Chapter 5, with due balance (co-benefits and adverse side effects).	Accepted. Text revised	Noé Lecocq	Inter-Environnement Wallonie	Belgium
25635	7	2	7	2	Excellent that social aspects of mitigation are finally being recognised in AR6. Perhaps reference could be made to the fact that only 0.12% of all research funding on climate change has been spent on the social science of climate mitigation (Overland and Sovacool, "The misallocation of climate research funding", Energy Research & Social Science, 2020).	Accepted. Reference included.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
31709	7	12	7	12	Defining human well-being, while being a laudable goal, is also very complex since it would have many cultural and context-specific aspects to it; and is likely to evolve with time. It would be good to mention/discuss these complexities somewhere.	Taken into account. These definitions are now discussed in the Social Sciences annex to Ch. 5.	Ashok Sreenivas	Prayas (Energy Group)	India
5457	7	12	7	15	It is important that "Wellbeing for all" should include future generations. This could be worded as- "Wellbeing for all, now and in the future". References: Jackson, T. (2017). Prosperity without Growth – foundations for the economy of tomorrow. London and New York, Routledge; and O'Neill, D. W., A. L. Fanning, W. F. Lamb and J. K. Steinberger (2018). "A good life for all within planetary boundaries." Nature Sustainability 1(2): 88-95.	Accepted. Well-being is now discussed more fully in the Social Sciences annex.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
11937	7	13	7	13	Please explain what is meant by a 'human-scale perspective'.	Text revised. Word replaced.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
24997	7	15	7	15	Delete "half of"	Accepted. Text revised	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
24999	7	16	7	19	Delete "A focus on human wellbeing ... Hayward and Roy 2019)." as wellbeing is not a "replacement" parameter, it is another proxy that could be used as elaborated later in the chapter	Taken into account. The definitions of well-being in relation to GDP is now discussed in the Social Sciences annex.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
37289	7	16	7	19	much earlier literature as well, at least Daly (1989). Many other relevant references are included on p. 15	Accepted. This paragraph has been deleted and alternate / well-being indicators are now discussed in the Social Sciences annex to Ch. 5).	Michiel Schaeffer	Climate Analytics	Netherlands
9439	7	19	7	21	I don't think you are doing justice to the definition of human wellbeing by focusing on "procedure". Instead, I would suggest using the vast literature on wellbeing (including capabilities and human needs, see authors like Sen, Nussbaum, Doyal & Gough, Max-Neef) to introduce it here. This is the first time you define human wellbeing in this chapter, so it's important to convey what you are actually referring to.	Accepted. Well-being is now discussed in more detail also included in the Social Sciences Primer annex. Some citations by these authirs are already included .	Lina Brand Correa	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
44901	7	19	7	23	Climate change has the potential to influence almost all components of the urban environment and raises new, complex challenges for quality of urban life, health and urban biodiversity.As scientific evidence and the European Commission is encourage us, we should take prompt action towards Urban sustainability through Nature Based solutions; and transformative change governance on Nature Based Solutions.	Noted. Chapter 8 is mandated to have details on Urban sector	Maria Carmen Garcia Mateo	MCG Research&Innovation Sustainability Architecture /Urban Planning	Spain
45583	7	27	7	43	much of this discussion is dry and academic. It looks as those it has been lifted from a textbook. Please give some examples of well-being and reduce the jargon	Accepted. Text revised thoroughly. Concepts are now placed in Social science Primer	Daniel Crow	International Energy Agency	France



Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
23067	7	30	7	33	This sentence seems inaccurate. The evidence is against the statement that “determinants are the commodity inputs in the production of wellbeing”. These are in fact not determinants for the well-being constituents mentioned in the same sentence i.e. an assortment of health and psycho-social components. Commodities are most closely correlated with the material constituent of well-being, measured objectively. See the following references for examples of non-commodity determinates of well-being. Diener, E., Diener, M., & Diener, C. (1995). Factors predicting the subjective well-being of nations. <i>Journal of Personality and Social Psychology</i> , 69(5), 851–864. <a href="https://doi.org/10.1037/0022-3514.69.5.851">https://doi.org/10.1037/0022-3514.69.5.851</a> Tay, L., & Diener, E. (2011). Needs and subjective well-being around the world. <i>Journal of Personality and Social Psychology</i> , 101(2), 354–365. <a href="https://doi.org/10.1037/a0023779">https://doi.org/10.1037/a0023779</a> Costanza, R., Fisher, B., Ali, SaleemBeer, C., Bond, L., Boumans, R., Danigelis, N. L., ... Snapp, R. (2007). Quality of life: An approach integrating opportunities, human needs, and subjective well-being. <i>Ecological Economics</i> , 61(2–3), 267–276. <a href="https://doi.org/10.1016/j.ecolecon.2006.02.023">https://doi.org/10.1016/j.ecolecon.2006.02.023</a> Vita, G., Ivanova, D., Dumitru, A., García-Mira, R., Carrus, G., Stadler, K., ... Hertwich, E. G. (2020). Happier with less? Members of European environmental grassroots initiatives reconcile lower carbon footprints with highVita, G., Ivanova, D., Dumitru, A., García-Mira, R., Carrus, G., Stadler, K., ... Hertwich, E. G. (2020). Happier with less? Members of Eur. Energy Research & Social Science, 60, 101329. <a href="https://doi.org/10.1016/j.erss.2019.101329">https://doi.org/10.1016/j.erss.2019.101329</a> Plus this reference which you already cover: Kahneman, D., & Deaton, A. (2010). High income improves evaluation of life but not emotional well-being. <i>Proceedings of the National Academy of Sciences</i> , 107(38), 16489–16493. <a href="https://doi.org/10.1073/pnas.1011492107">https://doi.org/10.1073/pnas.1011492107</a>	Accepted. The definition of well-being and its relationship with commodities as opposed to services is now discussed in the Social Sciences annex to Ch. 5. Articles by the authors suggested are included .	Gibran Vita	Open University of the Netherlands	Netherlands
31711	7	30	7	33	The determinants of well-being may also include non-commodity elements? If so, the sentence should be reworded accordingly.	Accepted. The definition of well-being and its relationship with commodities and services is now taken up in the Social Sciences annex to Ch. 5.	Ashok Sreenivas	Prayas (Energy Group)	India
42735	7	30	7	33	What are constituents of well-being already depends hugely on the well-being concept (hedonic / eudaimonic / evaluative). Please refer to Brand Correa and Steinberger, 2017.	Accepted. The definition of well-being is now discussed more fully in the Social Sciences annex to Ch. 5.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
26135	7	30	7	43	This paragraph defining human well-being has emphasized more the subjective aspect of well-being, how about the physiological needs and safety needs, it seems material life satisfaction should be the first priority. Well-being can be categorized either as “hedonic” or “eudaimonic”. Such classification seems arbitrary, is this an academically accepted assertion?	Accepted. The definition of well-being and its relationship with commodities and services is now taken up in the Social Sciences annex to Ch. 5. A focus on wellbeing builds on eudaimonic assessment, which is materialistic in its focus on material constituents. It's a useful and important supplement to macro-economic metrics that fail to measure the underlying hardware relevant for livelihoods.	Wenling Liu	Beijing Institute of Technology	China
13671	7	31	7	31	relationship should be relationships	Accepted. Text revised.	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
42737	7	32	7	32	commodity inputs': these don't have to be commodities!	Accepted. Text revised.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42739	7	32	7	32	production of wellbeing': I think it should say, in the 'enabling of wellbeing'. Don't think wellbeing can be 'produced'.	Accepted. Text revised.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42743	7	33	7	40	I would say, the essence of eudaimonic well-being is that it is concerned with the ENABLING of well-being by meeting pre-conditions (needs / capabilities), whereas hedonic well-being and evaluative approaches (e.g. life satisfaction) are concerned with the REALISATION of well-being.	Accepted. Much of the definition and discussion of well-being has been moved to the Social Sciences annex.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
25637	7	33	7	43	The detailed discussion of the differences between hedonic and eudaimonic wellbeing seems excessive this early on in the chapter, and the distinction is only very briefly mentioned again (on p.17, line 14). This discussion could be cut or moved to p.17. This would help keep the focus on the main point here: that welfare is not adequately measured by GDP.	Accepted. The definition and discussion of well-being has been largely moved to the Social Sciences annex.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
42741	7	36	7	36	life satisfaction is not really hedonic (it is not explicitly about maximising pleasure, minimising pain) but evaluative. Refer to Brand Correa and Steinberger, 2017.	Accepted. Text revised.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
23013	7	12	8	49	This section contains some interesting and worthwhile material, which could be integrated in section 5.2. I would suggest replacing it with a simple paragraph. Or maybe, an outline of what was investigated in section 5.1, clearly described as question or objective of the investigation. The section title is very programmatic. A clearer connection to mitigation should be made, which can be about competing social objectives, resource demand, opportunity for synergies, and potential trade-offs.	Taken into account. This section has been revised and much of the discussion of well-being has been moved to the Social Sciences annex.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
23015	7	12	8	49	What misses is an explanation of the overall analytical framework. What are the factors which you look at that are important? Well-being, tied to services, tied to ... Maybe such a framework is expressed in Fig. 5.2. However, what I miss is that there are so many influencing factors on well-being, only some of which are material or connected to services, which are important. Different ways of achieving well-being have radically different energy requirements and GHG outcomes, as well as connection to other SDGs. The overall picture needs to be made clear.	Accepted. The definition of well-being and its relationship with commodities and services is now taken up in the Social Sciences annex to Ch. 5.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
6567	7	1	9	33	This section defining well-being can be cut significantly shorter. Very little relates to climate change and, in this reviewer's opinion, most of the section (5.1.1) is unnecessary.	Accepted. Much of the definition and discussion of well-being has been moved to the Social Sciences annex.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
29425	7	12	31	4	The authors have compiled a comprehensive yet accessible review of the topic of chapter 5, providing the reader with substantial information from different perspectives. In general, the challenge of bringing the complex issue of demand-side mitigation into the linear structure of the text is well mastered. At a few instances, however, I had the impression that the presentation can be more streamlined and less repetitive, for example, when the insufficiency of GDP as welfare indicator is discussed or when the importance of social cohesion is emphasized several times. I therefore ask the authors to make additional checks for logical gaps, coherence, and repetitions in the introductory sections 5.1. and 5.2 when finalizing the report.	Accepted. Sections 5.1 and 5.2 have been revised and condensed, and much of the definition of terms has been moved to the Social Science annex.	Stefan Pauliuk	University	Germany
33571	7	12			Excellent introduction and framing (human wellbeing), possibly still too much of a northern perspective, and too little emphasis on basic human needs at this early stage. It is handled very well later in section (in fact better than any other AR6 chapter reviewed to date), so just cross-reference, and call out early that the survival (basic needs) of billions should take priority over the carbon-intensive comfort and pleasure of millions.	Accepted. global perspective and basic needs reflected .	Debra Roberts	EThekweni Municipality	South Africa
18087	8	1	8	4	Perhaps useful to mention that "rational choice" decisions are driven by preferences, so that models assuming stable preference to model "rational choice" may yield questionable results if based on stable preference assumptions	Accepted. Revised section text now includes discussion on endogenous preference.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
9441	8	1	8	8	I think it would help the reader if you clarify that preference satisfaction (and thus mainstream economics evaluations of welfare) is underpinned by a hedonic conception of wellbeing (see the work of John O'Neill)	Accepted. The definitions are now in Social science Primer	Lina Brand Correa	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
23069	8	1	8	20	The paragraph about preferences seems out of place here. You could consider having a sub-heading on "beyond GDP or beyond welfare-economics" for the next paragraphs in this section in order not to loose the reader.	Accepted. Revised substantially so section heading appropriately changed.	Gibran Vita	Open University of the Netherlands	Netherlands
23017	8	2	8	38	It is not clear why this paragraph is placed where it is. Is this material not covered in Chapter 2? If yes, a simple reference to the appropriate section would suffice. Further, what is key for the present chapter is why the GDP-emissions relationship is relevant for the issues investigated in the present chapter. There is much focus on breaking the energy-GHG link, some focus on breaking the GDP-energy link, and this is the only focus on breaking the wellbeing-GDP link.	Accepted. Text thoroughly revised to keep in focus chapter 5 scope. Conceptual parts are taken out and those relevant for chapter 5 are now in social science primer.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
23019	8	2	8	38	In general, the review of the available evidence misses some of the most prominent papers. For example, 10.5547/01956574.37.2.zcse, 10.1016/j.gloenvcha.2015.04.012.	Rejected. The discussion about the economic relationships between growth and emissions trends and drivers is outside the purview of chapter 5 and are covered in chapter 2.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
44101	8	8	8	10	In addition to price policies (incentives) other (mandatory) measures such as bans on advertising, smoking bans have been implemented.	Accepted. In revised draft section has been thoroughly revised and text deleted in the interest of space.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
44103	8	8	8	10	The fight against "big tobacco" could be mentioned here. See: Brownell K. D., Warner, K. E. (2009). The Perils of Ignoring History: Big Tobacco Played Dirty and Millions Died. How Similar Is Big Food? The Milbank Quarterly, 87 (1), 259-294	Accepted; reference has been added.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
24355	8	18	8	18	I don't get the point about "socially constrained by deliberative decision making" - what does it mean? and surely awareness campaigns and the like are designed to change preferences and choices	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
23113	8	21	8	21	Introduce a sub-heading along the lines of "Decoupling and limits of green growth". PLEASE do mention "living well" initiatives as an option for second order decoupling i.e. decoupling social wellbeing outcomes from impact. See below: Extracted from : Vita, Gibran, Diana Ivanova, Adina Dumitru, Ricardo García-Mira, Giuseppe Carrus, Konstantin Stadler, Karen Krause, Richard Wood, and Edgar G. Hertwich. 2020. "Happier with Less? Members of European Environmental Grassroots Initiatives Reconcile Lower Carbon Footprints with " Energy Research & Social Science 60 (February): 101329. <a href="https://doi.org/10.1016/j.erss.2019.101329">https://doi.org/10.1016/j.erss.2019.101329</a> . The notion of "green growth" assumes that economic growth could be decoupled from greenhouse gas (GHG) emissions via sustainable resource management, strong abatement and efficient resource use(Hatfield-Dodds et al. 2015; (UNEP) 2011). The decoupling pursuit is endorsed by simulation-based research and influential policy agendas((UNEP) 2011; Hatfield-Dodds et al. 2015). Nevertheless, empirical evidence over the past decades shows that no nation has achieved absolute decoupling and that most reported evidence has either overlooked problem-shifting to other resources or countries(Wiedmann et al. 2013; Wood et al. 2018). As a response to realizing the limits of "green growth" via decoupling(Victor 2010; Akenji 2014), alternative models such as "living well" (Sumac Kawsay) in the Global South and "sustainable de-growth" in the Global North, have gained traction across academic, policy and civil spheres(Martinez-Alier et al. 2010; O'Neill et al. 2017; D'Alisa et al. 2015). Their core assumption is that "a good life can be decoupled from environmental damage" (Martínez-Alier et al. 2010; Vita et al. 2019; O'Neill et al. 2017). Their common proposal is to satisfy fundamental human needs directly by endorsing goods and practices that effectively reconcile higher well-being with reduced impact(Vita et al. 2019; Brand-Correa and Steinberger 2017; Jackson 2005). Sustainability-focused grassroots initiatives are suggested to have a role towards this end. Nevertheless, their potential to enable lifestyles of lower impact and higher well-being has not been fully understood(Seyfang and Smith 2007; Hsu et al. n.d.; Hossain 2016). References: (UNEP), United Nations Environment Programme. 2011. Decoupling Environmental Resource Use and Economic Growth Summary. <a href="http://www.unep.org/resourcepanel/Portals/24102/PDFs/DecouplingENGSummary.pdf%5Cnpapers2://publication/uuid/E74B39E8-2ECE-40EB-B447-C245B77DF785">http://www.unep.org/resourcepanel/Portals/24102/PDFs/DecouplingENGSummary.pdf%5Cnpapers2://publication/uuid/E74B39E8-2ECE-40EB-B447-C245B77DF785</a> . Akenji, Lewis. 2014. "Consumer Scapegoatism and Limits to Green Consumerism." Journal of Cleaner Production 63: 13–23. <a href="https://doi.org/10.1016/j.jclepro.2013.05.022">https://doi.org/10.1016/j.jclepro.2013.05.022</a> .	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Gibran Vita	Open University of the Netherlands	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
23113	8	21	8	21	Comment continued: Brand-Correa, Lina I., and Julia K. Steinberger. 2017. "A Framework for Decoupling Human Need Satisfaction From Energy Use." <i>Ecological Economics</i> 141 (November): 43–52. <a href="https://doi.org/10.1016/j.ecolecon.2017.05.019">https://doi.org/10.1016/j.ecolecon.2017.05.019</a> . D'Alisa, Giacomo., Federico. Demaria, Giorgos. Kallis, and S Katherine Nelson. 2015. <i>Degrowth A Vocabulary for a New Era</i> . New York: Routledge. <a href="https://www.routledge.com/Degrowth-A-Vocabulary-for-a-New-Era/DAlisa-Demaria-Kallis/p/book/9781138000773">https://www.routledge.com/Degrowth-A-Vocabulary-for-a-New-Era/DAlisa-Demaria-Kallis/p/book/9781138000773</a> . Hatfield-Dodds, Steve, Heinz Schandl, Philip D. Adams, Timothy M. Baynes, Thomas S. Brinsmead, Brett A. Bryan, Francis H.S. Chiew, et al. 2015. "Australia Is 'free to Choose' Economic Growth and Falling Environmental Pressures." <i>Nature</i> 527 (7576): 49–53. <a href="https://doi.org/10.1038/nature16065">https://doi.org/10.1038/nature16065</a> . Hossain, Mokter. 2016. "Grassroots Innovation: A Systematic Review of Two Decades of Research." <i>Journal of Cleaner Production</i> 137 (September 2015): 973–81. <a href="https://doi.org/10.1016/j.jclepro.2016.07.140">https://doi.org/10.1016/j.jclepro.2016.07.140</a> . Hsu, Angel, Niklas Höhne, Takeshi Kuramochi, Mark Roelfsema, Amy Weinfurter, Yihao Xie, Katharina Lütkehermöller, et al. n.d. "A Research Roadmap for Quantifying Non-State and Subnational Climate Mitigation Action." <i>Nature Climate Change</i> . Accessed July 17, 2019. <a href="https://doi.org/10.1038/s41558-018-0338-z">https://doi.org/10.1038/s41558-018-0338-z</a> . Jackson, Tim. 2005. "Live Better by Consuming Less? Is There a 'Double Dividend' in Sustainable Consumption?" <i>Journal of Industrial Ecology</i> 9 (1–2): 19–36. <a href="https://doi.org/10.1162/1088198054084734">https://doi.org/10.1162/1088198054084734</a> . Martinez-Alier, Joan, Unai Pascual, Franck-Dominique Vivien, and Edwin Zaccal. 2010. "Sustainable De-Growth: Mapping the Context, Criticisms and Future Prospects of an Emergent Paradigm." <i>Ecological Economics</i> 69 (9): 1741–47. <a href="https://doi.org/10.1016/j.ecolecon.2010.04.017">https://doi.org/10.1016/j.ecolecon.2010.04.017</a> . O'Neill, Daniel W., Andrew L. Fanning, William F. Lamb, Julia K. Steinberger, Daniel W. O'Neill, Andrew L. Fanning, William F. Lamb, and Julia K. Steinberger. 2017. "A Good Life for All within Planetary Boundaries." <i>Nature Sustainability</i> 1 (February): 88–95. <a href="https://doi.org/10.1038/s41893-018-0021-4">https://doi.org/10.1038/s41893-018-0021-4</a> . Seyfang, Gill, and Adrian Smith. 2007. "Grassroots Innovations for Sustainable Development: Towards a New Research and Policy Agenda." <i>Environmental Politics</i> 16 (4): 584–603. <a href="https://doi.org/10.1080/09644010701419121">https://doi.org/10.1080/09644010701419121</a> . Victor, Peter. 2010. "Questioning Economic Growth." <i>Nature</i> 468 (7322): 370–71. <a href="https://doi.org/10.1038/468370a">https://doi.org/10.1038/468370a</a> . Vita, Gibrán, Edgar G. Hertwich, Konstantin Stadler, and Richard Wood. 2019. "Connecting Global Emissions to Fundamental Human Needs and Their Satisfaction." <i>Environmental Research Letters</i> 14 (1): 014002. <a href="https://doi.org/10.1088/1748-9326/aae6e0">https://doi.org/10.1088/1748-9326/aae6e0</a> . Wiedmann, Thomas O., Heinz Schandl, Manfred Lenzen, Daniel Moran, Sangwon Suh, James West, and Keiichiro Kanemoto. 2013. "The Material Footprint of Nations." <i>Proceedings of the National Academy of Sciences of the United States of America</i> 112 (20): 1–6. <a href="https://doi.org/10.1073/pnas.1220362110">https://doi.org/10.1073/pnas.1220362110</a> . Wood, Richard, Konstantin Stadler, Moana Simas, Tatyana Bulavskaya, Stefan Giljum, Stephan Lutter, and Arnold Tukker. 2018. "Growth in Environmental Footprints and Environmental Impacts Embodied in Trade: Resource Efficiency Indicators from EXIOBASE3." <i>Journal of Industrial Ecology</i> 22 (3): 553–64. <a href="https://doi.org/10.1111/jiec.12735">https://doi.org/10.1111/jiec.12735</a> .	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Gibrán Vita	Open University of the Netherlands	Netherlands
981	8	21	8	38	Should this paragraph be here? It breaks up the discussion of wellbeing	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
10055	8	21	8	38	The evidence is supported by multiple disciplines, see interdisciplinary social science review: Jorgenson, A. K., Fiske, S., Hubacek, K., Li, J., McGovern, T., Rick, T., ... & Zycherman, A. (2019). <i>Social science perspectives on drivers of and responses to global climate change</i> . Wiley <i>Interdisciplinary Reviews: Climate Change</i> , 10(1), e554. <a href="https://doi.org/10.1002/wcc.554">https://doi.org/10.1002/wcc.554</a>	Noted. statements changed substantially . New sentence added to reflect revised sections text. This reference has been added in 5.1	Jia Li	U.S. Environmental Protection Agency	United States of America
18089	8	21	8	38	The forthcoming set of two systematic review papers in <i>Env Res Lett</i> (Wiedenhofer, Haberl) will provide strong evidence to substantially revise this para. For example, the energy indicator that seems to be most strongly coupled with GDP is energy, and most energy-GDP decoupling results from improved conversion of primary energy to energy. The energy-GDP causality literature deserves a lot less attention here (lines 24–29), while a lot richer, nuanced statements are possible now based on this pair of articles. As the CLA is co-author of both articles, I trust this will be taken care of, but of course I will be pleased to help e.g. by reviewing the SOD.	Accepted. Reference has been added.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
30003	8	22	8	22	systemic review should be systemic reviews	Reject.	Brett Cohen	The Green House consultants	South Africa
9443	8	24	8	31	In referring to the energy-GDP link, I think there is a significant gap. There is a lot of literature from ecological economics that explores the link between energy use (and energy efficiency) and GDP. Pivotal in this are the empirical work of Robert Ayres and Benjamin Warr.	Noted. statements changed substantially . New sentence added to reflect revised sections text. Reference has been added.	Lina Brand Correa	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
37291	8	26	8	29	discussion here conflates energy use and CO2; while historically valid, in most cases, wording needs to be more careful	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Michiel Schaeffer	Climate Analytics	Netherlands
42747	8	29	8	29	It's not the emissions reductions but the measures adopted for the sake of GHG emissions reductions that may reduce economic growth.	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42749	8	30	8	30	efficiency gains offer obvious opportunities to break the birectional dependency: not necessarily! Efficiency gains drive economic growth, and in fact often increase energy consumption rather than decreasing it (rebound / backfire). See the work of Ayres and Warr, also of Paul Brockway and colleagues.	Noted. statements changed substantially . New sentence added to reflect revised sections text. References have been added.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42751	8	30	8	31	this is circular reasoning and can therefore be misleading: decoupling is defined by lack, or disappearance, of that linkage, so saying it CAN break the linkage is more of an empirical statement (and as the next sentences suggest, not necessarily accurate). Should say decoupling WOULD break the linkage.	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
1317	8	31	8	35	It is stated here that absolute decoupling of growth from emissions has only occurred during recessions or low/no growth - it does not make sense to speak of decoupling during recessions/no growth though - there is no or negative growth in these phases ... I suggest to rephrase this to make this clearer.	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
23021	8	31	8	35	Using older work, you argue that there is at best only relative decoupling, a point no longer valid. I would avoid the term decoupling. The economic literature that IPCC has relied on before has always shown a GDP-energy elasticity of less than one as the norm, with exceptions occurring periodically and in some cases. You point to recent analysis of Le Quere et al. which clearly indicates that emissions reductions have occurred in countries that have grown. Our own econometric analysis shows that absolute decoupling can be explained by a combination of factor productivity increase, changes in energy mix, electrification and deindustrialization. <a href="https://doi.org/10.31235/osf.io/ph9ye">https://doi.org/10.31235/osf.io/ph9ye</a> These factors need to be sustained to offset the emissions-raising effect of continued economic growth. Please note that the SI of our paper also contains a systematic literature review which outlines the forms of statistical relationships tested and some of the econometric problems in the existing literature.	Noted. While the chapter team decided to retain the term "decoupling" since it is widely used, these additional references have been added.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
35741	8	34	8	35	GDP does not grow during recessions, so there is no absolute decoupling (unless resource use grows, but that is not the type of absolute decoupling we want to see). Also the expressions "resource use", "material use" and "emissions" is used interchangeably here.	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Miklós Antal	Eötvös Loránd University	Hungary
46551	8	35	8	38	Experiment from Japan could be referenced: Hiroshi Komiya, Beyond the limits to growth: New ideas from Japan, Springer, 2014.	Accepted; reference added.	Vincent MAZAUIC	Schneider Electric / International Chamber of Commerce (ICC)	France
30005	8	37	8	38	"albeit at scales insufficient with mitigation pathways" - appears to be a typo	Noted. statements changed substantially . New sentence added to reflect revised sections text.	Brett Cohen	The Green House consultants	South Africa
10057	8	39	8	40	It's inappropriate to attribute the lack of sustainable development completely to inability of the conventional development indicators to measure well-being. It may be better to rephrase this to something like "The lack of comprehensive measures and considerations of human well-being have contributed to the failure to create more sustainable development."	Accepted. Text revised and sentence constricted differently to reflect the literature .	Jia Li	U.S. Environmental Protection Agency	United States of America
42753	8	39	8	40	This is (usually thought to be) just one factor. The very narrative of development as economic growth is at least as important in that failure. This goes back to the preference satisfaction approach which underpins the rationale for economic growth (more consumption = more preference satisfaction = better).	Accepted. Text revised to reflect the spirit of the comment .	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
38305	8	39	8	49	good discussion of alternatives to DGP. Bravo!	Thanks. We think it ment GDP.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
42755	8	42	8	42	GDP only measures MONETARY exchange and neglects not only inequality and capital services but also non-monetary service provision (e.g. care work). Crucially, GDP measures ALL monetary exchange as positive, no matter if the activity is desirable or undesirable.	Accepted. Text revised	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
44105	8	44	8	46	Add: Years of Good Life (YoG), a new indicator for assessing sustainable progress: Lutz et al. 2018; <a href="http://pure.iiasa.ac.at/id/eprint/15402/">http://pure.iiasa.ac.at/id/eprint/15402/</a> ; you may also add: Health Life Expectancy as health related indicator (see: WHO)	Accepted; reference has been added.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
26495	8	46	8	47	I wouldn't say that finding a single measure for wellbeing is a challenge only because of a lack of data - rather, it's a challenge because of valid debates about what wellbeing is, what it is we're measuring and whether it can, in fact, be measured. See Smith & Reid (2018) Which being in wellbeing? Which 'being' in wellbeing? Ontology, wellness and the geographies of happiness in the <i>Journal Progress in Human Geography</i> <a href="https://journals.sagepub.com/doi/10.1177/0309132517717100">https://journals.sagepub.com/doi/10.1177/0309132517717100</a>	Accepted. More clarification added in revised version around the concept used in this chapter. This reference has been added.	Thomas Smith	Masaryk University	Czech Republic
42757	8	46	8	47	Finding a single measure is in fact conceptually problematic because it would assume commensurability and substitutability of different aspect of well-being (e.g. health, social participation etc), which is at odds with at least the eudaimonic conception of well-being.	Accepted. Text revised.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
983	8	47	8	47	finding a single measure challenging above all because of non-substitutability of components of need-satisfaction/wellbeing. Gough, I. 2015a. Climate change and sustainable welfare: The centrality of human needs. <i>Cambridge Journal of Economics</i> , 39, 1191–1214.	Accepted. Text revised.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
42745	8	2	9	2	preferences are assumed to be fixed - but they are not, they adapt. See e.g. Gough, 2015: Climate change and sustainable welfare. The assumption stated in line 8 is at odds with line 9, which should either be resolved or at least be pointed out.	Accepted. Text revised and reference added.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
18529	8	39	9	8	Key problems with most or even all of these measures for well-being is that they focus on different interpretations of material well-being and cannot include virtually unquantifiable elements of the good life like liberty, autonomy, authenticity, security. Might it help to acknowledge these limitations but to add that no matter what, and no matter how it's measured, material well-being is a necessary part of the good life and (in particular for the developing world) an essential element of sustainable development? I.e., a necessary but not sufficient condition for the good life?	Accepted. Text revised.	Marcel Wissenburg	Radboud University, Nijmegen, The Netherlands	Netherlands
46553	8	39	9	8	Basically, there are two opposite issues: (i) the report splits the demand- (chapter 5) and the supply-sides (chapter 6) which is conform with the notion of GDP. By the way, it implicitly favors a dispatchable energy system to match the social demand, and therefore carbon-based technologies (or nuclear, hydro...). From a thermodynamic point of view these energies are dispatchable because they have access to enough, sometimes infinite, static/steady-state reserves always available (resp. O&G, U, dam...) and then always operable. (ii) to claim the ill-fitting of GDP to address the questions of sustainability and DLS would require to strongly integrate the energy system as a whole to just address a social demand. Even if this aspect is partially done by the digitalization at the \$5321 (and caption of figure 5.10), its contribution is just assessed at the demand level instead of a requirement to technically operate the energy system which is therefore underestimated (at least to manage and control the emerging issues of intermittency, flexibilities, dispersion...)	Accepted. Text revised.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
3723	8	49			()	Accepted. Text revised.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
5973	8				Several systematic review, reviewing more than 8000 individual papers, confirmed that the nexus between economic growth and energy use increases CO2 emissions - a controversial statement even if it bases itself on an external reference (see my general point on the top). Progress in most of the developed economies reveals a decline in emissions intensity (dependence of emissions on economic growth). The UK recently reported to decrease greenhouse gases to its level of late 19 century. A shift from carbon-intensive economies to low intensive economies occurs gradually with the development and with a shift to service-based economies	Accepted. Text revised.	Belyi Andrei	University of Eastern Finland, Centre for Climate Change, Energy and Environmental Law	Estonia
44107	9	2	9	2	social progress indicator (SPI): refer to : Porter, M., Stern, S. & Green, M. Social Progress Index 2017 (Social Progress Imperative, 2017) as this is the primary source	Accepted. This reference has been added in section 5.2.1.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
44109	9	4	9	5	"access to... health": Consequently, access to health services should be addressed in this chapter: see for example the paper mentioned above (Salas and Jha 2019). In this context telehealth could be mentioned as well.	Accepted. This reference has been added in section 5.2.3	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
781	9	9	9	16	There is a potential contradiction between this assertion and other assertions on the potential of low-demand scenario for mitigation (for example, first point of the Executive Summary "Ambitious low-energy demand-side 4 scenarios demonstrate the feasibility...", and other conclusions driven from 1.5 Special report and specifically (Gubler et al. 2018)). If IAM are indeed inadequate, how can we evaluate the potential of low demand scenario? This would need more discussion. This discussion could be useful to better position this chapter in relation to chapter 3 and 4 and describe the specific additional benefits of this chapter. One way to approach this question is to consider that IAM are useful for identifying and pointing to issues, and the latest works cited in this chapter identifies the issue of lifestyles in low demand scenarios, but they are maybe not able to inform this issue in a policy-relevant way. To support this vision: Waismann, H., Bataille, C., Winkler, H., Jotzo, F., Shukla, P., Colombier, M., Buir, D., Criqui, P., Fischelick, M., Kainuma, M., Rovere, E.L., Pye, S., Safonov, G., Siagian, U., Teng, F., Virdis, M.-R., Williams, J., Young, S., Anandarajah, G., Boer, R., Cho, Y., Denis-Ryan, A., Dhar, S., Gaeta, M., Gesteira, C., Haley, B., Hourcade, J.-C., Liu, Q., Lugovoy, O., Masui, T., Mathy, S., Oshiro, K., Parrado, R., Pathak, M., Potashnikov, V., Samadi, S., Sawyer, D., Spencer, T., Tovilla, J., Trollip, H., 2019. A pathway design framework for national low greenhouse gas emission development strategies. <i>Nature Climate Change</i> 9, 261. <a href="https://doi.org/10.1038/s41558-019-0442-8">https://doi.org/10.1038/s41558-019-0442-8</a>	Noted. This chapter presents policy-relevant ways of assessing demand-side mitigation that go beyond IAMs. Reference has been added.	MATHIEU SAUJOT	IDDR	France
25639	9	9	9	16	This paragraph could be clarified (similar point on p.97 lines 4-5): first it says that the specific problem with IAMs is that they don't sufficiently reflect reduced GDP, but then says that the real problem is that they use GDP which is an inadequate measure of wellbeing in any case. If the real problem is that they use GDP which is a bad metric, then surely it doesn't really matter that they underestimate that bad metric. To be consistent with the critique of GDP as a metric it might be better to say something like: "the current models don't acknowledge the reduction in wellbeing due to climate impacts".	Accepted. Text revised.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (CTA-UAB)	Spain
37293	9	9	9	16	Also, for those IAMs that assume optimum equilibrium systems currently, there is no other option except to find losses due to climate policies. For another approach, see Mercure et al <a href="https://doi.org/10.1016/j.esr.2018.03.003">https://doi.org/10.1016/j.esr.2018.03.003</a>	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
24357	9	9	9	33	The flow and logic is weird here, from alternative progress measures to IAMs to risks and supply-side. This is one of many places in the chapter where the text desperately needs editing down and organising for narrative coherence.	Accepted. Text revised.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
42759	9	15	9	16	IAMs are also inadequate to evaluate the impacts on human well-being of both climate change itself and of climate mitigation options.	Partially accepted. Text revised accordingly.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
26263	9	17	9	20	Calling negative emission technologies "destructive" is a matter of opinion and should be removed "make destructive negative emission technologies, such as Bio-Energy with Carbon Capture and Storage (BECCS) irrelevant". Also lots of BECCS options could be productive both substituting fossil products while leading to CDR.	Accepted. Text revised.	Levlín Fabian	KTH - Royal Institute of Technology	Sweden
18013	9	18	9	18	Why is "destructive" used as an adjective for a whole suite of mitigation technologies with no explanation. It reads as a bias.	Accepted. Text revised.	Tim Dixon	IEAGHG	United Kingdom (of Great Britain and Northern Ireland)
30025	9	18	9	18	Labeling negative emissions technologies as "destructive" seems a bit oversimplified	Accepted. Text revised.	Merk Christine	Kiel Institute for the World Economy	Germany
37295	9	18	9	19	using "destructive" the author arrive at a normative, misleading blanket statement and mischaracterization of underlying literature: "make destructive negative emission technologies, such as Bio-Energy with Carbon Capture and Storage (BECCS) irrelevant" True that this technology can be characterized as destructive in all cases everywhere? Destructive in which sense? Is BECCS in all those case more "destructive" than climateChange impacts associated with higher levels of warming that would occur without BECCS?	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
37297	9	20	9	20	"Well-designed demand for services scenarios" It is not the demand for scenarios that leads to increased well-being	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
23073	9	21	9	22	Include this citation next to Max-Neef 1995. It supports the statement and adapts Neef's approach to current assessment models.	Accepted. Reference has been added; also cited in various other places in this chapter.	Gibran Vita	Open University of the Netherlands	Netherlands
38209	9	22	9	26	Vita, G., Hertwich, E. G., Stadler, K., & Wood, R. (2019). Connecting global emissions to fundamental human needs and their satisfaction. <i>Environmental Research Letters</i> , 14(1), 014002. <a href="https://doi.org/10.1088/1748-9326/aae6e0">https://doi.org/10.1088/1748-9326/aae6e0</a> It will be good to include references on the disciplines mentioned in these lines as you have done for those mentioned in the previous lines.	Accepted. References have been added.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
44111	9	23	9	23	add: "...and improved health." (Watts et al. 2019, doi:10.1016/S0140-6736(19)32596-6)	Accepted. Reference has been added.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
42761	9	25	9	26	... potential decoupling': add 'as well as for 'true' win-win solutions' (see e.g. Rao, N.D., et al., Healthy, affordable and climate-friendly diets in India. <i>Global Environmental Change</i> , 2018. 49: p. 154-165.  Mastrucci, A. and N.D. Rao, Decent housing in the developing world: Reducing life-cycle energy requirements. <i>Energy and Buildings</i> , 2017. 152: p. 629-642.	Accepted. References have been added.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
25001	9	28	9	33	Mastrucci, A. and N.D. Rao, Bridging India's housing gap: lowering costs and CO2 emissions. <i>Building Research &amp; Information</i> , 2019. 47(1): p. 8-23. The scenario presented (LED-19) does not take into consideration regional and national differences, neither aspects related to energy poverty eradication	Accepted. Text revised.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
42763	9	30	9	31	LED-19 investigates the scope of a range / subset of demand-side solutions (not all)	Accepted. Text revised.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
35743	9	31	9	33	Each of these alternatives has a high uncertainty: the feasibility of low energy options is also very much uncertain.	Accepted. Text revised.	Miklós Antal	Eötvös Loránd University	Hungary
37299	9	31	9	33	"The comparison of scenarios reveals that such a low-energy demand pathways reduces the substitution of technologies in energy supply by a factor of two to three, and that it eliminates the need for technologies with high uncertainty, such as BECCS". Don't understand what it means to reduce the substitution of technologies	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
25641	9	30	10	1	I am confused by fig 5.1. It seems to show that 'LED' (presumably the 'LED-19' scenario referred to in the text) has much less of a Cumulative Emission Reduction than the three SSP scenarios. But the text suggests that LED was a better solution than the other three scenarios, i.e. I'd expect LED to have a higher Cumulative Emission Reduction. I think the point is that lower energy demand there are fewer emissions that subsequently need to be reduced, in which case it might be clearer in the figure to include also the emissions that are not produced as part of the Cumulative Emissions Reduction.	Accepted. Text revised. Legend clarifies this figure.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
6573	10	1	10	1	Please explain the abbreviations used in the graph and try to simplify or clarify the caption	Accepted. Text revised.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
18091	10	1	10	9	Excellent figure! Can the variability within scenario families be visualized? It could be useful to show that there is a lot of variance between scenarios in these families, and as the future is inherently uncertain, it would be valuable to acknowledge that also in the graph, while still conveying this super-important message	Accepted. Text revised.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
42765	10	15	10	15	using economic goods' --> 'using goods (economic or non-economic) and intermediary services'	Accepted. Text revised.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
22727	10	18	10	24	Mattioli (2016) provides a framework for conceptualising how personal mobility contributes to need satisfaction / human well-being in more or less carbon intensive ways, which is consistent with the example discussed here. REFERENCE: Mattioli, G. (2016). Transport needs in a climate-constrained world. A novel framework to reconcile social and environmental sustainability in transport. <i>Energy Research &amp; Social Science</i> , 18, 118-128.	This paragraph has been deleted, but we added a new sentence in 5.2.1 reading "In personal mobility, different variable need satisfiers (e.g., street space allocated to cars, buses, or bicycles) can satisfy human needs, such as accessibility to jobs, health care, and education."	Giulio Mattioli	TU Dortmund University	Germany
22729	10	25	10	31	A very important issue: carbon intensive ways of satisfying human needs have to some extent become locked-in in Global North countries. On this see e.g. Jackson & Papathanasopoulou (2008) and Mattioli (2016). Druckman & Jackson (2010) show that even if consumption was cut to a "minimum income standard" which is deemed to provide a decent life", that would reduce UK emissions by just 37% - meaning that 63% of emissions are actually required for basic needs in this country context. As an illustration, in very car-dependent countries such as the US, households without cars (or even households with just 1 car) suffer from severe social exclusion in most areas (King et al., 2019). REFERENCES: Druckman, A., & Jackson, T. (2010). The bare necessities: how much household carbon do we really need? <i>Ecological Economics</i> , 69(9), 1794-1804; Jackson, T., & Papathanasopoulou, E. (2008). Luxury or 'lock-in'? An exploration of unsustainable consumption in the UK: 1968 to 2000. <i>Ecological Economics</i> , 68(1-2), 80-95; King, D. A., Smart, M. J., & Manville, M. (2019). The poverty of the carless: Toward universal auto access. <i>Journal of Planning Education and Research</i> , 0739456X18823252; Mattioli, G. (2016). Transport needs in a climate-constrained world. A novel framework to reconcile social and environmental sustainability in transport. <i>Energy Research &amp; Social Science</i> , 18, 118-128.	Accepted. Sentence added in 5.2.1, reading "In some countries, carbon intensive ways of satisfying human needs have been locked-in, e.g., via car-dependent infrastructures, and both infrastructure reconfiguration and adaptation are required to organize need satisfaction in low-carbon ways (see also Box XX in Ch.10)."	Giulio Mattioli	TU Dortmund University	Germany
985	10	25	10	32	The term 'need-satisfier' should be introduced here. Max-Neef, M. 1989. Human scale development: An option for the future. <i>Development Dialogue</i> (Uppsala), 1, 5-80. Gough, I. 2015a. Climate change and sustainable welfare: The centrality of human needs. <i>Cambridge Journal of Economics</i> , 39, 1191-1214 Also the distinction between necessities and luxuries alongside survival and luxury emissions. See here Shue, H. 1993. Subsistence emissions and luxury emissions. <i>Law Policy</i> , 15, 39-60. Gough, I. (2017a). Recomposing consumption: defining necessities for sustainable and equitable well-being. <i>Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences</i> , 375, p. 20160379.	Accepted. These references have been added and the sub-heading has been changed to include "needs-satisfier".	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
42767	10	26	10	26	more energy': unclear what kind of more: more than others? or more than currently?	Accepted. Text revised.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42769	10	28	10	29	Expand on notion of luxury vs survival emissions by saying the latter are related to activities that are needed for human well-being, the former are not.	Accepted. Text revised.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
23075	10	29	10	29	These papers deal with distinguishing luxury from survival emissions  Druckman, A., & Jackson, T. (2010). The bare necessities: How much household carbon do we really need? <i>Ecological Economics</i> , 69(9), 1794-1804. <a href="https://doi.org/10.1016/j.ecolecon.2010.04.018">https://doi.org/10.1016/j.ecolecon.2010.04.018</a>  Jackson, T., & Marks, N. (1999). Consumption, sustainable welfare and human needs - With reference to UK expenditure patterns between 1954 and 1994. <i>Ecological Economics</i> , 28(3), 421-441. <a href="https://doi.org/10.1016/S0921-8009(98)00108-6">https://doi.org/10.1016/S0921-8009(98)00108-6</a>  Vita, G., Hertwich, E. G., Stadler, K., & Wood, R. (2019). Connecting global emissions to fundamental human needs and their satisfaction. <i>Environmental Research Letters</i> , 14(1), 014002. <a href="https://doi.org/10.1088/1748-9326/aae6e0">https://doi.org/10.1088/1748-9326/aae6e0</a>  Girod, B., & de Haan, P. (2010). More or better? A model for changes in household greenhouse gas emissions due to higher income. <i>Journal of Industrial Ecology</i> , 14(1), 31-49. <a href="https://doi.org/10.1111/j.1530-9290.2009.00202.0">https://doi.org/10.1111/j.1530-9290.2009.00202.0</a>	Accepted. References have been added.	Gibran Vita	Open University of the Netherlands	Netherlands
37301	10	31	10	33	"The comparison of scenarios reveals that such a low-energy demand pathways reduces the substitution of technologies in energy supply by a factor of two to three, and that it eliminates the need for technologies with high uncertainty, such as BECCS". The lack of BECCS in the scenario was by construction, so it didn't eliminate that technology, but rather assumed it doesn't exist. That was the whole premise of the paper: explore what is needed in terms of demand and extreme technology transformation after deciding to not include BECCS. Exogenous, not endogenous as BECCS"	Accepted. Text revised as "The comparison of scenarios reveals that such a low-energy demand pathways can be constructed to eliminate the need for technologies with high uncertainty, such as BECCS"	Michiel Schaeffer	Climate Analytics	Netherlands
23071	10		10		Figure 5.1 Consider adding the shortname of the SSP in the figure. Some people might not know what the scenarios are by heart. Also spelling out SSP in the caption or figure, same for BECCS.	Accepted. Text revised.	Gibran Vita	Open University of the Netherlands	Netherlands
39297	10	25	11	2	In fact, cultural differences play a role as well in judging what is better life and fuller satisfaction of human needs, particularly in the part of frugal life style, conspicuous consumption and luxury show-off.	Accepted. Text revised.	Xiusheng Zhao	Tsinghua University	China

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
10849	10	32	11	5	The statement: 'Fostering societies that are local, inclusive, peaceful, equitable and even frugal is increasingly seen as a main goal for societies (Boschetti et al. 2016). Energy sufficiency, or voluntary curtailment of energy consumption, motivated by the desire to live in more equitable societies, becomes a social and political priority' contains some highly doubtful claims, particularly the idea that frugality 'is increasingly becoming a main goal for society'. The second statement is somewhat more defensible (and more adequately cited) but although I accept that there are indications of growing social consciousness about links between coconsumption patterns, environmental threats and well-being, it is important not to over-state them at this point.	Accepted. Text revised.	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
46555	10	1			Not so clear!	Accepted. Text revised.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
33573	10	11			This paragraph would be an opportunity to use something other than cars as example, and so make it more globally applicable. Use a more basic need such as water or energy and work with that. Energy can come in the form of dung, wood, charcoal, paraffin, gas, electricity, solar/wind power. This has relevance across all levels of development.	Accepted. Text revised.	Debra Roberts	EThekweni Municipality	South Africa
33575	10	26			"Some countries are likely to require more energy to satisfy all services," rephrase "...to supply basic needs".	Accepted. Text revised.	Debra Roberts	EThekweni Municipality	South Africa
38307	11	1	11	2	Excellent goals! Well placed in this context.	Thanks	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
33579	11	1	11	16	These issues have been covered extensively in chapter 8 and it will be useful to cross-reference the relevant sections	Accepted. Cross chapter reference has been substantially improved in the revised draft.	Debra Roberts	EThekweni Municipality	South Africa
42771	11	4	11	4	motivated by the desire to live in more equitable societies': yes, but also the recognition that well-being for all REQUIRES energy sufficiency, because of climate change and other negative impacts of energy use.	Accepted. Text revised.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
9445	11	6	11	9	Here you say "the plurality of needs of people", but I think you need to be clear throughout about the means-ends divide. You talk earlier in the chapter about this, but I think you are confusing the two here. I think the language of "human needs" (as ends) and "satisfiers" (as means) is quite useful to keep the clarity.	Accepted. Text revised.	Lina Brand Correa	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
1319	11	11	11	32	Related to my comment above, the definition of "demand-side solutions" is confusing here as it includes supply side measures (production infrastructures and systems, service provision) as do various examples in this paragraph (socio-technical transitions, etc.).	Accepted. Text revised.	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
27389	11	14	11	14	The Lancet diet could be mentioned here (10.1016/S0140-6736(18)31788-4), or the co-benefit of dietary shifts for less intensive land uses (10.1038/ncomms11382, 10.1038/s41467-017-01410-w)	Accepted. These references have been added.	Karlheinz Erb	Institute of Social Ecology, Univ. of Natural Resources and Life Sciences Vienna	Austria
44113	11	14	11	15	refer to more recent literature: see references in the following chapters	Accepted. Text revised.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
987	11	17	11	26	To this list of disciplinary contributions should be added Development Studies (too numerous to mention), and Social Policy - Gough, J., 2017. Heat, Greed and Human Need: Climate change, capitalism and sustainable wellbeing. Cheltenham UK: Edward Elgar Ltd.	Accepted. Reference has been added.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
39299	11	22	11	23	Semi colon is missing, after 'normative economics', and before 'sociologists'	Accepted. Text revised.	Marlyne Sahakian	University of Geneva	Switzerland
9447	11	22	11	26	Lack of references throughout these lines!	Accepted. Text revised.	Lina Brand Correa	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
45879	11	23	11	23	insert after "socio-economic inequality": "(Sahakian and Wilhite, 2014)": Sahakian, Marlyne, and Harold Wilhite. 2014. "Making Practice Theory Practicable: Towards More Sustainable Forms of Consumption." Journal of Consumer Culture 14 (1): 25-44. <a href="https://doi.org/10.1177/1469540513505607">https://doi.org/10.1177/1469540513505607</a> . and "(Wilhite H, 2013)": Wilhite H (2013) Energy consumption as cultural practice: Implications for the theory and policy of sustainable energy use. In: Strauss S, Rupp S and Love T (eds) Cultures of Energy. San Francisco: Left Coast Press, pp. 60-72.	Accepted. References have been added in the Social Science Primer.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
42773	11	30	11	31	structure is not just about (physical) infrastructures but at least equally about economic structures (e.g. inequality, rentier power etc.) as well as power and decision-making structures.	Reject. Text revised substantially so no longer relevant	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
38309	11	33	11	33	Like!	Thanks	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
5435	11	33	11	40	I suggest you add a caveat at the end of this paragraph, such as: It is, however, important that a holistic view is taken to evaluate whether such mitigation actions reduce carbon emissions overall. For example, telework that eliminates commutes, may increase household carbon emissions through, for example, extra heating. This may result in an overall net increase in emissions.	Accepted. Text revised.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
22731	11	33	11	40	As far as I understand the ASI framework was originally developed for transport and is here applied to all emission sectors. This is great but perhaps some more discussion of the implications of this conceptual transfer is warranted? E.g. does the framework need to be adapted and if so why? My interpretation is that the emphasis that ASI puts on the more social / "demand" components ("avoid" and "shift") reflects the particular historical development of transport emissions - where activity increases have systematically offset technological improvements. This is not necessarily the case in other sectors. In other words, if one wants to emphasise the more social & demand aspects of mitigation, there is a lot to learn from research on transport & climate.	Accepted. Text revised.	Giulio Mattioli	TU Dortmund University	Germany
37303	11	38	11	38	"bus rapid transit and bicycles"	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
24359	11	1	12	31	Using services as a framing for this chapter is an important and necessary contribution (taking the discussion and analysis beyond energy use and demand). But the chapter would be significantly strengthened if the services framing could be used clearly and consistently throughout. There are many places where the text lapses back into technology- or demand-focused analysis, losing the emphasis on services (which in turn links to wellbeing). This section 5.1.3 introducing Avoid-Shift-Improve is one such example - the services emphasis is lost.	Accepted. Text revised substantially.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
18093	11	10	12	20	I agree that the ASI framework is hugely useful to structure the assessment, but still I think that it should be assessed against other frameworks existing in the literature to guide demand-side mitigation. These alternative frameworks are not necessarily in contradiction and may be even supporting the ASI framework, but they still provide other perspectives and should in my view be discussed in this section as well. Examples include practice theory (e.g. Hausknecht et al., 2018, Env Policy & Governance, 28, 371-382), others the use price-based mechanisms to achieve decoupling of GHG from GDP through socio-ecological tax reforms, still others the stock-flow-service nexus framework in Industrial Ecology (e.g., Haberl et al., 2017, sustainability 9, 1049; Haberl et al., 2019, Nat. Sust 2, 173), or ideas about circular economy (e.g. Haas Haas et al. <a href="https://doi.org/10.1111/jiec.12244">https://doi.org/10.1111/jiec.12244</a> ).	Accepted. These references have been added in section 5.1.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
9981	11	10	13	6	There also exists the efficiency - consistency - sufficiency framework by Samadi et al. (2017), which is compared to and framed alongside the avoid - shift - improve framework as discussed by Creutzig et al. (2018), by - van den Berg, N. J., Hof, A. F., Akenji, L., Edelenbosch, O. Y., van Sluisveld, M. A., Timmer, V. J., & van Vuuren, D. P. (2019). Improved modelling of lifestyle changes in Integrated Assessment Models: Cross-disciplinary insights from methodologies and theories. Energy Strategy Reviews, 26, 100420.	Accepted. These references have been added in section 5.1.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
33577	11	1			Insert "...societies that are provided for / provisioned, healthy, safe, ..." = basic needs of survival.	Accepted. Text revised.	Debra Roberts	EThekweni Municipality	South Africa
33581	11	10			Missing in this framing is the "supply" element: sustainably supply of basic needs where these are not yet met. This must be integrated into the whole idea of ASI, as the reader was reassured just three lines previously. The 'supply' element is also not reflected in the schematic in Fig 5.2. It needs to become an integral part of our thinking re sustainable, low-carbon provisioning systems. It is also missing from p12-L14 paragraph. See next section for excellent handling.	Accepted. The idea of DLS try to capture it. Text substantially revised.	Debra Roberts	EThekweni Municipality	South Africa
39301	12	1	12	1	I appreciate the emphasis on structure, meaning and agency used in this report, as a key notion in social theory. And yet, to call this figure a 'social practice' is somewhat misleading. In a practice-based approach, agency can be distributed across elements of practice - meanings, materials, competencies. Social practice approaches are also an attempt to overcome the structure-actor dichotomy in social sciences (Appears again on 5-55).	Accepted. Social practice theory based literature better reviewed and integrated. Social science primer also include and clarify some of these concepts. This figure is deleted.	Marlyne Sahakian	University of Geneva	Switzerland
783	12	1	12	2	Figure is not very clear.	Figure deleted.	MATHEU SAUJOT	IDRI	France
24361	12	1	12	2	Figure 5.2 works really well as a chapter overview built around the key concepts of energy services (and provisioning systems) and need satisfiers (linked to wellbeing). It makes clear that the Avoid-Shift-Improve framework for characterising demand-side mitigation options, measures, or policies affects how services are provided and the implications for human needs. The problem is that much of the chapter doesn't keep this strong framework for understanding services and mitigation. In particular the long sections on agency, structure and meaning read more like basic social science introductory texts rather than anything specifically useful to services-based mitigation. This is evident in the positioning of agency, structure and meaning in Fig 5.2 as a means of understanding energy provisioning (the lower half) when it is equally relevant for understanding needs and wellbeing. The suggestion that I explain further below is to remove much of the text on agency, structure and meaning from the chapter, and to focus on service provisioning systems. This latter concept is promisingly introduced early on but then rather fades.	Figure deleted.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
11939	12	1	12	13	This figure is not very helpful, as there are too many elements and its not clear how they relate to each other. Please consider breaking up into separate figures. The x and y-axis (5.2/5.3/5.4) should also be labelled in the figure itself and not just be explained in the legend.	Figure deleted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
26497	12	3	12	3	It is important to note here a broader debate in the low-carbon transitions literature, which stands across the various disciplines involved, that much of what is portrayed in this figure is very consensual and post-political. It assumes one common good that 'we' can aim for, and elides the various structural growth factors in capitalism which drive much of the increase in demand, and which ultimately slows down any possible low carbon transitions. For this, I would suggest looking at Swyngedouw's various works on the post-political in climate politics, and Feola's (2019) paper on capitalism being ignored in Sustainability Transitions Research.	Reject. Referred to Chapter 1.	Thomas Smith	Masaryk University	Czech Republic
42813	12	13	12	31	redesigning infrastructures: and provisioning systems. These extend well beyond physical infrastructures	Accepted. Text revised.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
25003	12		12		Figure 5.2 does not take into account the specific needs and circumstances of developing countries	Comment not clear	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
36253	12	14	13	6	Why this is here and not in the introduction section?	Accepted. Text revised.	Youba Sokona	South Centre	Switzerland
23023	12	21	13	6	It is too late to tell us what is in this chapter on p. 12.	Accepted. Moved up 6 pages.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
18095	12	26	23	26	"focus on people": I propose to find a formulation that makes clear that this does not mean individual humans who should be motivated to act differently, but that it is humans as embedded in their societal institutions, settings, structures, etc., including the physical infrastructures within which societal activity unfolds.	Accepted. Text revised. Social practice theory based insights integrated more now in the chapter, especially in 5.4.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
3725	12	24			helps	Accepted. Text revised.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
12603	12				the figure include an illustration with social practices consisting of three circles named agency, structure and meaning. This representation of social practices is missing a reference and it is a very strange, not to say wrong, representation of the theory. Later on page 55 there is a reference to (Sovacool and Hess, 2017) for inspiration for this way to represent practice theory. However, this is in my opinion a misunderstanding of Sovacool and Hess, see comment related to page 55	Accepted. Figure deleted and more literature on social practice theory added.	Gram-Hanssen Kirsten	Aalborg University	Denmark
44115	12				fig. 5.2 improve figure capture	Figure deleted	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
42775	13	4	13	4	... but also infrastructures and social norms: yes, but also wider systemic changes, including inequality in wealth, income, power, decision-making etc.	Accepted. Text revised.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
31713	13	7	13	7	This section perhaps perhaps need not exist as a whole section - can perhaps be restricted to a para or so.	Accepted. Text shortened substantially. As the literature is increasing at a very high rate there is need for allocating some space to discuss how that has been handled.	Ashok Sreenivas	Prayas (Energy Group)	India
37307	13	14	13	14	Explain what you mean by redundant here	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
11941	13	16	13	16	Please define 'relevant' data here.	Accepted. Text revised.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
37305	13	22	13	23	"The amount number of papers on demand and services in the context of climate change mitigation is growing exponentially." Does this mean fast or slow? Exponential can be either one.	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
22733	13	30	13	40	The reference to "North-Western area" of the graph etc. are confusing, as it's not immediately clear whether these are references to the position within the graph, or to the geographical location of specific countries (particularly since "China" is referred to at line 33). I suggest revising to e.g. "upper left area of the graph", etc.	Accepted. Text revised.	Giulio Mattioli	TU Dortmund University	Germany
785	13	36	13	40	In which category do you put economics?	Accepted. Text revised.	MATHIEU SAJJOT	IDDRI	France
38331	13	37	13	40	Not quite understanding the methodology! I.e. if engineering/nature sciences are high why are social sciences & humanity perhaps "comparatively high"? Is there a BIAS in the in the research approach which does not reflect the literature? This is crucial as I have argued elsewhere that more positivist approaches (reminiscent of 'hard sciences') are dominating methodology perhaps due to the cultural origins of climate change researchers? This has been evident for a long time actually.	Noted. Text revised.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
23063	13	7	14	4	What is the purpose of this section? What do we learn? I would recommend leaving this out to make the chapter more concise.	Reject. Please see response to comment 389 above	Edgar Hertwich	Norwegian University of Science and Technology	Norway
46557	13	7	14	5	Next to the precious map given in fig. 5.3, a temporal analysis over the last 2 or 3 decades would also be useful to assess awareness as a success factor for the expected transition.	Accepted. Text revised.	Vincent MAZAUIC	Schneider Electric / International Chamber of Commerce (ICC)	France
25643	13	31	14	4	In the text it is stated that modelling is "mostly of economic growth" and that this is a central topic, but the figure does not include either the word "economic" nor the word "growth". In general, the criteria for the inclusion of words in the figure is described as based on government mandate or author preference and the results may be a reflection of those interests rather than a reflection of the literature, so perhaps a more robust literature review methodology might be better.	Rejected. Section text revised substantially.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
3727	13	18				77.177 Accept. Changed appropriately.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3729	13	30			Figure 5.3 instead of Figure 5.4	Accepted. Text revised.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
6565	14	1	14	1	Please describe the x and y axes	Accepted. Text revised.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
11943	14	1	14	5	This table does not provide very useful information to warrant so much space. Please consider removing.	Reject. Text revised substantially	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
45585	14	3	14	3	label axes	Accepted. Text revised.	Daniel Crow	International Energy Agency	France
31715	14	3	14	4	The figure is not clear. For example, what do the axes represent?	Noted. Text revised.	Ashok Sreenivas	Prayas (Energy Group)	India
44117	14	9	14	9	add: environmental and in particular "climate justice"	Accepted; text revised.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
37309	14	38	14	38	Explain what you mean by redundant here	The page number for this comment seems wrong; I think it may apply to page 5-13, line 14 where the word "redundant" appears (PP) and text now revised and explanation added word changed.	Michiel Schaeffer	Climate Analytics	Netherlands
36657	14		14		Fig 5.3 The fig X and Y axis legend is missing	Noted. Text revised substantially.	NARESH KUMAR SOORA	Indian Agricultural Research Institute	India

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
28045	14	6	18	6	The words "Quality of Life" and "Sufficiency" are often used as well as "Well being". I think these words and difference among them should be commented.	Accepted; addressed in chapter restructuring. These terms are now discussed and defined in the Glossary as well as the Social Sciences Primer annexed to Ch. 5.	Yoshiyuki Shimoda	Osaka University	Japan
29417	14	1			The units of the axis in Fig. 5.3 needs explanation, the concept of the topical map needs a reference.	Accepted. Text revised.	Stefan Pauliuk	University	Germany
44027	14	14			Figure 5.3. Although it was interesting to me to try to visually map references to better understand groupings, I'm not sure how useful it was. There is no information on what the X and Y axes may mean, and several colors (while representing small percentages) are not even visible in the plot, making them useless. I wonder whether this plot should be deleted or replaced with some kind of more traditional cloud mapping of subjects, without axes.	Accepted. Figure revised.	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
31717	15	6	15	8	The sentence "Hence, nurturing equitable human well-being through ..." suggests that there is perfect alignment between actions to address well-being and climate change, which is not the case. It would be better to reword this to suggest that if the right mix of options are chosen, then well-being and climate mitigation solutions go hand in hand.	Accepted; text has been restructured and revised.	Ashok Sreenivas	Prayas (Energy Group)	India
24363	15	14	15	43	Much of this text seems like a reworded repeat of earlier text and can be deleted.	Accepted; addressed in chapter restructuring.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
42777	15	15	15	15	the notion of net welfare gains is inconsistent with the wellbeing approach that underpins this chapter (in particular DLS), ultimately relying on the concepts of human needs which are irreducibly plural and non-substitutable. NET welfare gains assumes commensurability and substitutability, which is at odds with the concept of needs and the derived concept of DLS. See e.g. Gough, 2015: Climate change and sustainable welfare.	Accepted; text revised. Citations included.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
45881	15	18	15	18	after "Lamb ad Steiberg 2017" insert "Goldenberg et al 1988": GOLDENBERG, J., JOHANSSON, T. B., REDDY, A. K. N. & WILLIAMS, R. H., Energy for a sustainable world, John Wiley, New York, 1988.	Accepted; text revised to include this reference.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
1321	15	20	15	20	add "direct and indirect" before "energy rather than ..." here to make it clear that you include embedded energy in the discussion of energy services	Accepted; text revised.	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42779	15	20	15	22	It is right that energy services, rather than energy use per se, are important for need satisfaction, but important also to be clear that energy services by themselves are not generally (or not necessarily) need satisfiers: most need satisfiers require / involve energy services, but they are not the same. Illumination for example is not a need satisfier, but underpins need satisfiers such as education systems / learning systems, health care systems. Mobility is not considered a need per se either (as is also stated above in this chapter) but is a required intermediary to ensure access to need satisfiers such as schools, hospitals, food etc.	Accepted; text revised to include this point.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
38311	15	21	15	22	well said!	Noted!	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
44119	15	21	15	22	another example would be: people value [...] (good) health not health care	Accepted; text revised.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
31719	15	22	15	25	While the sentence "Considering service needs for well-being ..." is true in principle, it is likely to be very difficult in practice due to path-dependence and associated lock-ins. A classic example would be sustainable urban transport and cities in the US which are not at all designed for it. Thus, while such a solution may be ideal, transitioning towards it is likely to be very difficult in areas where infrastructure build-out has happened (and hence, developed countries in particular).	Accepted; text revised to include discussion of the reasons why low-emission service provision may be difficult.	Ashok Sreenivas	Prayas (Energy Group)	India
23077	15	27	15	27	Include this reference as citation in the last sentence and in other places relevant to "illumination as a service" Whiting, K., Carmona, L. G., Brand-Correa, L., & Simpson, E. (2020). Illumination as a material service: A comparison between Ancient Rome and early 19th century London. Ecological Economics, 169, 106502. <a href="https://doi.org/10.1016/j.ecolecon.2019.106502">https://doi.org/10.1016/j.ecolecon.2019.106502</a>	Accepted; reference added.	Gibran Vita	Open University of the Netherlands	Netherlands
37311	15	28	15	28	differences	Accepted. Text revised	Michiel Schaeffer	Climate Analytics	Netherlands
38313	15	28	15	30	Again, what of renewables?	Accepted. Text revised	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
22735	15	28	15	35	On the question of "how to rapidly decouple human wellbeing from energy use" it is important to acknowledge that carbon intensive ways of satisfying human needs have to some extent become locked-in in Global North countries. On this see e.g. Jackson & Papathanasopoulos (2008); Mattioli (2016); Druckman & Jackson (2010); (King et al., 2019)	Accepted; references added.	Giulio Mattioli	TU Dortmund University	Germany
32445	15	28	15	35	In a warming world with a growing population and expanding middle-class, the demand for cooling is projected to rise substantially. Currently, there are 3.6 billion cooling appliances, which is projected to rise to 9.5 billion by 2050, though up to 14 billion would be required to provide adequate cooling for all. University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All ("Considering per capita equipment penetrations at regional level, it becomes clear that 9.5 billion cooling appliances by 2050 will, on the current technology pathways, not be sufficient to deliver universal access to cooling, let alone meet the UN SDGs 2030 targets. Food and medicine loss in the supply chain will still be high; food poisoning from lack of cold chain and domestic temperature management will still be significant; farmers will lack market 'connectivity' or 'access'; hundreds of millions of people will not have safe, let alone comfortable, living or working environments; medical centres will not have temperature-controlled services for post-natal care, etc... By 2050, would require a total of 14 bn cooling appliances – an additional 4.5 bn appliances compared to the baseline forecast – or 4 times as many pieces of cooling equipment than are in use today."); Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING.	Rejected; beyond the scope of the chapter and addressed in Ch. 9	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America
32447	15	28	15	35	At the same time, increased demand for air conditioning will increase energy demand that will thus require additional energy production. Energy efficiency, including in equipment efficiency like air conditioners, can reduce this demand and help limit additional emissions that would further exacerbate climate change. Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING; Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute; Shah, N., Wei, M., Letschert, V. and Phadke, A. (2019). Benefits of Energy Efficient and Low-Global Warming Potential Refrigerant Cooling Equipment. U.S.A: Lawrence Berkeley National Laboratory; Shah N., et al. (2015) Benefits Of Leapfrogging To Super-efficiency And Low Global Warming Potential Refrigerants In Air Conditioning. Ernest Orlando Lawrence Berkeley National Laboratory; IEA (2018) Future of Cooling: Sustainable Energy for All (2018) Chilling Prospects: Providing Sustainable Cooling for All; and Birmingham Energy Institute, University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All; Bardeau, L.T., Davis, L.W., Gertler, P., Wolfram, C., 2020. Heat exposure and global air conditioning. Nature Sustainability 3, 25–28 ("Air conditioning adoption is increasing dramatically worldwide as incomes rise and average temperatures go up. Using daily temperature data from 14,500 weather stations, we rank 219 countries and 1,692 cities based on a widely used measure of cooling demand called total cooling degree day exposure. India, China, Indonesia, Nigeria, Pakistan, Brazil, Bangladesh and the Philippines all have more total cooling degree day exposure than the United States—a country that uses 400 terawatt-hours of electricity annually for air conditioning.");	Rejected; beyond the scope of the chapter and addressed in Ch. 9	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America
32449	15	28	15	35	Reducing climate emissions from air conditioning while meeting cooling needs will require solutions that deliver cooling using less energy, i.e., more efficiently. Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING. Addition of cooling capacity in buildings is currently outpacing addition of solar generation capacity. Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute, 10 ("A case in point is that last year (2017), our record year of solar growth, with 94 GW of total solar generation deployed globally, was eclipsed by the incremental load of new RACs added to the grid, estimated at approximately 100 GW."); International Energy Agency (2019) Perspectives for the Clean Energy Transition: The Critical Role of Buildings ("In fact, since 2000, the rate of electricity demand in buildings increased five-times faster than improvements in the carbon intensity of the power sector.");	Rejected; beyond the scope of the chapter and addressed in Ch. 9	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America
32787	15	28	15	35	The demand for cooling is projected to rise substantially. Currently, there are 3.6 billion cooling appliances, which is projected to rise to 9.5 billion by 2050, though up to 14 billion would be required to provide adequate cooling for all. University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All ("Considering per capita equipment penetrations at regional level, it becomes clear that 9.5 billion cooling appliances by 2050 will, on the current technology pathways, not be sufficient to deliver universal access to cooling, let alone meet the UN SDGs 2030 targets. Food and medicine loss in the supply chain will still be high; food poisoning from lack of cold chain and domestic temperature management will still be significant; farmers will lack market 'connectivity' or 'access'; hundreds of millions of people will not have safe, let alone comfortable, living or working environments; medical centres will not have temperature-controlled services for post-natal care, etc... By 2050, would require a total of 14 bn cooling appliances – an additional 4.5 bn appliances compared to the baseline forecast – or 4 times as many pieces of cooling equipment than are in use today."); Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING.	Rejected; beyond the scope of the chapter and addressed in Ch. 9	Kristin Campbell	Institute for Governance & Sustainable Development	United States of America



Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
32789	15	28	15	35	At the same time, increased demand for air conditioning can increase energy demand that will thus require additional energy production. Energy efficiency, including in equipment efficiency like air conditioners, can reduce this demand and help limit additional emissions that would further exacerbate climate change. Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING; Rocky Mountain Institute; Shah, N., Wei, M., Letschert, V. and Phadke, A. (2019) Benefits of Energy Efficient and Low-Global Warming Potential Refrigerant Cooling Equipment. U.S.A: Lawrence Berkeley National Laboratory; Shah N., et al. (2015) Benefits Of Leapfrogging To Superefficiency And Low Global Warming Potential Refrigerants In Air Conditioning, Ernest Orlando Lawrence Berkeley National Laboratory; IEA (2018) Future of Cooling; Sustainable Energy for All (2018) Chilling Prospects: Providing Sustainable Cooling for All; and Birmingham Energy Institute, University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All.	Rejected; beyond the scope of the chapter and addressed in Ch. 9	Kristin Campbell	Institute for Governance & Sustainable Development	United States of America
32791	15	28	15	35	Reducing climate emissions from air conditioning while meeting cooling needs will require solutions that deliver cooling using less energy, i.e., more efficiently. Addition of cooling capacity in buildings is currently outpacing addition of solar generation capacity. Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute, 10 ("A case in point is that last year (2017), our record year of solar growth, with 94 GW of total solar generation deployed globally, was eclipsed by the incremental load of new RACs added to the grid, estimated at approximately 100 GW."); International Energy Agency (2019) Perspectives for the Clean Energy Transition: The Critical Role of Buildings ("In fact, since 2000, the rate of electricity demand in buildings increased five-times faster than improvements in the carbon intensity of the power sector").	Rejected; beyond the scope of the chapter and addressed in Ch. 9	Kristin Campbell	Institute for Governance & Sustainable Development	United States of America
23079	15	31	15	31	Include this citation next to Brand-Correa et al 2018 as it characterises the role of some of those contextual aspects for consumption.  Ivanova, D., Vita, G., Steen-Olsen, K., Stadler, K., Melo, P. C. P. C., Wood, R., & Hertwich, E. G. (2017). Mapping the carbon footprint of EU regions. Environmental Research Letters, 12(5), 054013. <a href="https://doi.org/10.1088/1748-9326/aa6da9">https://doi.org/10.1088/1748-9326/aa6da9</a>	Accepted. Text revised to include this reference.	Gibran Vita	Open University of the Netherlands	Netherlands
45883	15	31	15	31	Additional biblio might be usefully added after "Brand-Correa et al. 2018": i.e.  Sfakianaki, A., M. Santamouris, M. Hutchins, F. Nichol, M. Wilson, L. Pagliano, W. Pohl, J. L. Alexandre, and A. Freire. 2011. "Energy Consumption Variation Due to Different Thermal Comfort Categorization Introduced by European Standard EN 15251 for New Building Design and Major Rehabilitations." International Journal of Ventilation 10 (2): 195–204. <a href="https://doi.org/10.1080/14733315.2011.11683948">https://doi.org/10.1080/14733315.2011.11683948</a> .  Arens, Edward, Michael A. Humphreys, Richard de Dear, and Hui Zhang. 2010. "Are 'Class A' Temperature Requirements Realistic or Desirable?" Building and Environment 45 (1): 4–10. <a href="https://doi.org/10.1016/j.buildenv.2009.03.014">https://doi.org/10.1016/j.buildenv.2009.03.014</a> .  Brager G, Paliaga G, deDear R. Operable windows, personal control and occupant comfort. ASHRAE Transactions 2004;110(2):17–35.,  Zhang H, Arens E, Abbaszadeh S, Huizenga H, Brager G, Paliaga P, et al. Air movement preferences observed in office buildings. International Journal of Biometeorology 2007;51:349–60.  Pagliano, Lorenzo, and Paolo Zangheri. 2010. "Comfort Models and Cooling of Buildings in the Mediterranean Zone." Advances in Building Energy Research 4 (1): 167–200. <a href="https://doi.org/10.3763/aber.2009.0406">https://doi.org/10.3763/aber.2009.0406</a> .	Noted. This is beyond the scope of the chapter and is addressed in Ch. 9	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
45891	15	31	15	31	after "...and outside temperatures (Brand and Correa 2018)". The same level of thermal comfort, as measured e.g. via the index Predicted Mean Vote (PMV), can be achieved via various combinations of physical parameters, each with different values of energy need for cooling and energy need. (pagliano, erba, 2019)"  Pagliano, Lorenzo, and Silvia Erba. 2019. "Energy Sufficiency in (Strongly Intertwined) Building and City Design – Examples for Temperate and Mediterranean Climates." In Eceee 2019 Summer Study on Energy Efficiency: Is Efficient Sufficient?, 10. eceee. <a href="https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2019/">https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2019/</a> .	Noted. This is beyond the scope of the chapter and is addressed in Ch. 9	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
37313	15	36	15	36	entails	Accepted; text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
44029	15	36	15	43	Obviously, there is a huge political (and planning) dependence on the use of GDP these days. Is it possible to learn anything from how GDP was established as a primary measure, and what it would take to introduce and establish other measures as a primary measure to guide societal discussions and planning efforts?	Noted; this is beyond the scope of our chapter. GDP is largely taken up in Ch. 1.	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
42781	15	37	15	37	in addition to Rao et al. 2014, also mention Lamb and Rao, 2015	Accepted; reference added.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
13673	15	45	15	45	Either 'systems' or 'allows' has to be singular	Accepted; text revised.	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
24365	15	44	16	8	I think this is a critical paragraph, extending Fig 5.2 to make clear the dual framing of needs satisfaction and service provisioning. This is a really strong dual backbone for the chapter and I would urge the authors to use it as an organising principle throughout.	Accepted; the text of this chapter has been revised and restructured to emphasize the two-way relationship between well-being and service provisioning.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
9449	15		16		Repetition here on the GDP criticism as well as the alternative indicators. This was already covered earlier in the Chapter. So I would suggest merging the two (this part in section 5.2 has relevant literature that wasn't included in the earlier part in section 5.1), probably in the introduction section rather than here.	Accepted. Text on GDP has been revised and condensed in section 5.1 and this is also discussed in the Social Sciences appendix to Chapter 5.	Lina Brand Correa	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
29139	15	13	18	6	Sufficiency is a key concept framing discussions in Chapter 9. Please refer to the Executive summary and introduction of Chapter 9. For consistency but also perhaps an opportunity for stronger narrative	Accepted; Sufficiency is now discussed in the Glossary, the Social Sciences annex to this chapter, and the text is coordinated with Ch 9.	Minal Pathak	Ahmedabad University	India
3731	15	9			I would cut off the sentence after Table 5.1.	Accepted; text revised as suggested.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
33583	15	18			"reduction in primary energy" – consider adding "and/or shifting to renewable energy"	Accepted; text revised as suggested.	Debra Roberts	EThekweni Municipality	South Africa
33585	15	39			GDP also excludes all non-monetary activities, including parenting and caring, other unpaid work, subsistence farming, etc.	Accepted; text revised as suggested.	Debra Roberts	EThekweni Municipality	South Africa
26137	16	4	16	8	Why do we only talk about energy use? It should be defined what are the boundaries of demand side emission and mitigation. Since broadly speaking, all kinds of goods and services used to meet people's material needs directly or indirectly affect carbon emissions, such as the consumption of cement, iron&steel? In particular, the authors discuss a lot about carbon footprint (P19-line 25-26) and wider availability of services for human well-being (figure 5.4)	Taken into account; text of this paragraph has been revised. This chapter discusses demand for all services needed for well-being, not just energy demand.	Wenling Liu	Beijing Institute of Technology	China
42783	16	5	16	8	add here something along the lines of: "The greatest potential for mitigation options lies in their combination: the focus on needs satisfaction for equitable human well-being suggests a sufficiency approach for service delivery, in particular in light of the energy and emissions footprint of service delivery and their implications for current and future human well-being. Energy service provisioning should then be optimised (from a minimum energy use and emissions perspective) to deliver sufficient energy services (for sufficient service delivery, or need satisfier delivery), rather than just maximising the delivery of energy services. In other words, efficiency improvements in the energy service provisioning systems should be subordinate to targetting sufficient (not maximum) energy service delivery at minimum energy use. This is also key to escape the rebound effect which undermines the efficacy of decoupling, or the efficacy of efficiency improvements." (see e.g. the work of Paul Brockway and colleagues)	Accepted; text revised to include these points.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
12833	16	17	16	21	Concept of DLS used here does not include things that will be considered basic to traditional and indigenous communities, namely life in community and access to traditional lands. Reference to life in community should be explicit in the DLS concept since this is an essential aspect of existence for millions of peoples.	Accepted; the material in Box 5.1 has been moved to the Social Sciences annex to Ch. 5	Dina Townsend	University of Witwatersrand	Austria
31721	16	22	16	22	It is not clear if the definition of "Carbon footprint" refers to only the "flow" emissions due to consumption or also the "stock", i.e. historical responsibility. Ideally, it should reflect historical responsibility also since it is the stock of emissions that is the real challenge.	Taken into account; the material in Box 5.1 has been moved to the Social Sciences annex to Ch. 5).	Ashok Sreenivas	Prayas (Energy Group)	India
9635	16	22	16	28	Another import empirical study on how carbon emissions are linked to income levels is Sager (2019) how estimates Environmental Engel Curves for carbon emissions. Sager, L. (2019). Income inequality and carbon consumption: Evidence from Environmental Engel curves. Energy Economics, 104507.	Accepted; reference has been added.	Jasper Meya	German Centre for Integrative Biodiversity Research	Germany
24367	16	30	16	40	I think paragraphs like this are close to pointless. Very long lists of references with no insight into what is the distinctive scientific contribution of each reference. I would suggest deleting it.	Accepted; this text has been removed.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
37315	16	31	16	32	Again, some of the original literature is not cited, such as Daly for ISEW	Taken into account; these indicators are now discussed in the Social Sciences appendix to Ch. 5.	Michiel Schaeffer	Climate Analytics	Netherlands
42785	16	32	16	36	All of these composite indicators rely on the assumption of commensurability and substitutability of different aspects of human well-being, which is at odds with the DLS approach and the need theory that underpins it. See Gough, 2015: Climate change and sustainable welfare.	Accepted; this text has been removed.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
23095	16	35	16	35	"ecological footprint" is not a measure of wellbeing	Accepted; this text has been removed.	Gibran Vita	Open University of the Netherlands	Netherlands
42787	16	35	16	35	Ecological footprint is not a wellbeing indicator	Accepted; this text has been removed.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
44121	16	44	16	46	Lutz et al. 2018 could also be cited here: Lutz et al. 2018; <a href="http://pure.iiasa.ac.at/id/eprint/15402/">http://pure.iiasa.ac.at/id/eprint/15402/</a>	Noted. This text has been removed.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
989	16	46	16	49	On the relation between needs and SDGs: Gough, I., 2017. Heat, Greed and Human Need: Climate change, capitalism and sustainable wellbeing. Cheltenham UK: Edward Elgar Ltd., chapter 2.	Accepted; reference included.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
23081	16	30	17	4	This section could benefit the reader by including a sub-heading called "Indicators for well-being". The usage of the term "well-being" could be more diligent across the chapter, specially the first section. A basic restructuring could be to layout and overview of the fundamentals of wellbeing and distinguish what are you leaving out or including in this chapter. For example, by specifying more clearly in the box above (lines10-28) when you mention "well-being encompasses DLS but also many other things...but "here we limit our definition of well-being to DLS i.e. minimum material inputs for a decent material life." In the whole first section of the chapter (pg 1 to 17), "wellbeing" is used somewhat inconsistently to mean -or refer to literature based on- objective indicators, health or even subjective life satisfaction. After a certain point, it is used interchangeably with decent living standards, which here means "equitable service provision" (which btw, DLS doesn't seem to be a metric for equity once we follow the chapter). Then later on the chapter, the term well-being is used broadly. E.g. in the opening section "well-being for all" the "subjective wellbeing" is being mentioned and then never again. This makes it a bit confusing for the unfamiliar reader. Sections 5.1.1 and 5.2.1 could benefit by a throughout revision for clarity. It is hard to grasp a clear message. Naturally, this is a very complex topic and I recognize the challenge. One idea is to focus on breaking down well-being by all relevant angles in a systematic way. This section should be clear when taking a stance and definition by the authors for the rest of the chapter (DLS), which means material wellbeing, measured as inputs, objectively and excluding other measures and interpretations. Within this new proposed section "Indicators for well-being" you could explain that well being can be measured objectively and subjectively, individually or collectively, by inputs or outcomes, aggregated (ISEW) or by specific human needs (max-neef), composite (HDI) or single indicators (life-exp). Depending on the measurement of well-being, the determinants or contributors will be material and immaterial. Making it clear that well-being can be measured objectively (DLS) and subjectively (happiness, life satisfaction, but also subjective opinion on health, social life, etc.) or, probably ideally, a combination (not chosen in this chapter): A combined approach proposed in: Costanza, R., Fisher, B., Ali, SaleemBeer, C., Bond, L., Boumans, R., Danigelis, N. L., ... Snapp, R. (2007). Quality of life: An approach integrating opportunities, human needs, and subjective well-being. <i>Ecological Economics</i> , 61(2-3), 267-276. <a href="https://doi.org/10.1016/j.ecolecon.2006.02.023">https://doi.org/10.1016/j.ecolecon.2006.02.023</a> Social Progress Index And implemented here in a cross-sectional case by relating carbon footprint to fundamental human needs according to Max-Neef's Taxonomy of needs: Vita, G., Hertwich, E. G., Stadler, K., & Wood, R. (2019). Connecting global emissions to fundamental human needs and their satisfaction. <i>Environmental Research Letters</i> , 14(1), 014002. <a href="https://doi.org/10.1088/1748-9326/aae6e0">https://doi.org/10.1088/1748-9326/aae6e0</a> Or here according to social thresholds and planetary boundaries defined by the authors ad-hoc as being essential for basic needs. O'Neill, D. W., Fanning, A. L., Lamb, W. F., & Steinberger, J. K. (2018). A good life for all within planetary boundaries. <i>Nature Sustainability</i> , 1(Febuary), 88-95. <a href="https://doi.org/10.1038/s41893-018-0021-4">https://doi.org/10.1038/s41893-018-0021-4</a>	Accepted; the text on well-being has been condensed and restructured and moved to section 5.1. Well-being is also discussed in the Social Sciences annex to Ch. 5.	Gibran Vita	Open University of the Netherlands	Netherlands
29419	16	22			For a reference to the term "Carbon Footprint", please also cite "Wiedmann, T. and Minx, J. (2008). A Definition of 'Carbon Footprint'. In: C. C. Pertsova, <i>Ecological Economics Research Trends: Chapter 1</i> , pp. 1-11, Nova Science Publishers, Hauppauge NY, USA. <a href="https://www.novapublishers.com/catalog/product_info.php?products_id=5999">https://www.novapublishers.com/catalog/product_info.php?products_id=5999</a> ."	Accepted; the material in Box 5.1 has been moved to the Social Sciences annex to Ch. 5	Stefan Pauliuk	University	Germany
24369	17	1	17	53	I think DLS is a very useful framing for analysing and understanding the challenge of meeting basic human needs in line with SDGs, but I am sceptical it's a useful framing for the whole chapter as ultimately it's not relevant to most of the world's population who are well above DLS thresholds - here the challenge is partly the upper bound (interpreted through a sufficiency lens), but mainly the space between DLS and an upper sufficiency bound: this is the space which is critical for demand-side mitigation (while below DLS is more critical for foundational development). I'm also not clear how the DLS relate to the needs satisfier framework introduced earlier.	Accepted. Text now relates DLS to the chapter's needs-satisfier framework more clearly, and relates that framework to useful indicators and references at different DLS thresholds. The Social Sciences appendix provides more context on various indicators.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
31723	17	5	17	6	The definition of DLS is likely to be quite culture and context specific, and subject to evolution over time. Is this accounted for, in the literature? It would be good to make these aspects explicit	Accepted. Text revised to include cultural, contextual and temporal aspects of DLS.	Ashok Sreenivas	Prayas (Energy Group)	India
31725	17	5	17	6	Does the energy / emissions calculations from DLS account for the various intermediate services and activities required to provide those standards - e.g. financial services, distribution channels and retail outlets, regulation, law and order etc?	Noted. DLS discusses service provision within different cultural contexts which vary in energy use., which is part of the decoupling of service provision from energy use.	Ashok Sreenivas	Prayas (Energy Group)	India
42789	17	11	17	13	DLS is based very specifically on the Theory of Human Need by Doyal and Gough [1991], which describes this saturation behaviour in terms of the use of need satisfiers and need satisfaction, i.e. the need satisfaction increases with increased use of needs satisfiers up to a point of sufficiency, after which additional satisfier use does not result in significant improvements in need satisfaction. This is NOT the same as consumption expenditures, although consumption expenditures correlate with need satisfier use. In this context, it is important to distinguish specific consumption categories from aggregate consumption, though.	Accepted; text revised and clarified regarding the difference between consumption and needs satisfaction and aggregate consumption.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
23083	17	11	17	15	Change world "vital" dimensions of well-being to "material". Health issues, related to poor social life are an upcoming trend in death causes.	Accepted; text revised	Gibran Vita	Open University of the Netherlands	Netherlands
23085	17	13	17	13	include these studies as evidence of "well-being correlated with consumption expenditures but only up to a threshold)  Mazur A, Rosa E and Germany W 1974 <i>Energy and life-style Science</i> 186 607-9  Goldemberg J, Johansson T B, Reddy A K N and Williams R H 1985 Basic needs and much more with one kilowatt per capita AMBIO J. Hum. Environ. 14 190-200  Vita, G., Hertwich, E. G., Stadler, K., & Wood, R. (2019). Connecting global emissions to fundamental human needs and their satisfaction. <i>Environmental Research Letters</i> , 14(1), 014002. <a href="https://doi.org/10.1088/1748-9326/aae6e0">https://doi.org/10.1088/1748-9326/aae6e0</a>  O'Neill, D. W., Fanning, A. L., Lamb, W. F., & Steinberger, J. K. (2018). A good life for all within planetary boundaries. <i>Nature Sustainability</i> , 1(Febuary), 88-95. <a href="https://doi.org/10.1038/s41893-018-0021-4">https://doi.org/10.1038/s41893-018-0021-4</a>	Accepted; references included.	Gibran Vita	Open University of the Netherlands	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
5635	17	17	17	17	The phrase "excessive consumption" is highly problematic, as it reflects a normative value judgment which is not factual, scientific, objective, or universally held. Who is to say that some people are engaging in "excessive consumption"? By what metric or objective standard can that claim be supported? This term reflects an advocacy position rather than a summary of research or the views of the scientific community, and thus has no place in the AR6 report. Furthermore, final consumption itself is not necessarily the problem, but rather the negative environmental externalities that are often associated with consumption. There are certainly alternative ways to consume that are sustainable, and therefore should not be criticized so harshly. "Excessive consumption" is also the kind of phrase that engenders warranted criticism and backlash to the IPCC reports, hindering their ability to influence policy implementation in practice. I suggest getting rid of it and replacing it with a factual, objective statement, such as the fact that consumption is typically higher in certain contexts (e.g., among high-income populations).	Accepted; text revised to contextualize 'sufficiency' and relevant indicators at different DLS thresholds.	Benjamin Leibowicz	The University of Texas at Austin	United States of America
42791	17	17	17	17	excessive consumption should absolutely be viewed critically, but in addition to a general critical view of excessive levels of (aggregate) consumption, should specifically critically assess types of consumption that are not, or poorly, aligned with need satisfaction or DLS.	Accepted; text revised to contextualize 'sufficiency' and relevant indicators at different DLS thresholds.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42793	17	26	17	27	add something along the lines of: "add: Therefore, one key way of thinking about providing well-being for all at low carbon emissions should centre around prioritising ways of providing services / DLS in a low-carbon way (including choices of need satisfiers, and how these are provided or made accessible)."	Taken into account; text revised and clarified.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42795	17	41	17	41	in addition to 'in terms of behaviour and lifestyle shifts', should also consider in terms of political obstacles, including vested interests	Accepted; text in this section and elsewhere has been revised to include discussion of lock-in and other political obstacles.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
37317	17	41	17	53	Suggest adding: "It is also necessary to understand past global patterns of energy (electricity) and how these correspond to achieving SDG outcomes." Brecha, Sustainability 2019, 11(18), 5047; <a href="https://doi.org/10.3390/su11185047">https://doi.org/10.3390/su11185047</a> (2019) It is at least necessary to explain how historical patterns can be broken if a radically changed paradigm is proposed	Noted; text in this section and elsewhere has been revised to include historical patterns and lock-ins.	Michiel Schaeffer	Climate Analytics	Netherlands
17451	17	43	17	53	Please consider this comment in revising the section: Meat is a well-known high quality food for humans rich in essential amino acids, EPA, DHA omega-3, haem iron, vitamins B12 and D3, creatine, carnosine, taurine, particularly important in brain development of babies. The latter is relevant as studies have shown the risk run by vegan mothers not having meat in their diets before conception until the end of breastfeeding (Racioppi, et al., 2017 and Aguirre et al., 2019). Meat and animal source foods are often lacking as an important component of nutrients in the diets of people in less affluent societies where hunger and undernourishment are prevalent, as well as nursing mothers, babies, the elderly and poor persons in richer countries. While all animal sourced foods contain unique packages of highly bio-available nutrients, zinc and iron in meat make significant contributions of key nutrients. (HLPE, 2017). Claims favouring low red meat intake are scientifically challenged (Leroy and Cofnas, 2019) and, as a nutrient-dense food source, meat is a key contribution to achieve the United Nations SDG goal 2 (Zero Hunger).  References Aguirre, D.A., M. L. Donato, M. Buscio, V. Ceballos, M. Armeno, L. Aizpurua and L. Arpi. (2019) Serious neurological compromise due to vitamin B12 deficiency in infants of vegan and vegetarian mothers. Arch Argen Pediatr 2019;117(4):e420-e424 <a href="http://dx.doi.org/10.5546/aap.2019.e420">http://dx.doi.org/10.5546/aap.2019.e420</a>  HLPE. 2017. Nutrition and food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. <a href="http://www.fao.org/3/a-i7846e.pdf">http://www.fao.org/3/a-i7846e.pdf</a>  Leroy, F. and N. Cofnas, 2019. Should dietary guidelines recommend low red meat intake? Critical reviews in food and science nutrition <a href="https://doi.org/10.1080/10408398.2019.1657063">https://doi.org/10.1080/10408398.2019.1657063</a>  Racioppi F. A., G. Villamayor and N. Serrano, 2017. Manifestaciones neurológicas del déficit de vitamina B12 en pediatría. Medicina Infantil 2017; 27-30	Taken into account. The chapter now includes the perspective for regions/people where hunger and undernourishment are prevalent (Godfray et al. 2012). However, studies are consistent that a dietary pattern in high plant-based foods and lower animal-based foods, as well as foods that are lower in total energy inputs, is both healthier and associated with less impact on the environment (Nelson et al. 2016, Clark et al. 2019, Springmann et al. 2016)	Hsin Huang	International Meat Secretariat	France
17739	17	43	17	53	Please consider this comment in revising the section:  Livestock makes a huge positive contribution to livelihoods and nutrition including for poor and vulnerable people in the developing world. Over 1 billion people depend on livestock for their livelihoods, among which 600 million are poor farmers (HLPE 2016).  References HLPE. 2016. Sustainable agricultural development for food security and nutrition: what roles for livestock? A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. <a href="http://www.fao.org/3/a-i5795e.pdf">http://www.fao.org/3/a-i5795e.pdf</a>	Taken into account. This chapter is related to demand-side options (some related to dietary patterns). Chapter 7 (AFOLU) in section 7.5. address the importance of livestock contribution to livelihoods and nutrition.	Hsin Huang	International Meat Secretariat	France
15331	17	45	17	46	Smaller letter size	Editorial – copyedit to be completed prior to publication. Thanks!	Simone D'Alessandro	University of Pisa	Italy
15333	17	46	17	46	"values show" instead of "valueshows"	Editorial – copyedit to be completed prior to publication. Thanks!	Simone D'Alessandro	University of Pisa	Italy
6569	17	53	17	53	Please define Annex-I and non-Annex-I prior to using those terms	Accepted – text revised. We will use other terminology to refer the developed and developing world.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
28053	17	45	18	5	Table 5.1 shows the direct services. These direct services are classified into two categories: Direct emission is dominant (Cooking, Hot water, Shelter, thermal comfort, Lighting, mobility) and indirect emission is dominant (Food).	Accepted. The table is now substantially improved to clarify the services (now moved to section 5.3).	Yoshiyuki Shimoda	Osaka University	Japan
25005	17		18		Table 5.1 - how does the affordability aspect of energy access is taken into consideration? How SDG 8 on decent work relates to mobility?	Taken into account. This chapter address inequality in section 5.2.2. ( see also chapter 2. 2.7.2. Factors affecting household consumption patterns and behavioural choices. SDG 8 deleted in the table.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
3733	17	45	17	46	The table 5.1 shows inputs and indicators...	Rejected. The comment is not clear/specific.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
33587	17	16	17	17	Brilliantly worded! Elevate this to ES and SPM, with some relevant data. ... following pages: Chapter 5 you outdid yourselves. Best handling of the topic yet in IPCC reports. This framing now should be carried through to the rest of the chapter (and report). Currently, later sections abandon this dual perspective to greater or lesser extent.	Taken into account. This is a key message in the chapter.	Debra Roberts	EThekweni Municipality	South Africa
26499	18	1	18	2	This table and the proposed indicators shows the poverty of many quantitative approaches to wellbeing analysis, versus, for example bottom-up community based indicators (see the work of Sarah White on relational wellbeing, Atkinson et al - Being Well Together: Individual Subjective and Community Wellbeing - and Smith and Reid, above). For instance, food calories sidelines the importance of balanced nutrition and micronutrients, square metres for living quarters valorises size over quality - see the rise of a 'tiny house' movement with sustainability goals in the global north - while miles per person gives no insight into the quality or resource-intensity of that transport, thus valorising high-mobility cultures such as the US, the communication metrics ignore research which questions the link between high net connectivity and wellbeing, and so on.	Taken into account. We now included text related to subjective well-being, and case studies in order to show local/practical examples.	Thomas Smith	Masaryk University	Czech Republic
31727	18	1	18	2	It is not clear what the global average / capita refers to - is it per week, per month, per year?	Accepted. The table is now substantially improved to clarify the services (now moved to section 5.3).	Ashok Sreenivas	Prayas (Energy Group)	India
31729	18	1	18	2	A global average number for parameters such as Hygiene (Hot water) can be questionable / misleading.	Rejected. The parameters in the table are used as a reference. Hygiene considers hot water use in terms of the use of fuel and electric immersion boilers (see, 1. J. M. Cullen, J. M. A. Á, (2010) and Walker, et al. (2016).	Ashok Sreenivas	Prayas (Energy Group)	India
31731	18	1	18	2	A global average of 23 sq m / capita for living space seems quite high.	Taken into account. Data revised. For example, Rao et al. (2019) found support for a minimum space required of 10 m2 per person, above a minimum home size of 30 sqm (for up to three persons), in several national standards for public housing.	Ashok Sreenivas	Prayas (Energy Group)	India

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
31733	18	1	18	2	In its current form, the table does not seem to account for well-being parameters such as, say, education or social interactions.	Rejected. Although the proposed metrics are relevant, there is no data available to support the changes suggested.	Ashok Sreenivas	Prayas (Energy Group)	India
45885	18	1	18	3	various measurement units need to be adjusted, e.g to m <sup>2</sup> living area / capita; MJ m <sup>-2</sup> y <sup>-1</sup> , passenger-km per capita and year?	Accepted. Indicators corrected.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
38315	18	1	18	5	interesting	Noted	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
18097	18	1	18	6	In my view, this way of structuring the table quickly runs into conceptual problems due to the mismatches between functions, well-being contributions, services, etc. in the energy service cascade, as discussed in Kalt et al. 2019, En Res Soc Sci, 53, 47-58. I think an approach is needed that focuses on any of these levels, but not at all at the same time	Taken into account. The aim of the table is to be used as a reference of services that provide well-being. It is of course recognized that energy services are the intermediaries between functions and benefits that provide human needs and well-being (Kalt, 2019), but it is difficult to represent those complex interactions in a simple form. The table is now in section 5.3. and improved.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
28047	18	1	18	6	This table is very important to understand the relationships between service and energy demand. But it should be commented that energy demand for thermal comfort is affected by climate zone and energy demand for mobility is affected by land use as shown in page 20 line 2-3.	Accepted. Text in relation to spatial differences is added..	Yoshiyuki Shimoda	Osaka University	Japan
25645	18	3	18	3	Since the evidence referred to throughout this chapter suggests that economic growth may be incompatible with climate mitigation and that economic growth a poor metric of well-being (it is even described as 'receding into irrelevance' on p.99), some brief criticism of the inclusion of 'economic growth' in SDG 8 seems appropriate here; to include it uncritically in this table seems incongruous with the rest of the chapter.	Taken into account. SDG 8 to be deleted in the table. In line with the response to the comment ID 25005.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
23087	18		18		Table 5.1 Include another column stating the Ref Value according to DLS metric or SDGs indicator if DLS not applicable. If possible, provide a range in the column for "global average" or ideally distinction between high income and middle to low income countries values. Reference (3) Rao et al 2019 is not reflected in the table.  For food intake values across nations , this report provides ranges: Vázquez, F., Vita, G., & Müller, D. (2018). Food Security for an Aging and Heavier Population. Sustainability, 10(10), 3683. <a href="https://doi.org/10.3390/su10103683">https://doi.org/10.3390/su10103683</a>	Accepted. Reference values added (DLS). Distinction between high and middle income is not possible due data availability. References added and Rao et al 2019 now reflected in the table using parameters for housing and urban/rural distinctions.	Gibrán Vita	Open University of the Netherlands	Netherlands
36659	18		18		Table 5.1. The units for Global Average/ capita should be explicit and also the column Service Indicator or Unit/ day???	Accepted. Text added to clarify and being more explicit. Table moved to 5.3.	NARESH KUMAR SOORA	Indian Agricultural Research Institute	India
44123	18				table 5.1 improve capture: DLS is not explained	Accepted. DLS now explained within the text.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
44125	18				table 5.1 SDG3: health services (health care) could be added here, service indicator, for OECD countries see OECD health statistics. Typical input: ?	Taken into account. Typical inputs refers to the means that provide the services. The table was moved to 5.3. and updated for clarification.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
44127	18				table 5.1 The figure could be improved by showing global GHG /cap	Rejected. GHG/cap goes beyond the aim of the table.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
46559	18				Table 5.1: (i) Correspondences between DLSs and SDGs are not clear. (ii) SDG1 is associated to mobility whereas it could enlightens all the DLSs.	Rejected. In the table we use SDGs are used as reference for each DLS dimension, and match this with current global development efforts. Only the most important SDGs for each dimension are considered.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
40301	19	14	14		Low income populations living in informal settlements with public services deficiencies regarding access to sanitation, services (drinking water, sewage and stormwater drainage) live in high social sanitary and environmental vulnerability, and with overcrowding housing conditions are the most vulnerable to extreme events in the context of Climate Change. This population amounts to 300.000 in the city of Buenos Aires representing approximately ten per cent of its populations. ( Koutsovitis et al 2018)	Accepted. Reference added. The framework of DLS allows to consider the threshold in terms of consumption, but definitely the context matters. This last now discussed in section 5.2.1.	HUMBERTO EDGARDO STEPANIK	Catedra libre ingeniería. UBA voloneer work for villa 31	Argentina
30551	19	4	19	10	Beyond energy consumption, food consumption is another good example of where consumption patterns across nations vary significantly (with per capita GHG footprints attributed to food consumption differing by a factor of nearly 6 across countries), and demonstrate the need to increase food consumption (especially protein, energy and certain micronutrients) to address undernutrition in some populations while in other parts of the world, decreased overconsumption would improve public health. See: Kim et al. (2019). Country-specific dietary shifts to mitigate climate and water crises. Global environmental change, 101926. <a href="https://doi.org/10.1016/j.gloenvcha.2019.05.010">https://doi.org/10.1016/j.gloenvcha.2019.05.010</a>	Noted. Reference has been added.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
38317	19	8	19	9	yes, good.	Noted.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
26139	19	11	19	12	"At present, the 'energy-poor' – more than three billion people, nearly one-third of the world's population – have little or no access to energy for clean cooking." it should be verified. So far global population are about 7.7 billion, is the statement " more than three billion people have no access to energy" accurate? and it is not one-third of total population.	Taken into account. It refers to the energy threshold for human-well being.	Wenling Liu	Beijing Institute of Technology	China
22737	19	11	19	29	"Energy poverty" is mentioned in this paragraph, but only with reference to domestic energy. It is important to acknowledge that similar issues of "transport poverty" exists, notably given the importance of transport in terms of energy consumption and carbon emissions. This is particularly since the remainder of this section highlights strong heterogeneity in passenger km levels both within and between countries. For a recent review paper on transport poverty that brings into dialogue Global North and Global South perspectives see Lucas et al. (2016). For a discussion of the similarities and differences between energy and transport poverty see Mattioli et al. (2017). REFERENCES: Lucas, K., Mattioli, G., Verlinghieri, E., & Guzman, A. (2016, December). Transport poverty and its adverse social consequences. In Proceedings of the institution of civil engineers-transport (Vol. 169, No. 6, pp. 353-365); Mattioli, G., Lucas, K., & Marsden, G. (2017). Transport poverty and fuel poverty in the UK: From analogy to comparison. Transport Policy, 59, 93-105.	Accepted. Reference has been added.	Giulio Mattioli	TU Dortmund University	Germany
25007	19	11	19	29	Use the latest available data in regards to people who lack access to electricity	Rejected. The unit is explained within the figure.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
37319	19	12	19	14	need to distinguish as well between "lacking energy" in the sense of no access, as opposed to not having enough energy consumption to fulfill basic, or more than basic, needs.	Rejected. The comment is not clear/specific.	Michiel Schaeffer	Climate Analytics	Netherlands
26501	19	17	19	17	The use of the word 'drudgery' here seems to raise more questions than it answers, and appears to be importing a lot of assumptions about 'backwards' lifeways. It seems to imply that the mainstream development model is the way out of vastly different ways of life, which are all billed as 'drudgery', whereas the reality is that many would like to be more capable of subsisting in their communities through labour-intensive 'drudgery', if their livelihoods were not being constantly undermined by geopolitical, economic and climatic factors.	Rejected. The energy justice literature includes many references to 'drudgery' which define and explain the use of this term, in various geographic locations.	Thomas Smith	Masaryk University	Czech Republic
44131	19	27	19	28	Might be interesting: In comparison the carbon footprint/cap of health care in rich countries alone is several times higher (see Pichler et al, 2019 doi: 10.1088/1748-9326/ab19e1)	Taken into account. In the text we provide several references, that confirm high agreement about the importance of equitable resource distribution. However, maybe we can type the word "decent" levels of human development, instead "high".	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
46561	19	30	19	45	(i) Please clarify the kind of energy. (ii) A reference to the Swiss Governmental Program "2,000 W society" (63G) could be valuable: (i) Paul Kesselring, Carl-Jochen Winter: World Energy Scenarios: A Two-Kilowatt Society - Plausible Future or Illusion? PSI-Energietage, Villigen, Paul-Scherrer-Institut, 1994. and (ii) <a href="https://www.local-energy.swiss/fr/programme/2000-watt-gesellschaft/">https://www.local-energy.swiss/fr/programme/2000-watt-gesellschaft/</a>	Taken into account. It refers to the energy threshold for human-well being. A clarification is now inserted in the text. Thank you for the reference, will be revised.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
30857	19	35	19	42	Add reference from Vita et al, 2019. This paper adds significantly to this substantive issue calculate the carbon and energy footprints required for key quality of life indicators: subsistence, protection, creation, freedom, leisure, identity, understanding and participation. These indicators provide a more fundamental view of wellbeing. Vita, G., Hertwich, E.G., Stadler, K. and Wood, R., 2019. Connecting global emissions to fundamental human needs and their satisfaction. Environmental Research Letters, 14(1), p.014002.	Accepted. Reference has been added.	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
38211	19	36	19	40	Specify that the figures referred to here and in page 22 are per year	Accepted. The unit is explained within the figure.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
26141	19	36	19	45	energy required for decent living standards	Rejected. The comment is not clear/specific.	Wenling Liu	Beijing Institute of Technology	China
45887	19	37	19	37	GJ per capita <sup>^y-1</sup> ?	Accepted. Notation to be corrected.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
33589	19	46	19	46	How robust is the literature?	Taken into account. In the text we provide several references, that confirm a high agreement about the importance of equitable resource distribution. However, maybe we can type the word "decent" levels of human development, instead "high".	Debra Roberts	EThekwni Municipality	South Africa
5637	19	48	19	48	The phrase "overconsumption by the global rich" is highly problematic for the same reasons outlined in my Comment #5 above, and this particular phrase is even more unacceptable for an IPCC report which aims to be a scientific document.	Accepted; text revised to contextualize relative levels of energy use for service provision and related indicators.	Benjamin Leibowicz	The University of Texas at Austin	United States of America
15335	19	48	19	48	I believe it would be important to mention explicitly how the literature envisions a reduction of overconsumption by the global rich.	Noted.	Simone D'Alessandro	University of Pisa	Italy
23089	19	46	20	2	"high levels of human development" but the references given study only the Human Development Index. This could be specified.	Taken into account. We will use the word "decent" levels of human development, instead "high" and provide studies considering other indexes.	Gibran Vita	Open University of the Netherlands	Netherlands
37321	19		25		There is a significant amount of repetition on inequality of energy use and emissions, both between countries and within countries and income groups; suggest paring this down if possible	Accepted; the narrative is reframed to avoid repetition.	Michiel Schaeffer	Climate Analytics	Netherlands
995	19	1	27	14	Section 5.2.2 contains a wealth of useful info and analysis but is organised in a confusing way. I suggest distinguishing three parts: 1. variations in access to DLS services or need-satisfiers (Figure 5.4), 2. variations in energy use (Figure 5.5), 3. variations in (consumption-based) emissions. In all cases further distinguishing within-country and between-country inequalities. This suggests Table 5.6 should be as detailed and informative as the previous two - it is rather weak at present.	Accepted. Now the section 5.2.2 is organized in part, using your suggestion. Thanks.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
23097	19	1	27	14	This section 5.2.2, jumps from cross-national level inequalities/heterogeneities, then o within country income quintiles, to differences in individuals (comparing to neighbors) and then gender. Consider breaking up these topics within this section.	Accepted. The text has been reframed.	Gibran Vita	Open University of the Netherlands	Netherlands
36255	19	19			It should be here clean energy access	Accepted. Text revised	Youba Sokona	South Centre	Switzerland
991	19	30			Heterogeneity? Inequality is a clearer term	Accepted. Text revised.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
5639	20	2	20	3	The fact that per capita energy demand in the U.S. was 63% higher than in Germany is a valid, factual statement on its own. However, the use of this fact to support the highly problematic argument that there is "overconsumption by the global rich" (see my Comment #6 above) is misleading. Does this statistic imply that people in the U.S. are engaging in overconsumption? While that may or may not be true (and is ultimately subjective), there are so many reasons why energy use is higher in the U.S. that could not accurately be labeled as "overconsumption." For starters, the U.S. has many climate regions that are either much hotter or much colder than Germany, leading to higher heating and cooling energy use. The U.S. is a much larger nation, which means that domestic travel entails longer distances and more airplane travel. The U.S. developed in an entirely different historical context in which land was an abundant factor input, leading to a path-dependent, sprawling development pattern. All of this is not to say that the U.S. shouldn't reduce its own energy use. It should. Nevertheless, using this statistic as evidence that the U.S. is engaging in "overconsumption" of energy is misleading.	Accepted; text revised to contextualize and discuss differences in levels of energy use in relation to levels of service provision for general well-being, and the use of empirical indicators in comparative analysis.	Benjamin Leibowicz	The University of Texas at Austin	United States of America
23091	20	3	20	3	Suddenly changes topic to "human well-being is socially-based". This should be a different section or at least paragraph. The DLS and material provisioning is not socially based or relational in the sense as it is being meant here. Here is all about subjective well-being.	Accepted. The text has been reframed.	Gibran Vita	Open University of the Netherlands	Netherlands
38319	20	17	20	17	So, anecdotally, more money does not necessarily lead to more happiness?	Rejected. More money does not necessarily lead to more happiness. Humans are often predictably wrong and experience less well-being than expected (Kahneman et al. 1997) there is a discrepancy between expectation and experience. Consumption result in more well-being only up to the point that is used to satisfy basic human needs (see also).	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
24371	20	17	20	24	It's unclear from the data and material presented in the chapter how the quantitative DLS thresholds are calculated nor whether they are relevant universally (or whether they are intended to define minimum thresholds relevant for those excluded from sufficient access to modern energy services). For example, a DLS of 20 p-km per capita per day would be breached by a teleworker avoiding a daily commute, but elsewhere this is argued as a needs satisfier.	Taken into account; DLS are based on Rao et al (2019), 1. N. D. Rao, J. Min, A. Mastrucci, Energy requirements for decent living in India, Brazil and South Africa. Nature Energy (2019), doi:10.1038/s41560-019-0497-9. A clarification will be added to mention that they are intended to define the minimum threshold for people excluded from access to energy services.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
25647	20	18	20	18	The across country graphic in fig 5.4 is very nice. The within country graphic less so. Perhaps it would be clearer to make two figures: one of the within country data, one of the across country data. The within country heterogeneity figure is a bit muddled: it is comparing the top 25% of India with the top 10% of the Netherlands, for example. But it might be that the top 10% in India actually has the same consumption rates as the top 10% in the Netherlands, we don't know from this figure; the figure would make more sense if it compared the same percentiles from the two different countries.	Taken into account. The figure has been improved based on the suggestions, in order to achieve a better visualisation. Same percentiles will be analysed/presented in the within country graphics, if data availability.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
25649	20	18	20	18	It would be nice to have total energy per capita compared in a similar fashion to fig 5.4, if that is possible.	Taken into account. Data will be added to have energy percapita.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
42797	20	19	20	24	Showing the top/bottom 10% from a high income country and the top/bottom 25% of a low-income country in the same figure may very easily be misunderstood. Should write labels "India" and "Netherlands" in each of the graphs to make it very clear.	Taken into account. The figure has been improved based on the suggestions, in order to achieve a better visualisation. Percentiles are analysed based on data availability.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
11945	20	17	21	4	This figure has good potential, but as of now it becomes difficult to read. Please consider breaking up and simplifying. E.g. there is no need for a coloured world map as well as coloured labels in the legend to show the countries (duplication). The descriptions in the figure itself (e.g. "within country heterogeneity") should be more descriptive (e.g. add which countries they relate to in this case India and Netherlands) and y-axes in the bottom half of the figure should all be labelled. The figure could also benefit from more explanatory text re. across-country differences.	Taken into account. Figure will be simplified to improve visualization, colors, and captions. Country and axes labels will be added.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
993	20	11			The sentence beginning 'Recent research' is making a quite separate point.	Accepted. Text revised.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
3735	20	17			In the down part of the Figure 5.4, "decent" instead of decetn	Accepted. Text revised.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30735	20	17			The information density and design of this figure could be significantly improved. The upper panel on "within country heterogeneity" could use violin plots ( <a href="https://en.wikipedia.org/wiki/Violin_plot">https://en.wikipedia.org/wiki/Violin_plot</a> ) to show the full distribution of each country's population, rather than just two percentiles. Then, with the same plot area, four representative countries could be displayed. Violin plots, or other statistical plots showing the entire distribution rather than just a mean and CI confidence interval could be used for the bottom panel. The lower panel could also be rotated to display horizontal bar graphs (or violin plots etc), leaving room to label the continents directly on the axis, rather than via color matching. The subplots in each panel should also be aligned for ready comparison (ie, the food meat plots should be next to one another).	Taken into account. Violin plots are a good option, but depends on data availability. Figure will be improved.	Jacob Peacock	The Humane League Labs	United States of America
33853	20				Figure: Please just insert the labels "India" and "Netherlands" in the graphs, so one doesn't miss this important detail, otherwise it just doesn't make sense. It would also help to use the same cut-offs (i.e. 10%) in both countries. It would be very revealing to include a third example of a very unequal society (e.g. South Africa, Egypt).	Accepted. Labels has been added to the within country graphs. Same percentiles will be used to compare countries if data is available.	Debra Roberts	EThekini Municipality	South Africa
44031	20				It would be useful to explain the significance of the global average being below the decent living standard (mobility). Or is that a mistake?	Accepted. A deep explanation will be added. DLS deficits in developing countries are related to mobility and sanitation. So, it is clear in the graph how the global average is below the DLS line.	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
42799	21	7	21	8	should say "consume less energy than the international energy requirements for DLS". Whether they lack final energy for meeting DLS is not clear without studying each country.	Accepted. Text added.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42801	21	11	21	11	expand on the price elasticity, by adding something like: "implying that growing incomes lead to over-proportional growth of energy footprints in these consumption categories."	Accepted. Text added to expand explanation.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
22739	21	11	21	13	Goessling (2019) provides a glaring illustration of the highly carbon-intense lifestyles of global elites in his study of celebrities' air travel. REFERENCES: Gössling, S. (2019). Celebrities, air travel, and social norms. <i>Annals of Tourism Research</i> , 79, 102775.	Accepted. Reference has been added.	Giulio Mattioli	TU Dortmund University	Germany
46563	21	11	21	13	Two sectors are without control (or not controlled by mitigation policies: transportation and IT) (see above and below)	Taken into account. To be discussed in policy section.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
38321	21	12	21	13	So, the highest polluters are the rich? Could this be spelled out e.g. as a 'climate justice' issue?	Accepted. This would be spelled here but also making a reference to section 4.4.4 (Chapter 4) which address the climate justice issue.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
6571	22	1	22	1	Could the legend be changed so that it is easier to read and understand? Perhaps going left to right as opposed to top to bottom? Why are there categories for lowest, low, mid, high, as well as q1, 2, 3 and 4?	Accepted. This text will be deleted from this section and moved to section 5.4.; 5.6.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
11947	22	1	22	6	The figure is interesting and would benefit from simplification, e.g. reducing the number of income groups or instead displaying box plots to show the variation. The measure (energy required) should also be labelled in the figure itself and not just in the legend.	Accepted. Figure simplified.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
23093	22	8	22	8	This section starts here suddenly. Perhaps a headline would be useful.	Accepted. Now part of a subsection on variability in energy use.	Gibran Vita	Open University of the Netherlands	Netherlands
36257	22	3			I wonder if firewood consumption is included. If this is the case it distorts the comparison due to the fact they are estimated and considering only population growth	Noted. Figure 5.5 does not use population growth in showing relative energy consumption across population quartiles /quintiles. Firewood may not be reflected in expenditures if it is gathered without purchase. The caption has been revised to include the term 'monetary expenditures'.	Youba Sokona	South Centre	Switzerland
44033	22				it is confusing to use 4 categories for certain sets of countries and 5 categories for others. I would suggest trying to choose one and use it consistently as best as possible; if it's truly not possible, then it needs to be better explained. Many countries are also missing, with no explanation of how the existing subset was chosen; it may be better to either include all countries, or to use an even smaller subset with an explanation as to why they are chosen as a representative set for each grouping of countries. Is there a better way to represent the inequality in energy usage within a country compared to other countries? I think this plot is likely far more complicated than it needs to be to get the takeaway message across.	Taken into account. The figure has been updated to communicate the message in a better way. Categories and the use of different subsets of countries is now explained in the figure.	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
46565	22				figure 5.5: what are the correlations between energy spreads and group incomes for the 5 groups?	Rejected. Although is an interesting suggestion, the aim of the figure is only to highlight the inequality in energy use. In this case by different countries grouped by different income.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
24373	23	1	23	15	This paragraph is a non-sequitur from the previous text.	Accepted. This text will be deleted from this section and moved to section 5.4.; 5.6.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
2633	23	2	23	7	Hopefully, the study mentioned on line 2 (there is no reference to it available ?) will have investigated why the Mexican families liked to keep their windows open. Was that pure laziness, or because they did want to keep as large a contact with the world outside as possible, or what ? Incorporating human behaviour into engineering models is necessary but not enough, because for the sake of mitigation one might like (this is the case here) to change somewhat this behaviour, and for this purpose it is useful first to understand it.	Accepted. This text will be deleted from this section and moved to section 5.4. 5.6. Good point, this is discussed now in the text. This comment highlight the importance of human behaviour and the multiple factors affecting it. Also, the importance of social sciences in climate mitigation.	Phillippe Waldteufel	CNRS/IPSL/LATMOS	France
44797	23	8	23	12	Could mention different diet shift approaches for different economic levels. Decrease in red meat in some countries (the average) may not confer the health benefit that it does in the Netherlands	Accepted. This text will be deleted from this section and moved to section 5.4. 5.6. The chapter now include the perspective for regions/people where hunger and undernourishment are prevalent (Godfray et al. 2012). However, studies are consistent that a dietary pattern in high plant-based foods and lower animal-based, as well as lower in total energy is both healthier and associated with less impact on the environment (Nelson et al. 2016, Clark et al. 2019, Springmann et al.2016)	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
10851	23	12	23	15	References needed to support the claims made, especially given that the sentence opens with Literature is in high agreement.	Accepted. Literature now added. This text will be deleted from this section and moved to section 5.4. 5.6.	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
23025	23	12	23	15	I would be more cautious with truth claims. What kind of literature? Is it empirical literature, or normative? Did you check the literature for contradicting findings?	Accepted. Literature (both supporting and contradicting) has been added/complemented and discussed. It is recognized that correlation between emissions and human development does not imply that their dynamics are coupled in the long term; the same when considering the key role of the environment on human health, for example "economic growth is one of the most important factors influencing the health expenditures in Europe" (Badulescu et al. 2019) . Increases in primary energy and carbon emissions account for only a quarter of improvements in life expectancy, but are closely tied to growth in income (Steinberger, 2020).	Edgar Hertwich	Norwegian University of Science and Technology	Norway

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
45889	23	14	23	15	Additional biblio might be usefully added after "heating and cooling": i.e.  Zhai Y., A. Honnekeri, M. Pigman, M. Fountain, H. Zhang, X. Zhou, and E. Arens. 2019. Use of adaptive control and its effects on human comfort in a naturally ventilated office in Alameda, California. <i>Energy and Buildings</i> , Vol. 203, 13 pp. November. <a href="https://doi.org/10.1016/j.enbuild.2019.109435">https://doi.org/10.1016/j.enbuild.2019.109435</a> <a href="https://escholarship.org/uc/item/9nv63029">https://escholarship.org/uc/item/9nv63029</a>  Parkinson, T., R. de Dear, and G. Brager. 2020. Nudging the adaptive thermal comfort model. <i>Energy and Buildings</i> , Vol 206. January. <a href="https://doi.org/10.1016/j.enbuild.2019.109559">https://doi.org/10.1016/j.enbuild.2019.109559</a> <a href="https://escholarship.org/uc/item/0080620p">https://escholarship.org/uc/item/0080620p</a>  Arens, E., Humphreys, M. A., de Dear, R. and Zhang, H. (2009) 'Are "class A" temperature requirements realistic or desirable?', <i>Building and Environment</i> , Vol 45, no 1, pp4–10  de Dear, R. J. and Brager, G. S. (2002) 'Thermal comfort in naturally ventilated buildings: Revisions to ASHRAE Standard 55', <i>Energy and Buildings</i> , vol 34, no 6, pp549–561,  Zhang, H., Arens, E., Fard, S. A., Huizenga, C., Paliaga, G., Brager, G. and Zagreus, L. (2007) 'Air movement preferences observed in office buildings', <i>International Journal of Biometeorology</i> , vol 51, no 5, pp349–360  Pagliano, Lorenzo, and Paolo Zangheri. 2010. "Comfort Models and Cooling of Buildings in the Mediterranean Zone." <i>Advances in Building Energy Research</i> 4 (1): 167–200. <a href="https://doi.org/10.3763/aber.2009.0406">https://doi.org/10.3763/aber.2009.0406</a> .	Noted. References revised, but this text has been moved to section 5.4. 5.6.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
11949	23	16	23	17	This is a very important finding/message and should be highlighted in the exec.summary and used to frame the importance/relevance of the chapter.	Noted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
46567	23	16	23	47	There is an excessive counting equivalence between carbon footprint and energy: If this is the case, the one-to-one correspondance should be given!	Accepted. The text has been reframed to avoid confusion.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
22743	23	18	23	19	On future growth trends in passenger transport see the ITF "Transport Outlook 2019" report, as well as: UNWTO & ITF, 2019. Transport-related CO2 emissions of the tourism sector – Modelling results. World Tourism Organisation, Madrid, Spain.	Accepted. Reference has been revised.	Giulio Mattioli	TU Dortmund University	Germany
30553	23	26	23	30	The country of origin of specific foods (particularly red meat) and dairy consumption also play a significant role in the variation of per capita food-consumption-related GHG footprints between low-income and high-income countries. The highest per capita food-consumption-related GHG emissions do not correlate perfectly with the income status of countries. See: Kim et al. (2019). Country-specific dietary shifts to mitigate climate and water crises. <i>Global environmental change</i> , 101926. <a href="https://doi.org/10.1016/j.gloenvcha.2019.05.010">https://doi.org/10.1016/j.gloenvcha.2019.05.010</a>	Accepted. Reference revised and added in the discussion, in relation to the importance of trade, culture, and nutrition in diet footprints.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
24375	23	29	23	33	There are quite a few places in the chapter when literature reviewed is really quite dated, particularly when research in the corresponding field has been active. This is one of them.	Accepted. Literature has been updated to avoid the quite dated one.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
42803	23	30	23	30	unclear whether 'global reach' is clear in this context. Instead say something like: "with a considerable fraction of the carbon footprint stemming from abroad but imported as embedded in imported goods and services."	Accepted. Text revised.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
1323	23	31	23	31	Add our paper Büchs, M., & Schneepf, S. V. (2013). Who emits most? Associations between socio-economic factors and UK households' home energy, transport, indirect and total CO2 emissions. <i>Ecological Economics</i> , 90, 114–123. doi: <a href="http://dx.doi.org/10.1016/j.ecolecon.2013.03.007">http://dx.doi.org/10.1016/j.ecolecon.2013.03.007</a> for a more up to date reference on the UK.	Noted. However, the text here has been deleted in the section.	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
26503	23	33	23	34	At face value, this focus on the 1 billion - while making sense - comes across as somewhat static and shortsighted. The lifestyles of the billions immediately outside that initial bracket are rapidly shifting and will also need focusing on, with the relevant equity considerations, of course.	Accepted. This is an interesting point, now is included in the text.	Thomas Smith	Masaryk University	Czech Republic
38323	23	35	23	36	No "wealth redistribution" as such surely i.e. net demand would remain the same whereas we wish to reduce demand or at the very least make it 'smarter'?	Noted	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
15337	23	37	23	46	Tighter spacing in this paragraph	Editorial copyedit to be completed prior to publication	Simone D'Alessandro	University of Pisa	Italy
11951	23	43	23	44	This is a very important finding/message and should be highlighted in the exec.summary and used to frame the importance/relevance of the chapter.	Noted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
37323	23	43	23	46	are you discussing energy or emissions - mixed language here	Accepted. The text has been reframed to avoid confusion, discussing emissions and energy separately.	Michiel Schaeffer	Climate Analytics	Netherlands
42805	23	46	23	46	should refer to energy footprint rather than carbon footprint here	Accepted. Carbon footprint replaced.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
22741	23	16			Given recent controversies on the use of the term "BAU" in climate research & reporting, it would be important to briefly clarify how the term is used here / what it means	Accepted. Clarification now has been added.	Giulio Mattioli	TU Dortmund University	Germany
23027	23	22			Since you cite an older paper for the carbon footprint and the concept of consumption based accounting, I would recommend to go all the way back to the original work of Hertwich & Peter, and Wiedmann in introducing this term to the scientific literature.	Accepted. Reference has been added.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
29421	23	22			For a reference to the term "Carbon Footprint", please also cite "Wiedmann, T. and Minx, J. (2008). A Definition of 'Carbon Footprint'. In: C. C. Pertsova, <i>Ecological Economics Research Trends: Chapter 1</i> , pp. 1-11, Nova Science Publishers, Hauppauge NY, USA. <a href="https://www.novapublishers.com/catalog/product_info.php?products_id=5999">https://www.novapublishers.com/catalog/product_info.php?products_id=5999</a> ."	Accepted. Reference has been added.	Stefan Pauliuk	University	Germany
23029	23	38			There is an error in the unit, probably tonnes per year.	Accepted. Units revised and corrected in the text. Thanks.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
33591	23	42			There is some repetition.	Accepted. Text revised.	Debra Roberts	EThekwi Municipality	South Africa
9637	24	9	24	9	You could compare and double check this with Sager, L. (2019). Income inequality and carbon consumption: Evidence from Environmental Engel curves. <i>Energy Economics</i> , 104507.	Rejected. Inequality in carbon consumption is treated in other sections.	Jasper Meya	German Centre for Integrative Biodiversity Research	Germany
33595	24	10	24	10	Given the rapid transition that some of these technologies have undergone over a very short period, some of the data points in Box 5.2, Figure 1 will need to be updated to provide accurate information.	Accepted. New numbers added.	Debra Roberts	EThekwi Municipality	South Africa
42807	24	10	24	12	gini numbers partly inconsistent between graph and table	Accepted. Gini numbers checked and harmonized.	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
22745	24	27	24	29	"Transport (cars, mopeds, and bicycles) ... can be seen as proxies for access to mobility ... crucial to participate in society". Correct but it would be important to mention public transport here - otherwise it sounds like social inclusion can only be achieved with private transport modes	Accepted.	Giulio Mattioli	TU Dortmund University	Germany
3737	24	1			is indicated : BOX 5.2 starts here	Accepted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
33593	24	10			The cellphone is an interesting example of how provision of one service (communication) can reduce the need for another service (transport), saving poor people who had no land lines before, the time and money to travel long distances to speak to someone. Now they can call. Cellphones also allow them to make appointments, and avoid having to keep going back because someone wasn't there. They can access health information and don't have to run off to a clinic every time as a first resort, it improves safety, can be used to make payments and transactions, and now take photos, make copies, receive mail, etc. So cellphones have improved the lives of the poor much more than just ... the phone. They save the owner so much time and money that would have been wasted on other things. That is also why the uptake has been so high, because the value is multiplied. Are there perhaps other examples of where provision of one service or technology can multiply across other services/needs? Or can the cellphone be used for even more uses that improve life, save time, travel, money and carbon emissions? E.g. 'online doctors', early warning or weather services for farmers, second hand sales, education sites, etc.	Accepted. We added a sentence saying: "bringing accessibility benefits especially to populations with very low disposable income and to those whose physical mobility is limited (Porter, 2015)."	Debra Roberts	EThekwi Municipality	South Africa
3739	24	17		19	issue with the brackets	Accepted. Corrected.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
44035	24				Is there a reason to include both TVs and PCs given that the lines are almost identical? I would suggest including only PCs to simplify visually.	Rejected. TV and PCs lines have important differences. In the Gini index there are also important gaps.	Tegan Blaine	Blue Cairn Climate Consulting	United States of America

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23031	25	6	25	10	The pattern you describe has indeed been observed since the first consistent comparison in my work (Hertwich and Peters 2009), but it does not apply universally. Richer people also travel more, especially long distance. A decarbonization of the building sector, which is easier than other things, takes an important baseload away. In Norway, for example, we observe elasticities larger than 1, 10.1111/jiec.12405. Also, be careful as to what is described in the carbon footprint account, all CO2, fossil CO2, or all GHGs. It has a significant influence on results, in particular at the lower end of income, where food is more important.	Accepted. Text has been revised. References have been added. Carbon footprint account is described in text.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
23099	25	6	25	15	Contradictory statements: "Per capita disparities in carbon footprints decline as countries become richer" "The higher the income level, the more disproportionate 15 the carbon footprint (Figure 5.6)" Then in pg 29 line 48 "Correspondingly, for Annex I countries where there is high income inequality, pro-poor growth measures are associated with reduced emissions (Grunewald et al. 2017b)."  Would be really useful to summarize the main mechanisms that explain why higher income equality reduces or increases emissions. These statements come up throughout the section and seem interesting but do not provide any explanation, e.g. carbon elasticity of basic goods, redistribution through income tax, etc.  In general I would reconsider these definitive statements. There are not a general rule and in contradiction to Simon Kuznet and others work.	Accepted. Text revised.	Gibran Vita	Open University of the Netherlands	Netherlands
38325	25	6	25	16	OK, good conclusion, but focus with what? Education? Taxes? Other incentives? Crucial the rich in capitalist nation states have 'power' so such interventions must tread carefully so as to be accepted e.g. employ change management strategies, etc!	Taken into account. This kind of suggestions/strategies, will be added in section 5.6 in the chapter.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
11953	25	13	25	17	This is a very important finding/message and should be lifted to the exec.summary.	Noted	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
15339	25	14	25	15	The phrase "the higher the income level, ..." is unclear. Does it mean higher income levels of a country are associated with disproportionate inequality in carbon footprint within that country?	Accepted. Text revised.	Simone D'Alessandro	University of Pisa	Italy
11955	25	17	25	19	This is a simple and useful figure - please retain. Please consider to indicate that this is on a global level (if so), and that the "group"-coloring refers to income-level (if so).	Rejected. Unfortunately the figure has been deleted due space constraints. A new figure contains part of this information.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
18099	25	18	25	19	Excellent message from this graph, but needs much stronger caption (e.g. explanation how per-capita GHG was calculated, which system boundaries, etc.). If that could be based on merging several studies, and perhaps also depicting a variety of climate impact indicators, that would be great.	Rejected. Unfortunately the figure has been deleted due space constraints. A new figure contains part of this information.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
15341	25	21	25	25	I believe the argument that the poorest will suffer the most from climate change extends beyond their greater reliance on agriculture for food and income, to non-agricultural production. See fig. 2 of Burke, Marshall, Solomon M. Hsiang, and Edward Miguel. "Global non-linear effect of temperature on economic production." Nature 527, no. 7577 (2015): 235-239.	Accepted. Text revised and reference has been added.	Simone D'Alessandro	University of Pisa	Italy
3741	25	4			is indicated : BOX 5.2 ends here	Editorial	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
22747	25	16			An important early reference on this is: Brand, C., & Boardman, B. (2008). Taming of the few—the unequal distribution of greenhouse gas emissions from personal travel in the UK. Energy Policy, 36(1), 224-238.	Accepted. Reference has been added.	Giulio Mattioli	TU Dortmund University	Germany
36259	25	29		30	Increasing energy use for development does not necessarily imply increasing emissions	Accepted. Text revised, adding the type of energy.	Youba Sokona	South Centre	Switzerland
46569	25				Figure 5.6: a country/region analysis would be helpful to correlate with figs. 5.4 and 5.5.	Rejected. Data availability becomes a limitation to perform the analysis.	Vincent MAZAUIC	Schneider Electric / International Chamber of Commerce (ICC)	France
42809	26	1	26	3	Really important to point out that this is NOT necessarily the case: some countries that show significant deprivations of several human needs (or DLS) could achieve DLS without increase in average energy use. See Rao et al. 2019a (btw, same as Rao et al. 2019b).	Accepted. Text deleted. This point is already included in the previous section 5.1.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
42811	26	7	26	7	good for development": inconsistent with (adequate) criticism of GDP as measure of progress or development earlier in this chapter. More accurate would be to say: which has been associated with some improvements in human development (subject to issues of GDP and economic growth as measures and goals of development), but also increases in overall emissions.	Accepted. Text revised and suggested wording added.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
25009	26	7	26	10	Delete "To mobilize the benefits of ... Campagnolo and Davide 2019)." as the subject argument does not take into account energy efficiency improvements and technological advancement	Taken into account. We added energy efficiency improvements and technological advancement.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
38327	26	8	26	9	good!	Noted.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
46729	26	9	26	10	Please add Mikael Karlsson, Eva Alfredsson & Nils Westling (2020) Climate policy co-benefits: a review, Climate Policy, DOI: 10.1080/14693062.2020.1724070.	Noted. However, this text has been deleted here.	Mikael Karlsson	KTH Royal Institute of Technology	Sweden
26505	26	11	26	12	How much are these more positive statistics skewed by the predominance of China and India in such shifts? They would appear to obscure as much as they reveal.	Taken into account. China and India certainly plays an important role in global indicators for human development. This is no highlighted in the text. However, increases in those indicators can't be seen necessarily as skewed patterns.	Thomas Smith	Masaryk University	Czech Republic
38329	26	14	26	14	sounds a little vague + idealistic?	Rejected. Lack of information in individuals affects behavior. If people are unaware of the importance of energy services and how they operate, they will hardly make the right decisions.	Timothy Barker	Keele University	United Kingdom (of Great Britain and Northern Ireland)
30555	26	21	26	22	Countries with high GHG emissions can also focus on shifting towards less GHG-intensive diets	Taken into account. This suggestion will be discussed in section 5.6.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
38801	26	25	26	30	Is there a scientific reason to categorize countries by Non-Annex I and Annex I? Portions of the chapter use GHG emissions or income percentiles to provide categorical impacts across the world. Moreover, these statements do not adhere to the policy-neutral principle and seem to incite policy differences among nations.	Accepted. Text has been revised to adopt the TSU-approved terminology in a policy-neutral way.	Julian Reyes	Personal Capacity	United States of America
26507	26	45	26	49	It's unclear what 'better public information' means in this context and how it could unleash 'great creativity'. The links and causality were unclear to this reader, especially given systemic lock-in and the role of carbon-intensive practices.	Accepted; text has been revised and clarified.	Thomas Smith	Masaryk University	Czech Republic
34809	26	9	27		Box 5.3 "The informal sector and climate mitigation" should be inserted in the appropriate page.	Noted. Text box will be moved if possible.	Onema Adojoh	Missouri University of Science and Technology, Rolla, USA	United States of America
22749	26	29	27	14	Box 5.3. highlights the potentialities of the informal sector for climate change mitigation. But the informal economy can also be a hindrance, for example when it comes to the provision of public transport. In many countries in the Global South, M. (2017). Taken for a Ride: Grounding Neoliberalism, Precarious Labour, and Public Transport in an African Metropolis. Oxford University Press. There are high levels of 'informal' public transport provision (Cervero & Golub, 2007). The resulting public transport systems are characterised by abundant supply, but also poor integration, as well as safety and congestion problems, and this in a period of increasing private motorisation. While there is a consensus around the need for integrated, hierarchical public transport networks in developing cities, these are hard to implement due to state weakness and resistance from current operators (Pojani & Stead, 2017; Rizzo, 2017). As incomes rise and urban densities decrease, the poorly integrated systems of Global South cities may find it difficult to compete with rising car ownership. REFERENCES: Cervero, R., & Golub, A. (2007). Informal transport: A global perspective. Transport Policy, 14(6), 445-45; Pojani, D., & Stead, D. (Eds.) (2017). The Urban Transport Crisis in Emerging Economies. Cham: Springer; Rizzo, M. (2017). Taken for a Ride: Grounding Neoliberalism, Precarious Labour, and Public Transport in an African Metropolis. Oxford University Press.	Accepted. Text has been revised to include literature on informal transportation, other examples of informal-sector mitigation, and policy effects.	Giulio Mattioli	TU Dortmund University	Germany



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35879	26	29	27	14	Box 5.3: This is a very important linkage. One more issue is that it is difficult to get data on GHGs from the informal sector especially in the developing countries.	Noted. Text has been revised to include as much data as possible.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
29271	26	29	30	40	There is a need to explain the role of the informal settlement in managing material flows. See for example the work of Louise Guibrunet: Guibrunet, L., 2017. The contribution of the informal economy to urban sustainability—case study of waste management in Tepito, Mexico City (Doctoral dissertation, UCL (University College London)).	Accepted. Text has been revised to include this reference.	Vanesa Castan Broto	University of Sheffield	United Kingdom (of Great Britain and Northern Ireland)
3743	27	21	23		As it is, the sentence means that material and energy consumption is higher in more equal societies...	Accepted. Text has been revised for clarity.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
31735	27	6	27	7	In addition to taking care not to additionally burden the unpaid and marginalized while providing locally appropriate services using low-energy technologies, care should also be taken that the quality of service that the disadvantaged receive is comparable to that which others receive - otherwise, the service provision will not result in the necessary benefits.	Accepted; text has been revised to include this point.	Ashok Sreenivas	Prayas (Energy Group)	India
31737	27	16	27	16	There is a lot of repetition in this (and previous) sections. E.g. the relationship between greater equity and lower emissions; and between gender equity and lower emissions etc. are repeated multiple times.	Accepted. Text has been revised and restructured to condense this material in an earlier section.	Ashok Sreenivas	Prayas (Energy Group)	India
26509	27	17	27	17	Is the statement in the first sentence unequivocally correct? Take Norway, for example, with one of the lowest Gini coefficients, but an economy based on oil exploitation. Most low-gini coefficient countries seem to be high-carbon emitters.	Accepted. Text has been revised and contextualized, with references.	Thomas Smith	Masaryk University	Czech Republic
26511	27	27	27	29	Terminology and concepts seem to be getting muddled here. How can life satisfaction be high, while emotional well-being is not? I would treat some of the psychology findings cited here with care, especially given the replication crisis and possible question marks over the robustness of those findings.	Accepted. Text has been clarified and evidence reviewed.	Thomas Smith	Masaryk University	Czech Republic
23101	27	27	27	30	Cite Add this reference Vita, G., Hertwich, E. G., Stadler, K., & Wood, R. (2019). Connecting global emissions to fundamental human needs and their satisfaction. Environmental Research Letters, 14(1), 014002. <a href="https://doi.org/10.1088/1748-9326/aae6e0">https://doi.org/10.1088/1748-9326/aae6e0</a>  here:  "high consumption and emissions levels (which often accompany inequality) are generally decoupled from happiness, especially in higher-income countries (Frank 2010; Oishi et al. 2018; Xie et al. 2018; Wang et al. 2019; Schneider 2016)."  And this reference : Vita, G., Ivanova, D., Dumitru, A., García-Mira, R., Carrus, G., Stadler, K., ... Hertwich, E. G. (2020). Happier with less? Members of European environmental grassroots initiatives reconcile lower carbon footprints with highVita, G., Ivanova, D., Dumitru, A., García-Mira, R., Carrus, G., Stadler, K., ... Hertwich, E. G. (2020). Happier with less? Members of Eur. Energy Research & Social Science, 60, 101329. <a href="https://doi.org/10.1016/j.erss.2019.101329">https://doi.org/10.1016/j.erss.2019.101329</a>  Here: "High life satisfaction, although not emotional well-being, does appear to have an income or consumption-related component (Kahneman et al. 2006; Kahneman and Deaton 2010; O'Neill et al. 2018)."	Accepted. These references have been included.	Gibran Vita	Open University of the Netherlands	Netherlands
12835	27	37	27	40	The claim that solastalgia and stress caused by environmental change are less prevalent in societies where DLS conditions are met seems highly questionable. The notion of solastalgia was developed in relation to people living near mining in Australia (people whose needs are met). There is also research to suggest that fracking in the US causes enormous emotional distress. (Willow, 2014) There is no reason to think people in well to do societies are not distressed by environmental harm and change.	Accepted. This sentence has been deleted.	Dina Townsend	University of Witwatersrand	Austria
24377	27	17	28	32	This whole section 5.2.3 on equity in governance is repetitive of the previous section on equity, and it's also not clearly about services-based mitigation, but rather is generic social science text. It's also very strongly normative in taking as a start point that equity is good and necessary, and then generically exploring what this means in a mitigation context. It also gives the impression that services-based mitigation is only possible by also improving equity - which isn't true (as evidenced by countries which have peaked and declined demand-side emissions while inequality has worsened). I would suggest cutting most of section 5.2.3 out and integrating the remainder of this section with the one before on inequalities in service provision - given that services are one of the organising principles of the chapter.	Accepted. Text has been revised and restructured to condense this material in an earlier section, and include its relevance to mitigation.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
6575	27	43	28	9	The author cites research suggesting that income inequality is associated with increased emissions from economic growth and that decreased income inequality would decrease emissions from the same economic growth. The way the paragraph is written, it sounds as though the research that is cited finds an association between the two factors (inequality and emissions from economic growth) and that this relationship is likely causal (hence decreasing inequality would lead to reduced emissions). Could the authors perhaps add a sentence describing what factors are controlled for in the research or why they imply that inequality likely influences emissions (rather than simply being associated with them)?	Accepted. Text has been revised to clarify the relationships and causal links found in the literature. (The text has been revised to forward the argument that due to inequality and lack of access to basic needs for decent living there is going to be increase in demand. However, we also putforward the scope for reduction in emission while providing access to services through alternative delivery models in section 5.3. The argument about reduction in inequality to enhance participation in mitigation action and building trust for mitigation governance is explained in section 5.2)	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
24379	27	43	28	9	The mechanism for inequality causing (or being associated with) higher emissions is not explained. Inequality could expand low-emitters at the bottom as well as high-emitters at the top.	Accepted. Text has been revised to clarify the relationships and causal links found in the literature. (Accepted. Please see response to preceding comment)	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
46571	27	16	30	21	Not enough straightforward, too verbose!	Accepted. Text has been condensed, restructured, and combined with earlier sections.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
25653	27		31		In general, the whole subsection could be more focused and better structured. For example, remarks on gender equality are distributed in various places (e.g. p.28 line 10, p. 29 line 24, p.30 line 5) in a disjointed fashion and could be brought together.	Accepted. Text has been condensed, restructured, and combined with earlier sections.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
22751	27	16			Section 5.2.3 is a bit repetitive and could be shortened	Accepted. Text has been condensed, restructured, and combined with earlier sections.	Giulio Mattioli	TU Dortmund University	Germany
36261	27	48			It should be here modern energy sources	Accepted. Text has been revised to include this.	Youba Sokona	South Centre	Switzerland
12837	28	2	28	2	Surely the relationship between these works both ways and is not as obvious as stated.	Noted. The point of the article is as summarized.	Dina Townsend	University of Witwatersrand	Austria
31739	28	4	28	7	Couldn't the causality be the other way around? That is, is it clear that increased inequality has led to weak climate policies, or could it be the other way around?	Accepted. The text has been rewritten to clarify conclusions in the literature on the relationship between equity and mitigation.	Ashok Sreenivas	Prayas (Energy Group)	India
25011	28	8	28	9	Delete "Policies to assist the renewable energy transition ... access for the poor." as this statement does not take into account reliability issues, and aspects related to energy efficiency improvement	Rejected. The sentence has been clarified to specify which kinds of policies strengthen equity, and more supporting references have been included. Energy efficiency improvement is discussed at the end of the paragraph.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
10853	28	10	28	11	I don't dispute this point but the evidence base is slender relative to the scale of the claim. Suggest adding further references to support.	Noted. Many additional, recent references have been added to document this claim.	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
39303	28	12	28	12	In relation to conspicuous consumption by the wealthy, you could include a reference to: Sahakian, M. (2017). Constructing normality through material and social lock-in: the dynamics of energy consumption among Geneva's more affluent households. In A. Hui, R. Day, & G. Walker (Eds.), Demanding energy: space, time and change (pp. 51-71). Cham, Switzerland: Palgrave Macmillan.	Accepted; reference has been added.	Marilyne Sahakian	University of Geneva	Switzerland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
22753	28	12	28	13	On "conspicuous consumption by the wealthy" being the cause of a large proportion of emissions" see also: Brand, C., & Boardman, B. (2008). Taming of the few—the unequal distribution of greenhouse gas emissions from personal travel in the UK. <i>Energy Policy</i> , 36(1), 224-238; Brand, C., & Preston, J. M. (2010). '60-20 emission'—The unequal distribution of greenhouse gas emissions from personal, non-business travel in the UK. <i>Transport Policy</i> , 17(1), 9-19; Gössling, S. (2019). Celebrities, air travel, and social norms. <i>Annals of Tourism Research</i> , 79, 102775.	Accepted; references have been added in section 5.2.3.3.	Giulio Mattioli	TU Dortmund University	Germany
6577	28	12	28	20	This paragraph contains a sentence about gender inequality at the end that likely fits best with the paragraph above	Accepted. This sentence has been moved.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
23105	28	18	28	19	Include references as evidence of double-dividend , individual level studies:  Vita, Gibran, Diana Ivanova, Adina Dumitru, Ricardo García-Mira, Giuseppe Carrus, Konstantin Stadler, Karen Krause, Richard Wood, and Edgar G. Hertwich. 2020. "Happier with Less? Members of European Environmental Grassroots Initiatives Reconcile Lower Carbon Footprints with " Energy Research & Social Science 60 (February): 101329. <a href="https://doi.org/10.1016/j.erss.2019.101329">https://doi.org/10.1016/j.erss.2019.101329</a> .  B. Grinde, et al., Quality of life in intentional communities, <i>Soc. Indic. Res.</i> 137 (2018) 625–640, <a href="https://doi.org/10.1007/s11205-017-1615-3">https://doi.org/10.1007/s11205-017-1615-3</a> .  K. Mulder, R. Costanza, J. Erickson, The contribution of built, human, social and natural capital to quality of life in intentional and unintentional communities, <i>Ecol. Econ.</i> 59 (2006) 13–23, <a href="https://doi.org/10.1016/j.ecolecon.2005.09.021">https://doi.org/10.1016/j.ecolecon.2005.09.021</a> .	Accepted. These references have been added in section 5.2.3.3 on the double-dividend.	Gibran Vita	Open University of the Netherlands	Netherlands
6579	28	21	28	22	The author makes a number of statements that imply a causal relationship and I'm not sure that there is enough evidence presented to make that type of statement. For example, this sentence could have a reverse-causal relationship (better governance or stronger democracies leading to less waste and better emissions control)	Accepted. Text clarifies that the relationships noted in the literature are correlations, not causalities in either direction; additional references have been added.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
10061	28	21	28	32	This paragraph should be streamlined to ensure the discussion is consistent. The first sentence starts by suggesting better environmental policies lead to better governance while the rest of the paragraph (and subsequent paragraphs) discusses how a society with good governance, equitable democracy lead to better environmental/carbon policies. The linkage between the two points is not articulated. In addition, the first sentence should be supported by reference(s).	Accepted. Text has been revised to clarify the links between the points made in the literature, and add references.	Jia Li	U.S. Environmental Protection Agency	United States of America
10063	28	34	28	35	Can reference interdisciplinary social science review of drivers of climate change that addresses this point: Jorgenson, A. K., Fiske, S., Hubacek, K., Li, J., McGovern, T., Rick, T., ... & Zycherman, A. (2019). Social science perspectives on drivers of and responses to global climate change. <i>Wiley Interdisciplinary Reviews: Climate Change</i> , 10(1), e554. <a href="https://doi.org/10.1002/wcc.554">https://doi.org/10.1002/wcc.554</a>	This paragraph has been deleted but the reference has been added in the Social Sciences appendix.	Jia Li	U.S. Environmental Protection Agency	United States of America
22755	28	40	28	42	There is evidence that young people, despite greater concern for climate, do not have lower emissions, due in particular to high levels of air travel - see e.g.: Stanes, E., Klocker, N., & Gibson, C. (2015). Young adult households and domestic sustainabilities. <i>Geoforum</i> , 65, 46-58; Frändberg, L., & Vilhelmson, B. (2014). Spatial, generational and gendered trends and trend-breaks in mobility. In <i>Handbook of sustainable travel</i> (pp. 15-32). Springer, Dordrecht; Sippel, M., Meyer, D., & Schollers, N. (2018). What about greenhouse gas emissions from students? An analysis of lifestyle and carbon footprints at the University of Applied Science in Konstanz, Germany. <i>Carbon Management</i> , 9(2), 201-211.	Accepted. Recent literature on young peoples' emissions has been added.	Giulio Mattioli	TU Dortmund University	Germany
25651	28	33			The title of this subsection is "Equity matters...," but this paragraph is about what causes norms and preferences to change over time, and most of these are not norms and preferences that have anything at all to do with equity. The paragraph could be cut or moved to a subsection (perhaps in section 5.4) that discusses norms more generally	Accepted. This paragraph has been moved elsewhere in the chapter.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
22757	29	3	29	5	Qualitative studies of air travel behaviour have found that, while people with high environmental concern are willing to pay eco-taxes on it, they do not intend to reduce their flights. Randles, S. and Mander, S. 2009. Aviation, consumption and the climate change debate: 'Are you going to tell me off for flying?' <i>Technology analysis &amp; strategic management</i> . 21(1), pp.93–113; Barr, S., Shaw, G., Coles, T. and Prillwitz, J. 2010. 'A holiday is a holiday': Practicing sustainability, home and away. <i>Journal of Transport Geography</i> , 18(3), pp.474–481;	Accepted. More references have been added on this point.	Giulio Mattioli	TU Dortmund University	Germany
10855	29	3	29	6	The basic point here is fine but the statement does not address the important follow-on question of the extent to which people are willing to pay for climate mitigation or the types of payments they are prepared to pay, only the conditions they may be willing to pay. The discussion needs more nuancing, based on evidence from willing-to-pay studies or, preferably, live situations.	Accepted. More references have been added on this point.	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
6581	29	10	29	21	I would like to see more evidence that policies or social norms have been changed through activism and indigenous communities. Perhaps an example, summarized in a sentence or two, could help.	Accepted. More references and an example have been added on this point.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
24477	29	10	29	21	A word "indigenous" is used broadly in the paragraph. There are some countries with different ethnic groups and minorities for instance Myanmar is a country of eight major ethnic groups and 135 minorities or indigenous. We would like to recoment to mention ethnic group and indigenous, knowledge, technology, and livelihoods in line with climate change mitigation and adaptation as well. Indigenous governance will be more appropriate to mention as "Ethnic and/or minorities/indigenous traditional socio-economic management".	Accepted. Text has been defined and clarified.	SAN WIN	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation	Myanmar
12839	29	22	29	24	The claim about equity and populism seems clearly incorrect. The increase in migration in 2015/2016 drove the rise of populist movements in Europe. Populist movements have gained growing support in the US, Brazil, Sweden and the Netherlands in the past few years.	Accepted. Text has been revised to clarify the relationships and causal links found in the literature.	Dina Townsend	University of Witwatersrand	Austria
42119	29	22	29	35	strong statements here which really need to have rock solid references +more of them	Accepted. References have been added and text has been revised to clarify the relationships and causal links found in the literature.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
6583	29	35	29	49	The author suggests a hypothesis that equitable societies lead to better governance which, in turn, leads to better climate change mitigation. Perhaps this could be articulated more explicitly in a heading and topic paragraph. The paragraphs in this section seem somewhat disjointed and sectioning off the paragraphs about this hypothesis could make the whole section more readable. I also think that the author should provide stronger evidence for this causal sequence of occurrences.	Accepted. Text has been restructured for clarity, and more references added.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
3745	29	27			the date is missing for the last reference	Accepted. The date has been added.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3747	29	47			one bracket in excess	Accepted. The extra bracket has been removed.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
6585	30	1	30	1	If this model is critical to the section, it should be presented earlier and called out specifically in the text. The paragraphs that follow would then have a more logical structure, as they explain each piece of the model. That said, I'm not sure there is sufficient evidence to support this model. It may be presented as a hypothesis or a proposal, but the current text does not provide enough evidence to conclude this is necessarily how the constructs are related. For example, why is there no direct path from "effective governance" to "higher well-being"? Why is "trust" not directly linked to "reduced emissions" (one might expect it would be, based on commons dilemma research)?	Accepted. This section has been restructured for clarity, references added, and the diagram improved and referenced to the literature.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
18101	30	3	30	4	Good graph, in principle, but needs references and could be a lot more specific in terms of the evidence behind the interdependencies shown in the graph. Caption is weak, no citation, not clear where it comes from. I recognize that this is to some extent described in lines 25-49 on the previous page, but I still think the graph can be made stronger, and should be self-evident when read together with the caption "standalone"	Accepted. This section has been restructured for clarity, references added, and the diagram improved and referenced to the literature.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
6587	30	4	30	4	Once again, the author implies a causal link without providing sufficient evidence for supporting this conclusion. For example, women may eat less meat and drive less than men, but that does not mean that an increase in pay for women would cause an overall reduction in carbon emissions. Indeed, the authors do not clearly draw a line connecting equal pay and carbon emissions. A reverse-causal link could be true. However unlikely, the authors should provide evidence that the lower carbon footprint of females is not a result of their lower incomes - and that increasing incomes would not increase carbon emissions.	Accepted. References have been added and text has been revised to clarify the relationships and causal links found in the literature.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
44799	30	5	30	5	If women were given access to better income/food security, can we continue with the assumption they will eat less meat?	Accepted. References have been added and text revised to clarify the causal links found in the literature.	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
22759	30	5	30	7	"Women's carbon footprints are ... lower than men's ... mostly based on their lower vehicle use". But this is due to traditional gender roles whereby women are less likely to be on the labour market - there is a vast literature on this in transport studies. If that is the case, it follows that greater gender equity (i.e. greater female labour participation) would not necessarily improve climate action (at least not in that respect)	Accepted. References have been added and text revised to clarify the causal links found in the literature.	Giulio Mattioli	TU Dortmund University	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
31741	30	5	30	7	Is this conclusion after controlling for their generally lower incomes and so on?	Accepted. References have been added and text has been revised to clarify the relationships and causal links found in the literature.	Ashok Sreenivas	Prayas (Energy Group)	India
11957	30	5	30	11	This is an important point - please consider lifting to the exec summary	Noted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
5441	30	5	30	31	Include: Druckman et al (2012) find that a higher proportion of an average man's carbon footprint is due to leisure than an average woman's. Druckman, A., I. Buck, B. Hayward and T. Jackson (2012). "Time, gender and carbon: A study of the carbon implications of British adults' use of time." Ecological Economics 84: 153-163. DOI: 10.1016/j.ecolecon.2012.09.008	Accepted. These references have been included.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
35881	30	6	30	11	These two statements are very contradictory. The emissions from women is lower mainly because they stay at home and do not have access to many amenities like men. But as economic equality between men and women rises, they will be using equal amenities leading to a rise in emissions. However, gender equality is necessary for climate mitigation because they have greater role as educators (also for the new generation), and now also as decision makers. They are an important percentage of agricultural laborforce and their understanding of climate change can significantly help in averting climate change at the local level.	Accepted. More references on gender and mitigation have been added and this paragraph has been clarified.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
34811	30		30		Fig 5.7 should be edited properly especially the color contrast in the circle used to show the relationship and feedback between well being, equity, trust, migration, etc. In addition, table 5.3 should be inserted properly as well.	Accepted. Figure 5.7 has been improved, better referenced, and moved earlier in the section. Table 5.3 has also been moved.	Onema Adojoh	Missouri University of Science and Technology, Rolla, USA	United States of America
997	30	1			Figure 5.7: the necessity-luxury distinction should be introduced into this summary figure.	Accepted. This aspect has been added to Figure 5.7	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
33597	30	7			"lower vehicle use" – this may be partly a negative effect of gendered power relations, or unequal employment. Women need to get around as much as men, and have the same right to work, drive or travel but are often denied that right.	Accepted. References have been added and text revised to clarify the causal links found in the literature.	Debra Roberts	EThekweni Municipality	South Africa
23115	31	6	31	6	At some point, would be useful to introduce the chances enhance well-being by diminishing defensive emissions.  Defensive expenditures and emissions: Expenses which are regrettably necessary to protect current satisfaction rather than increasing it (Stiglitz, Sen, and Fitoussi 2010; Knight and Rosa 2011). They do not enhance well-being directly but as an intermediate consumption that might influence well-being (Huetting and Leipert 1990; Stiglitz, Sen, and Fitoussi 2010) e.g. military expenditure, commuting to work or medical care to heal pollution related diseases.  As well as regulating or banning commodities that do not contribute to well-being but drive a big portion of the impact: tobacco, alcohol, weapons, advertisements etc.  Huetting, Roefie, and Christian Leipert. 1990. "Economic Growth, National Income and the Blocked Choices for the Environment." The Environmentalist 10 (1): 25–38. <a href="https://doi.org/10.1007/BF02239555">https://doi.org/10.1007/BF02239555</a> .  Knight, Kyle W., and Eugene a. Rosa. 2011. "The Environmental Efficiency of Well-Being: A Cross-National Analysis." Social Science Research 40 (3): 931–49. <a href="https://doi.org/10.1016/j.ssresearch.2010.11.002">https://doi.org/10.1016/j.ssresearch.2010.11.002</a> .  Stiglitz, Joseph E., Amartya Sen, and Jean-Paul Fitoussi. 2010. Mismeasuring Our Lives: Why GDP Doesn't Add Up. Vol. 1. New York: New Press.	Accept. Changes made to text in Section 5.2 to mention defensive emissions.	Gibran Vita	Open University of the Netherlands	Netherlands
24381	31	7	31	27	I commented earlier that the dual framing of needs satisfiers and service provisioning work extremely well as organising principles for the chapter, with the ASI framework useful as a typology of options or policies for changing service provisioning systems and/or satisfying needs with lower resource implications. This seems to be the intent of the chapter, but the reality in this draft is that much of the material presented is not linked either implicitly or explicitly to these organising principles, a lot of extraneous material is introduced (particularly on agency, structure and meaning), and more generally, it desperately needs an edit to reduce the word count. I think it could be halved in length without loss of meaning or insight!	Accept. New structuring and streamlining of chapter makes framing and content much more cohesive.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
15343	31	17	31	17	"...megatrends that are..." instead of "...megatrends that is..."	Editorial - accept.	Simone D'Alessandro	University of Pisa	Italy
15345	31	17	31	27	Check the hyphens in this paragraph	Editorial - accept.	Simone D'Alessandro	University of Pisa	Italy
44133	31	28	31	28	To improve readability abbreviations in headings should be avoided	Accepted. Editorial.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
11989	31	40	31	41	Please consider including in the executive summary some of these major conversion losses, and maybe also the first sentence(s) of "5.3 Mapping the opportunity space"	Accepted. Space restriction limit the number of examples that can be given in this intro section, but some selected examples will be added.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
46573	31	43	31	45	The data do not seem aligned with the figure 5.8.	Noted. Numbers have been checked and found consistent between text and Figure.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
42121	31	7	32	14	strong statements here which again really need to have rock solid references	Accept. Strong references added to support this statement.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
33599	31	6			In this section cross-check with chapter 8 for overlap and align your messages to each other.	Accept	Debra Roberts	EThekweni Municipality	South Africa
12605	31				paragraph 5.3.1 seems quite technical oriented to fit into this chapter. The chapter represent a strong believe that technical efficiency can deliver reductions, even much social science have shown how there are so many limitations to this strategy. This reference should be included. Later there is a paragraph on rebound effect, why not include it here, and then include that the positive expectations have to be adjusted on what reductions are actually realistic	Noted. This section however does not discuss limitations and takebacks etc. of efficiency improvements. It is entirely diagnostic and simply illustrates where in the entire service delivery chain losses happen.	Gram-Hanssen Kirsten	Aalborg University	Denmark
46575	32	9	32	14	Add that the lever effect on primary energy will be reduced along with the whole efficiency of the process.	Noted but comment incomprehensible. One unit of savings in service translates into x units of savings in primary energy (considering all conversion losses). This ration is diagnostic and does not change unless one considers an alternative service provision chain.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
6589	32	11	32	11	Please provide a citation for the estimation of "primary resource inputs are reduced between a factor of 6 to 7 units..."	Accepted. Reference added (TWI2050, 2019)	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
18103	32	9	33	8	Services cannot really be measured in the same unit as energy - or these indicators are not really service indicators. For example, transportation services are often expressed in units like ton-kilometres or person-kilometres (which are also not measurable in energy units), but in fact both are not service indicators. The service may be social participation (meeting friends and relatives, reaching one's work place), access to specific goods (buying groceries, seeing a doctor, etc.), and their quality respectively fulfillments does not depend on travelling far (person-kilometre). Hence I ask myself how the right-most numbers in Graph 5.8 are calculated, respectively how the ratios quoted in the last para on p 32 are defined. In my view it is important to be precise here because by looking only at functions (like ton-kilometres) instead of services (availability of a certain product in a defined place) one misses out on many important options to reduce resource use without reducing services. See e.g. Kalt et al., 2019, Energy Res Soc Sci and also the work by Brand-Correa and Steinberger quoted several times in the chapter	Noted. Text modified. But argument against any meaningful service indicators (passenger-km) not in line with literature and rather weak (or rather unnecessarily philosophical).	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6591	32	1	36	23	The authors provide a good calculation of potential energy savings from a technical standpoint, but there are several other reports on energy savings potential from behavior change that could be cited (some, such as Dietz et al., 2009, appear in the peer-reviewed literature). The Dietz article is explained in detail in 5.4.3.6, but it does not fit well under the heading "Values, energy system change and resource efficiency" - it would be better suited to this section. These are the others: 1 - Gardner and Stern, 2008; 2 - Vandenbergh, Michael P., et al. (2008). Individual Carbon Emissions: The Low-Hanging Fruit; 3 - Sahota, Ron, et al. (2008). Behaviour and Energy Savings in Residential Dwellings; 4 - Thomas Dietz, Gerald T. Gardner, Jonathan Gilligan, Paul C. Stern, and Michael P. Vandenbergh, 2009; 5 - Laitner, John A. "Skip", et al. (2009). Examining the Scale of the BehaviourEnergy Efficiency Continuum; 6 - NRDC & The Garrison Institute, "Simple and Inexpensive Actions Could Reduce Global Warming Emissions by One Billion Tons", 2010; 7 - Jones, Christopher M. & Daniel M. Kammen. (2011). Quantifying Carbon Footprint Reduction Opportunities...; 8 - Norton, Bill. "Saving Waste: Energy Use and Waste Analysis by End-Use.", 2012; 9 - Heck, Stefan & HumayunTai. (2013). Sizing the Potential of Behavioral Energy-Efficiency Initiatives in the U.S.; 10 - Ehrhardt-Martinez, Karen. (2015). Behavior Wedge Profiles for Cities: Estimating Achievable Savings and Critical Behaviors; 11 - Kane, Rachel & Nathan Srinivas. (2014). Unlocking the Potential of Behavioral Efficiency...2014; 12 - Marta A. R. Lopes, Carlos HenggelerAntunes, Ana Reis & Nelson Martins (2016): Estimating energy savings...;	Accepted. References added.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
3749	32	10			can translate	Accepted. Editorial.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
1443	33	1	3	9	pls improve the quality of this figure.	Noted. Figure will be redrawn.	JUNGUO LIU	Southern University of Science and Technology	China
11959	33	1	33	8	The figure would benefit from simplification and better explanations. E.g. the x-axis should be labelled and not just explained in the legend, and the explanatory/legend text needs to be simplified/improved. The sentence "The aggregate efficiencies of service delivery chains is with 13-17 % low" does not make sense.	Noted. Figure will be redrawn.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
33601	33	3	33	3	It is difficult to read the text in figure 5.8	Noted. Figure will be redrawn.	Debra Roberts	EThekweni Municipality	South Africa
46577	33	1	35	10	Figure 5.8 & 5.9 should be redrawn from exergetic viewpoint.	Noted. No follow up. Exergy Section now deleted due to space constraints.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
3751	33	1		2	In the Figure 5.8, the top is not readable	Noted. Figure will be redrawn.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
29423	33	1			Label "Industries - Excluding N-E" needs explanation: what is "N-E"?	Accepted. N-E= Non-energy uses of fuels, will be explained.	Stefan Pauliuk	University	Germany
33603	33	10			How relevant is this section to this chapter? Would it fit better under industry and cross-referenced?	Noted. Section now deleted.	Debra Roberts	EThekweni Municipality	South Africa
35635	34	2	34	6	This sentence needs much better precision. It uses the words high and low, but it is not clear what it is compared to, what is the reference of high and low? Biofuels can deliver also high-temperature heat, electricity etc.	Noted. No follow up (Section deleted).	Göran Finnveden	KTH Royal Institute of Technology	Sweden
11743	34	12	34	15	"analysis of national and global energy systems, e.g. for Canada (Rosen 1992), Brazil (Schaeffer and Wirtshafer 1992) and its Sao Paulo State (Mosquim et al. 2018), India (Jadhao et al. 2019), the USA (Ayres 1989) or entire global and regional energy systems (Grubler et al. 2012c; Nakićenović et al. 1996a)". Comment: This literature has been rapidly expanded in the last 10 years since 2010, and would benefit from updating. In addition the India ref is only for industry, not for all India, so does not fall into the national-level category. More recent literature of exergy accounting at a national level include: 1. Warr, B., Ayres, R., Eisenmenger, N., Krausmann, F., & Schandl, H. (2010). Energy use and economic development: A comparative analysis of useful work supply in Austria, Japan, the United Kingdom and the US during 100 years of economic growth. Ecological Economics, 69(10), 1904–1917. <a href="https://doi.org/10.1016/j.ecolecon.2010.03.021">https://doi.org/10.1016/j.ecolecon.2010.03.021</a> ; 2. Brockway, P. E., Barrett, J. R., Foxon, T. J., & Steinberger, J. K. (2014). Divergence of trends in US and UK aggregate exergy efficiencies 1960-2010. Environmental Science & Technology, 48, 9874–9881. <a href="https://doi.org/http://dx.doi.org/10.1021/es501217t">https://doi.org/http://dx.doi.org/10.1021/es501217t</a> ; 3. Brockway, P. E., Steinberger, J. K., Barrett, J. R., & Foxon, T. J. (2015). Understanding China's past and future energy demand: An exergy efficiency and decomposition analysis. Applied Energy, 155, 892–903. <a href="https://doi.org/10.1016/j.apenergy.2015.05.082">https://doi.org/10.1016/j.apenergy.2015.05.082</a> ; 4. Serrenho, A. C., Warr, B., Sousa, T., & Ayres, R. U. (2016). Structure and dynamics of useful work along the agriculture-industry-services transition: Portugal from 1856 to 2009. Structural Change and Economic Dynamics, 36, 1–21. <a href="https://doi.org/10.1016/j.strueco.2015.10.004">https://doi.org/10.1016/j.strueco.2015.10.004</a> ; 5. Guevara, Z., Sousa, T., & Domingos, T. (2016). Insights on Energy Transitions in Mexico from the Analysis of Useful Exergy 1971–2009. Energies, 9(7), 488. <a href="https://doi.org/10.3390/en9070488">https://doi.org/10.3390/en9070488</a> ; 6. Heun, M. K., & Brockway, P. E. (2019). Meeting 2030 primary energy and economic growth goals: Mission impossible? Applied Energy, 251, 112697. <a href="https://doi.org/10.1016/j.apenergy.2019.01.255">https://doi.org/10.1016/j.apenergy.2019.01.255</a> . Finally, the first country-level exergy study was Reistad, G. (1975). Available Energy Conversion and Utilization in the United States. ASME Transactions Series Journal of Engineering for Power, 97, 429–434. Lastly, at the global level you might also reference 1. Cullen, J. M., & Allwood, J. M. (2010). The efficient use of energy: Tracing the global flow of energy from fuel to service. Energy Policy, 38(1), 75–81. <a href="https://doi.org/10.1016/j.enpol.2009.08.054">https://doi.org/10.1016/j.enpol.2009.08.054</a>	Noted. Useful references, but Exergy Section now deleted.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
11745	34	30	34	30	"Jenkins and Hopkins 2019)": Comment: This reference refers to the whole book. The specific chapter in the book where this is dealt with is listed here, and may be a more appropriate reference to give: Brockway, P., Sorrell, S., Foxon, T., & Miller, J. (2019). 'Chapter 8: Exergy economics - New insights into energy consumption and economic growth' in Jenkins, K.E.H and Hopkins, D. (Eds.) Transitions in Energy Efficiency and Demand: The Emergence, Diffusion and Impact of Low-Carbon Innovation. (pp. 133–154). Routledge, UK. <a href="https://www.taylorfrancis.com/books/9781351127264/chapters/10.4324/9781351127264-8">https://www.taylorfrancis.com/books/9781351127264/chapters/10.4324/9781351127264-8</a>	Noted. Useful references, but Exergy Section now deleted.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
35637	34	33	34	34	"service exergy delivered" must be defined.	Noted. No follow up. Section now deleted.	Göran Finnveden	KTH Royal Institute of Technology	Sweden
35639	34	34	34	39	This sentence is very difficult to understand.	Noted. No follow up. Section now deleted.	Göran Finnveden	KTH Royal Institute of Technology	Sweden
11747	34	45	34	48	"Illustrative exergy efficiencies of entire national or global service delivery systems range from 2.5% (USA, Ayres 1989) to 5% (OECD average, (Grubler et al. 2012c)) and 10% (global, Nebojša Nakićenović, Grubler, et al., 1996) respectively." Comment: similar to comment above, the recent (2010-2020) addition of multiple country exergy studies means these estimates and references can be updated. The USA ref (Ayres 1989) is very old, Additional references to consider at a country-scale suggest primary-to-useful exergy efficiencies at a country-scale of 10-20%, these include 1. UK-US-Japan-Austria (10-20%) reference Figure 8 of Warr, B., Ayres, R., Eisenmenger, N., Krausmann, F., & Schandl, H. (2010). Energy use and economic development: A comparative analysis of useful work supply in Austria, Japan, the United Kingdom and the US during 100 years of economic growth. Ecological Economics, 69(10), 1904–1917. <a href="https://doi.org/10.1016/j.ecolecon.2010.03.021">https://doi.org/10.1016/j.ecolecon.2010.03.021</a> ; 2. UK-US primary-to-useful efficiencies of 10-15% [Brockway, P. E., Barrett, J. R., Foxon, T. J., & Steinberger, J. K. (2014). Divergence of trends in US and UK aggregate exergy efficiencies 1960-2010. Environmental Science & Technology, 48, 9874–9881. <a href="https://doi.org/http://dx.doi.org/10.1021/es501217t">https://doi.org/http://dx.doi.org/10.1021/es501217t</a> ]; 3. China primary-to-useful efficiency of 5% (1971) more than doubling to 12.5% as it moves from agricultural to industrial-based country, ref: Brockway, P. E., Steinberger, J. K., Barrett, J. R., & Foxon, T. J. (2015). Understanding China's past and future energy demand: An exergy efficiency and decomposition analysis. Applied Energy, 155, 892–903. <a href="https://doi.org/10.1016/j.apenergy.2015.05.082">https://doi.org/10.1016/j.apenergy.2015.05.082</a> . For EU-15 the study by Serrenho et al gives final-to-useful (so these will be higher than primary-to-useful) efficiencies of ~15-23% ref Fig 5 & 6: Serrenho, A. C., Sousa, T., Warr, B., Ayres, R. U., & Domingos, T. (2014). Decomposition of useful work intensity: The EU (European Union)-15 countries from 1960 to 2009. Energy, 76, 704–715. <a href="https://doi.org/10.1016/j.energy.2014.08.068">https://doi.org/10.1016/j.energy.2014.08.068</a> . Last, at a global level the 2010 study suggest global primary-to-useful efficiency of 13% in 2005, see Figure 3: Cullen, J. M., & Allwood, J. M. (2010). Theoretical efficiency limits for energy conversion devices. Energy, 35(5), 2059–2069. <a href="https://doi.org/10.1016/j.energy.2010.01.024">https://doi.org/10.1016/j.energy.2010.01.024</a>	Noted. Many good references. No follow up. Section now deleted.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
46579	34	10	35	9	The concept of exergy is very powerful and valuable. It should also be included that (i) exergy depends also from the geography because thermodynamic cycles have not the same efficiency everywhere; (ii) the carbon footprint of the exergetic sources is not the same; and (iii) exergy analysis is a more inclusive method, allowing to endogenize the whole process, therefore more compliant with the Life Cycle Assessment analysis. This is the reason why the efficiencies drop in the exergy framework.	Noted. No follow up. Section now deleted.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
3759	34	47	48		The first name is in excess. I guess the date is 1996b	Noted. No follow up. Section now deleted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
3753	34	1			The bracket is in excess	Noted. No follow up. Section now deleted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3755	34	9			one bracket is missing	Noted. No follow up. Section now deleted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3757	34	42			one bracket is missing	Noted. No follow up. Section now deleted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
35641	35	5	35	9	I am not sure that I agree. It is also difficult to check since there are no references.	Accepted. References added to one para discussion of exergy that survives revision.	Göran Finnveden	KTH Royal Institute of Technology	Sweden
11961	35	10	35	26	The figure would benefit from simplification, or separating out elements. It is also unclear whether the blue text describes categories or developments, and it is unclear whether the x-axis shows development across time or is just categories.	Noted. Editorial comment. Will be considered in final redrafting of figure.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
31743	35	13	35	25	Is the figure indicating that the bulk of the scope for energy demand reduction is from the Global South? That seems to be problematic in principle as well as politically.	Noted. Not absolute reductions but reductions compared to baseline. Also service demand increases in South are shown separately and counterbalance efficiency-led reductions.	Ashok Sreenivas	Prayas (Energy Group)	India
3761	35	4			one bracket is missing	Accepted. Editorial.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
33855	35				Figure is hard to understand. Acronyms in figure are unnecessary, just label the top X axis with words. What do the box sizes mean? The legend is too technical to be understood.	Noted. Figure will be redrawn.	Debra Roberts	EThekweni Municipality	South Africa
39305	36	1	36	1	It is worth noting early on in this section on efficiency that this would be an 'improve' strategy (as stated on p.55). According to Shove, a policy that is overly focused on efficiency (rather than sufficiency) runs the risk of placing too much attention on 'improvements' rather than reductions. Shove, E. (2018). What is wrong with energy efficiency? Building Research & Information, 46(7), 779-789. doi:10.1080/09613218.2017.1361746	Noted.	Marlyne Sahakian	University of Geneva	Switzerland
46581	36	2	36	23	The given potentials are only estimations ceteris paribus and would probably require a more refined methodology, like Life Cycle Assessment. Particularly the tension on the resources is not quoted (for EV, for IT...)	Noted, but disagree with comment on "requiring more refined methodology". The scenario was developed using one of the most sophisticated Integrated Assessment Modeling frameworks that considers all systemic linkages and is thus far superior to simple LCA.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
2183	36	15	36	15	Please, add the following sentence before "...These...": "New concrete mix designs will allow to increase the carbon dioxide uptake by cement-based materials (Sanjuán et al 2020), such as concrete made with GGBFS-cements (Andrade and Sanjuán 2018)". Sanjuán, M.Á.; Andrade, C.; Mora, P.; Zaragoza, A. Carbon Dioxide Uptake by Cement-Based Materials: A Spanish Case Study. Appl. Sci. 2020, 10, 339. https://doi.org/10.3390/app10010339  Andrade C, Sanjuán MA. Updating Carbon Storage Capacity of Spanish Cements. Sustainability 2018;10:4806. https://doi.org/10.3390/su10124806	Rejected. Self-serving comment and reference inappropriate for this section discussing demand for materials as opposed to supply of new materials.	Miguel Ángel Sanjuán	Technical University of Madrid	Spain
12499	36	16	36	16	Please, add the following sentence: "Low-carbon concrete mix designs which are able to increase carbon dioxide uptake by mortars and concretes with 8 EJ (blended cements carbon dioxide absorption, carbon dioxide uptake estimation by mortars and concretes)". Sanjuán, M.Á., Estévez, E., Argiz, C. Carbon Dioxide Absorption by Blast-Furnace Slag Mortars in Function of the Curing Intensity. Energies 2019, 12(12), 2346; https://doi.org/10.3390/en12122346 Andrade C, Sanjuán MA. Updating Carbon Storage Capacity of Spanish Cements. Sustainability 2018;10:4806. https://doi.org/10.3390/su10124806 Xi, F.; Davis, S.J.; Clais, P.; Crawford-Brown, D.; Guan, D.; Pade, C.; Shi, T.; Syddall, M.; Lv, J.; Ji, L.; et al. Substantial global carbon uptake by cement carbonation. Nat. Geosci. 2016, 9, 880–883. https://doi.org/10.1038/NGEO2840 Pade, C.; Guimaraes, M. The CO2 uptake of concrete in a 100 year perspective. Cem. Concr. Res. 2007, 37, 1348–1356. https://doi.org/10.1016/j.cemconres.2007.06.009 Gajda, J.; Miller, F.M. Concrete as a Sink for Atmospheric Carbon Dioxide: A Literature Review and Estimation of CO2 Absorption by Portland Cement Concrete. R&D Serial N_2255, 1st ed.; PCA: Chicago, IL, USA, 2000. Galán, I.; Andrade, C.; Mora, P.; Sanjuán, M.A. Sequestration of CO2 by Concrete Carbonation. Environ. Sci. Technol. 2010, 44, 3181–3186. https://doi.org/10.1021/es903581d Andrade, C.; Sanjuán, M.A.; Rebollo, N. Reliability calibration by carbonation exposure class deemed-to-satisfy prescriptions of Spanish concretes. Concreto Construção 2018, 91, 97–102. Available online: http://ibracon.org.br/Site_revista/Concreto_Construcoes/ebook/edicao91/files/assets/basic-html/index.html#102 (accessed on 16 October 2019). Sanjuán, M.Á., Andrade, C.; Mora, P.; Zaragoza, A. Carbon Dioxide Uptake by Cement-Based Materials: A Spanish Case Study. Appl. Sci. 2020, 10, 339. https://doi.org/10.3390/app10010339	Rejected. Suggested references inappropriate for this section discussing demand for materials as opposed to supply of new materials.	MORA PERIS PEDRO	Profesor Titular de Universidad de la ETSI Minas y Energía de la Universidad Politécnica de Madrid	Spain
6595	36	25	36	40	Please provide evidence that these three megatrends are indeed the three primary trends of the foreseeable future	Taken into account. These three megatrends have clear implications for service demand levels and efficiencies; we will try to better justify the scope on these.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
16247	36	25			In Section 5.3.2 Megatrends, consider adding a subsection related to Traditional Knowledge describing how traditional societies in limited-resource contexts typically maintained sustainable practices with a combination of clear social norms and expectations, and sacred spaces that were left unexploited to provide for biodiversity and resource renewal, plus seasonal practices and some shared governance structures that allow for flexibility. Much of the developing world is in transition from traditional societies, and including information about Traditional Knowledge will improve the coverage of the section.	Accept. More acknowledgement of traditional sharing practices and their benefits added.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
6593	37	3	37	3	The arrows below this figure suggest that electricity demand potential will necessarily grow as society moves from "past" to "present" to "future". Is this the case? Does freight co-loading, blockchain and industrial symbiosis increase energy consumption? If energy demand is always increased over time, then the arrow may be warranted, but if not, then perhaps the arrow should be removed or changed	Accept. Figure has been improved for clarity.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
23107	37	11	37	11	this section lacks a mention of the material implications of digitalization. For example, By 2050, the number of electronic devices is expected to increase by 80% in the global North, to 42 devices per capita. In the global South, a 3 fold rise is expected to 24 devices per capita (Grubler et al., 2018).	Accept. Literature exists to account for material requirements, which is now cited.	Gibran Vita	Open University of the Netherlands	Netherlands
26143	37	25	38	7	Besides the implications of digitalization on energy and resource system discussed in this section, I would suggest considering the potential influences of big-data as well. Large amounts of data have been increasingly accumulated in the energy sector with the continuous application of sensors, wireless transmission, network communication, and cloud computing technologies. the application of big data would be crucial for achieving smart energy management.	Taken into account. New cross-chapter coordination on digitalization messaging addresses this.	Wenling Liu	Beijing Institute of Technology	China
28049	37	27	38	1	Reduction of energy use and floor area in commercial building due to increase in internet shopping and telecommuting is very important example of system level energy and resource efficiency.	Taken into account. Teleworking and e-commerce benefits are highly situation-specific, which we acknowledge.	Yoshiyuki Shimoda	Osaka University	Japan
15347	37	11	39	31	I suggest the authors also mention the impact of digitalization on the labour market. Even though there is no clear trend of technological unemployment due to IT, there is plenty of evidence that it has shifted the patterns of job creation, contributing to hollowing out of middle-wage-middle-skill jobs over the past decades. Such process, mostly in developed economies, have consequences to DLS and might undermine governance structures in these countries. See the job polarization literature: Goos, Maarten, Alan Manning, and Anna Salomons. "Job polarization in Europe." American economic review 99, no. 2 (2009): 58-63.,	Taken into account. New cross-chapter coordination on digitalization messaging may address this in policy chapter.	Simone D'Alessandro	University of Pisa	Italy

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
46583	37	11	40	8	The issue of digitalization is probably the bigger long-term uncertainty in term of energy either to supply demand-side (as described within this chapter), or to manage the energy system by itself with more intermittent sources, more connectivity, more electric and dispersed sources, less elastic/analogic loads, more (versatile) end-uses by migration towards carbon-free sources. However, the specificity of the power system is to balance (i) the energy flowing from the supply- to the demand-side, and (ii) the energy dedicated to its control (including digitalization) and its stability under operation (ancillary services), both of them sharing the same physical system. Under the trend of a higher connectivity, the power system requires a higher redundancy and a higher level of resilience, each of them contributing to reinforce, in a pace growing faster than the number of connections, the weight of digitalization and self-consumption of the ancillary services in the future. Basically, the second principle of thermodynamics requires to spend an amount of energy to manipulate information. This value was assessed by Landauer (see e.g.: A. Berut, A. Arakelyan, A. Petrosyan, S. Ciliberto, R. Dillenschneider, E. Lutz: Experimental verification of Landauer's principle linking information and thermodynamics, Nature, 483, pp. 187-192, 2012; N. Gershenfeld: Signal entropy and the thermodynamics of computation, IBM Systems Journal, 35, (3&4), pp.577-586, 1996; and: Energy Limits in Computations, Edited by : Lent, Orlov, Porod, Snider, Springer, 2019). As matter of fact, current technologies (Random Access Memory, Phase Change Memory) require at least 6 orders of magnitude more to perform the binary operation of Landauer and a technological breakthrough is probably required in order reduce it drastically by shifting from polarized technologies (with permanent leakage currents) to spintronics. The IT industry has already faced to this kind of drastic energy reduction since it prevailed, along with other requirements such as reliability, cost, compactness and rapidity, in the replacement of cabled technology to the development of micro-electronics in the 1960s: at that time, 15MW (final) were needed to undertake 100 binary operations.	Taken into account. New cross-chapter coordination on digitalization messaging to better address supply-side concepts, whereas this section now include a discussion of IT efficiency limits.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
33605	37	11			Check: global internet allows rolling server farms powered by solar power, that follow daylight around the world. Does this come up?	Reject. But load shifting between data centers to follow the availability of renewable energy is indeed happening, can is now mentioned.	Debra Roberts	EThekini Municipality	South Africa
33607	37	11			Consider mentioning here the emissions savings from access to cellphones, as discussed in comment on p24-L10. In general, consider digitalization in developing world context.	Accept. More discussion of developing world facets of digitalization added.	Debra Roberts	EThekini Municipality	South Africa
41965	37	11			Bullet 5.3.2.1. "Digitalization". In my opinion the title is attractive with regard to the recent trends. However, digitalization is not comprehensive enough. Digitalizations does not include important areas of control technology, for instance control technology which are not necessarily part of the digitalization area. Power electronics an extremely relevant technology enabling the use of renewable energies) stays also out of digitalization. Perhaps a better title would be "ICT and control electronics".	Reject the title change, but the broader issue of controls falling under digitalization can be addressed.	Francisco Javier Hurtado Albir	European Patent Office	Germany
41967	37	11			Bullet 5.3.2.1. "Digitalization". A second comment with regard to this bullet of the chapter would be that only the positive effects of these technologies are referred. A complete assessment should consider the energy intensive manufacturing of silicon-based technology (this covers any electronics, also ICT, digitalization and control electronics) and also the disposal of any silicon-based device. The environmental impact of both, manufacturing and disposal of these technologies are also an issue that needs to be considered for a complete trade-off. The absence of such complementary approach convey the (wrong) impression that ICT and electronics in general are green technologies which only bring positive effects when fighting climate change.	Accept. More discussion of life-cycle impacts and negative tradeoffs of digitalization added.	Francisco Javier Hurtado Albir	European Patent Office	Germany
41969	37	11			Bullet 5.3.2.1. "Digitalization". An important contribution of digitalization (in fact of ICT) are smart grids, which have a very relevant contribution to the efficient operation of power networks and, in particular, to the support the penetration of renewable energies in electric power systems.	Taken into account. New cross-chapter coordination on digitalization messaging addresses this.	Francisco Javier Hurtado Albir	European Patent Office	Germany
33609	37				Add second-hand goods trading – this is big in Africa. Many items change owners multiple times (often down the income chain) until they are unusable. There are second-hand buy-sell social media sites. Often items are offered for free-to-collect to avoid nuisance of taking things to the dump. And someone usually wants it. Even down to old bricks, used lumber, etc. Compare this with Europe where people are constantly buying new and discarding perfectly functional furniture on the street.	Accept. More discussion of traditional sharing and developing world relevance added.	Debra Roberts	EThekini Municipality	South Africa
28401	38	8	38	10	the question of ICT emission trajectories uncertainties lies primarily on data center since the other stock of ICT emission is well known within acceptable boundaries ( cf studies already quoted : Malmodin and Lundén 2018;Belkhir and Elmelig 2018, but also for France in the report "Réduire la consommation numérique du numérique V14/11 https://www.economie.gouv.fr/files/directions_services/cge/consommation-energieque-numerique.pdf ). Connected objects embodied emissions (manufacturing) and their life cycle (mainly consumption) are covered by many studies and estimates ( Urban, B., Kurt, R., Singh, M., Howes D., 2017. Energy Consumption of Consumer Electronics in U.S. Homes in 2017. Fraunhofer USA Center for Sustainable Energy Systems, Boston.). Telecom operators emissions trajectories are mainly contained within their capability to bill their customers in a context of stagnant revenues, (cf Malmodin and Lundén 2018 for vision of the past) Data centers trajectories do not reach a consensus as shown in 2018 Jones Nicola (2018) How to stop data centres from gobbling up the world's electricity Nature 561, 163-166 (2018). Models based on Andrae and Edler 2015 do not match with the vision of IEA (IEA Report, Data centres and data transmission networks, 2019. Available online: https:// www.iea.org/tecip/buildings/ datacentres/ ). This is probably due to the fact that data centers consumption does not growth linearly with data growth	Accept. More discussion added on uncertainties in modeling and projecting ICT energy use.	david erlich	Orange	France
34481	38	8	38	27	Digitalization will be compatible with energetical and carbon transition provided that overconsumption would be limited by sufficiency especially in the OECD's countries See https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf	Accept. Discussion of need to monitor and manage rampant demand growth due to digitalization added.	Emmanuel RAUZIER	NGO Association negaWatt	France
38213	38	8	38	27	See https://theshiftproject.org/wp-content/uploads/2019/03/Lean-ICT-Report_The-Shift-Project_2019.pdf for lean ICT	Noted	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
44275	38	18	38	20	There is still a large potential for improving energy efficiency in data centres and teh demand is rapidly increasing for AI, streaming and the coming 5G. In this paper the demand for data centres in Europe is analysed: Angerinou, M.; Bertoldi, P.; Castellazzi, L. Trends in Data Centre Energy Consumption under the European Code of Conduct for Data Centre Energy Efficiency. Energies 2017, 10, 1470, it is suggested to cite it,	Accept. More discussion of efficiency potential of ICT and data centers added.	BERTOLDI PAOLO	European Commission	Italy
44277	38	28	38	47	Attention shall be paid to use a very efficient ICT system (e.g. data centres, networks, home devices, etc.) otherwise there will be a huge increase in ICT energy consumption.	Accept. Discussion of need for efficiency to ensure positive outcomes added.	BERTOLDI PAOLO	European Commission	Italy
5443	38	31	38	33	It is, important that a holistic view is taken to evaluate whether such mitigation actions reduce carbon emissions overall. For example, telework that eliminates commutes may increase household carbon emissions, and this may result in an overall net increase in emissions. [see my comment above re page 11 on the same point]	Accept. More discussion of both positive and negative possibilities added.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
25655	38	40	38	42	The sentence begins "Only one study has..." but then two studies are cited (GeSI 205; Accenture 2015).	Editorial - accept.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
28399	38	40	38	47	other studies have been studying digitalization and ICT : Malmodin, Jens & Bergmark, Pernilla. (2015). Exploring the effect of ICT solutions on GHG emissions in 2030. 10.2991/ict4s-env-15.2015.5. as well as : GSMA 2020, "the enablement effect", https://www.gsma.com/betterfuture/enablement-effect	Noted. Reference included	david erlich	Orange	France
6597	38	45	38	47	Given that the two sources cited in this paragraph were published in 2015, could the author provide a more updated estimate of emissions savings potential from digitization of mobility? In 2015, ride hailing apps were virtually non-existent. Does the development of these apps reduce or increase energy consumption from transportation?	Accept. Several more recent reviews and articles have been added.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
1047	39	1	39	1	****ibid "substantial risks of rebound effects"	Editorial - accept.	Harry Saunders	Carnegie Institution for Science	United States of America
5641	39	1	39	18	This passage is not comprehensive in its coverage of current research on the effects of (shared) autonomous vehicles on GHG emissions, and it is missing several major mechanisms that mediate these effects. The following two references from 2019 provided evidence that, even if (shared) autonomous vehicles do cause a notable increase in vehicle miles traveled, this will likely be more than offset by the effect they have on accelerating the market adoption of alternative fuel vehicles such as EVs.  Jones, E.C., Leibowicz, B.D., 2019. Contributions of shared autonomous vehicles to climate change mitigation. Transportation Research Part D: Transport and Environment 72, 279-298.  Brown, K.E., Dodder, R., 2019. Energy and emissions implications of automated vehicles in the U.S. energy system. Transportation Research Part D: Transport and Environment 77, 132-147.	Taken into account. More literature has been assessed on the possible outcomes of autonomous vehicles.	Benjamin Leibowicz	The University of Texas at Austin	United States of America
24383	39	1	39	31	This quite generic text and not clearly to services-based mitigation, so could be deleted.	Accept	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
1049	39	27	39	27	****ibid Same sense	Editorial - accept.	Harry Saunders	Carnegie Institution for Science	United States of America
3763	39	18			(Figure 5.11)	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
46585	40	1	40	7	Coming from the physics of Phase Transition, the notion of connectivity is important to understand how a valuable local change in a model could produce a global effect, even in the opposite direction. While basic needs have often low connectivity ("Just because air is free doesn't mean you breathe twice as fast", but also e.g. housing (\$5.2.2.2) providing a continuous change, high connectivity of some (new) services produces rapid changes in a context ultimately dominated by the affinity.	Reject. Not sure what is being requested here.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
11963	40	1	40	8	This figure is not very helpful as it incorporates too many elements and dimensions, and it is not clear how these relate to each other. It is also unclear what units of measurement are used and if/how these relate to each other. Suggest removing or separating out smaller elements. CAGR should also be spelled-out/defined either in the figure or in the legend.	Accept. A new streamlined figure has been created.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
12841	40	10	40	14	Although reference is made earlier in the report to the fact that the sharing economy is not new and has been part of many formal and informal economic activities in many developing countries for a long time, this paragraph implies it is a new phenomenon and something that primarily happens online or via the gig economy. In doing so, it treats new sharing economy activities as valuable and a contribution to reducing climate change, but long-existing practices as irrelevant. This could be entirely rephrased to see economic actors in the developing world as experts in the sharing economy with something to share and teach those in developed economies.	Accepted. Text has been revised and contextualized, with references.	Dina Townsend	University of Witwatersrand	Austria
26513	40	18	40	20	I don't think the diversity within the sharing economy is represented adequately here. In particular, there are many non-market and non-capitalist forms of sharing economy which are being sidelined (for instance, couchsurfing or Freecycle), not to mention the collaborative infrastructures which are being created by communities to provide shared access to tools and equipment in the 'maker movement' - see for example Smith, TSJ (2019) 'Stand back and watch us': Post-capitalist practices in the maker movement, Environment & Planning A: Economy and Space 0308518X19882731	Accepted : example added, text revised. It is important to mention that most of the examples relates to collaborative infrastructures can be classified as P2P or C2C.	Thomas Smith	Masaryk University	Czech Republic
30859	40	22	40	22	Belk 2014 also highlights differences between sharing and pseudo sharing which can be used to guide policy makers towards peer to peer sharing activities using spare capacity that lead to greater levels of Avoid rather than pseudo-sharing activities facilitated by platforms such as Airbnb that lead to greater levels of consumption and energy use through additional travel and tourism. Sharing: Belk, R., 2014. Sharing versus pseudo-sharing in Web 2.0. The Anthropologist, 18(1), pp.7-23. Helps unpack the different forms of sharing and pseudo sharing (such as those practiced by Airbnb) which might allow greater sensitivity to the statement regarding the potential of sharing to impact energy use	Accepted. Text has been revised and contextualized, with references.	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
6599	40	25	40	27	Please provide a citation for the sentence about expensive goods sharing being economically motivated	Rejected : the sentence presents the reference (Böcker, L., and T. Meelen, 2017: Sharing for people, planet or profit? Analysing motivations for intended sharing economy participation. Environ. Innov. Soc. Transitions, 23, 28–39. https://doi.org/10.1016/j.eist.2016.09.004.), from which the statement has been motivated.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
6601	40	27	40	28	I believe that, in this sentence, "ride sharing" refers to sharing a purchased vehicle, as opposed to ride hailing (which refers to the use of apps to replace taxi services). Perhaps this distinction could be made explicit?	Accepted. Text has been revised and contextualized.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
15349	40	9	42	33	I suggest the authors consider the impact of the for-profit gig economy on those employed and the risks it presents to DLS of a growing number of individuals. See, for instance, Schor, Juliet B. "Does the sharing economy increase inequality within the eighty percent?: findings from a qualitative study of platform providers." Cambridge Journal of Regions, Economy and Society 10, no. 2 (2017): 263-279.	Noted. Text has been revised and contextualized, with references regarding pseudo-sharing and its business relationships, which may not be beneficial to all parties.	Simone D'Alessandro	University of Pisa	Italy
44401	40	9	44	4	There are risks of the sharing economy that may counteract the benefits such as the rebound effect, by which there might be an increased overall consumption, an inadequate regulation with unfair competition in the market and lower tax revenues, and inequalities in access to products.  The EU Environmental Foresight System (FORENV) – Final report of 2018-19 annual cycle – Emerging issues at the environment-social interface, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-09707-5, doi 10.2779/363227 Hüttel, A., Ziesemer, F., Peyer, M., and Balderjahn, I., 2018. To purchase or not? Why consumers make economically (non-) sustainable consumption choices. Journal of Cleaner Production, 8(1): 827-836. Jacobs, K., Petersen, L., Horisch, J., Battenfeld, D., 2018. Green thinking but thoughtless buying? An empirical extension of the value-attitude-behaviour hierarchy in sustainable clothing. Journal of Cleaner Production, 203: 1155-1169. Connolly, J., and Prothero, A., 2008. Green consumption life-politics, risk and contradictions. Journal of Consumer Culture, 8(1): 117–145.  Additionally, collaborative consumption can fuel consumerism, rather than leading to more sustainable consumption. "If the sharing economy follows this pathway of corporate co-option it appears unlikely to drive a transition to sustainability." Martin, C.J. 2016. The sharing economy: A pathway to sustainability or a nightmarish form of neoliberal capitalism? Ecological Economics, Volume 121: 149-159. https://doi.org/10.1016/j.ecolecon.2015.11.027.  Total consumption in the EU has not decreased, as evidenced by Eurostat, 2019. Clothing and footwear statistics. European Commission, https://ec.europa.eu/eurostat	Noted. Text has been revised and contextualized, with references regarding pseudo-sharing and its business relationships, which may not be beneficial to all parties.	Urbano Fra Paleo	University of Extremadura	Spain
4989	40	9	46	7	I believe that to facilitate human well-being and mitigate the effects of CC, governments must favor the devotion of nature-based solutions (NBS). Raise awareness and empower society to apply these good practices	Noted. NBS has been highlighted in different chapters of the FOD but as a supply-side solution for mitigation. The chapter recognized the vital importance of Nature-based Solutions but it is focusing on demand-side solutions, which are listed as megatrends.	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
5011	40	9	46	7	self-sustaining societies	Noted. Section 5.3.2.3 about Circular Economy, which defines ten strategies for circularity (Refuse (R0), Rethink (R1), Reduce (R2), Reuse (R3), Repair (R4), Refurbish (R5), Remanufacture (R6), Repurpose (R7), Recycle (R8), Recover energy (R9)) as an attempt for self-sustaining societies.	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
3765	40	1			In Figure 5.11, please to explain vkm	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
33611	40	9			Please add non-Western perspectives, e.g. street food vendors, in some regions people mainly eat in street eateries and sometimes don't have their own cooking facilities.	Noted. It is important to mention that food sharing is presented in page 41. In addition, sharing cooking facilities are an example of P2P. However, street food vendors are not directly part of sharing economy. They represent the informal labour market.	Debra Roberts	EtheKwini Municipality	South Africa
6603	41	1	41	10	Please explain the term "food sharing" before using it.	Accepted. Text has been revised and contextualized.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
44037	41	9	41	9	Given the organization of the sentence, I expected that "higher educated groups" would be MORE socially motivated. Is this perhaps an error, given that both other examples in the sentence talk about "more" X motivation?	Accepted. Text has been revised and contextualized.	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
5643	41	13	41	19	The additional references included in my Comment #8 above are also suitable to bolster the argument made here in this first paragraph on shared mobility, that shared mobility can help reduce GHG emissions by accelerating the market adoption of less GHG-intensive vehicle types.	Accepted. Text has been revised and contextualized, with references.	Benjamin Leibowicz	The University of Texas at Austin	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
12843	41	29	41	40	Given the focus on wellbeing in this chapter, it is also important to talk about the condition of employment that are created in shared travel scenarios and how drivers can end up employed in precarious conditions (without paid leave or health cover).	Accepted. Text has been revised and contextualized, with references.	Dina Townsend	University of Witwatersrand	Austria
22761	41	31	41	32	Wells et al. (2020) find that "Mobility as a Service" schemes are "more friends than foes" of the incumbent automotive industry - Wells, P., Wang, X., Wang, L., Liu, H., & Orsato, R. (2020). More friends than foes? The impact of automobility-as-a-service on the incumbent automotive industry. <i>Technological Forecasting and Social Change</i> , 154, 119975.	Accepted. Text has been revised and contextualized, with references.	Giulio Mattioli	TU Dortmund University	Germany
6605	41	34	41	34	Explain the term "deadheading" before use. Does this refer to being a fan of the grateful dead or to driving without a passenger? Or to driving without a passenger while listening to the grateful dead. Joking aside - please clarify this term for those who are unfamiliar with it.	Accepted. Text has been revised and contextualized.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
33613	41	12			Consider mentioning security angle of shared mobility including 'Uber' in high crime settings – risk of hijackings, and the potential of improved security through digital means, tracking and GPS. Also how do bike sharing schemes work in high crime settings? Or the impacts of high temperature or heavy rain or terrain? Is there information on where in the world such schemes could work best? And what the options are for developing countries?	Accepted. Text has been revised and contextualized, with references.	Debra Roberts	EThekweni Municipality	South Africa
3767	41	30			Two brackets in excess	Accepted. Text has been revised and contextualized.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3769	41	48			Why is "shift and improve" within brackets?	Noted. The avoid, shift, improve (ASI) framework help examining the role of service-related mitigation options. Text has been revised.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
12845	42	20	42	24	This brief discussion of travel conditions of the majority of people in the world is too brief and probably inadequate, citing only one publication. Transport is a critical human rights issue and many have no access to transport. There is the need for significant increases in transportation for many which also entails improvements of roads and other infrastructure. This may all have climate change implications. This is not much discussed or explored in this chapter.	Noted. There is no doubt about the importance of transport and infrastructure, but these issues are explored in depth in their specific chapters, which focus on supply-side solutions. Chapter 5 focused on demand-side solutions for mitigation.	Dina Townsend	University of Witwatersrand	Austria
22763	42	25	42	33	On the importance of governance of the smart mobility transition for sustainable transport see: Docherty, I., Marsden, G., & Anable, J. (2018). The governance of smart mobility. <i>Transportation Research Part A: Policy and Practice</i> , 115, 114-12; Marsden, G., & Reardon, L. (Eds.). (2018). <i>Governance of the smart mobility transition</i> . Emerald Group Publishing.	Accepted. Text has been revised and contextualized, with references.	Giulio Mattioli	TU Dortmund University	Germany
29275	42	34	42	48	The negative social impacts of the sharing economy have also been described, however, here seems to be described as something positive characterised by the 'willingness to participate' of social groups.	Rejected. The comment is not clear/specific.	Vanesa Castan Broto	University of Sheffield	United Kingdom (of Great Britain and Northern Ireland)
1051	42	43	42	43	****ibid	Rejected. The comment is not clear/specific. The reasoning regarding rebound effects is based on causality and the sentence is not prescriptive.	Harry Saunders	Carnegie Institution for Science	United States of America
33615	42	34			Consider non-Western angle. E.g. extended families living together. Child care sharing. There are things the West can learn from the rest of the world. Equipment sharing / renting. There is the security-angle where multiple occupants add security to a property in high crime settings. Also there is tremendous psychological/social benefit from not living alone. These 'sharing' topics are often presented as novel ideas, and yet it is more a case of the rich, individualistic, Western world having (sometimes fairly recently) deviated from how they used to live in the past, and how the rest of the world still does it. Instead of presenting it as a novel idea, one could tell the story from the non-Western perspective and show how valuable these options are. There is literature on this.	Accepted. Text has been revised and contextualized, with references.	Debra Roberts	EThekweni Municipality	South Africa
36263	42	35			could you please specify the environmental impacts?	Accepted. Text has been revised.	Youba Sokona	South Centre	Switzerland
1053	43	3	43	3	****ibid	Rejected. The comment is not clear/specific. The reasoning regarding rebound effects is based on causality and the sentence is not prescriptive.	Harry Saunders	Carnegie Institution for Science	United States of America
24385	43	1	44	4	If I understood the sharing economy section correctly, one of its main relevances for services-based mitigation is that it can lead to higher product-to-service ratios in service provisioning systems which in turn can lead to lower material and embodied energy requirements for service provisioning. Is this right? If so, it's not clear from Table 5.2 or from any of the earlier text whether sharing economy strategies do actually increase product-to-service ratios. (One anecdotal example I'm aware of is that the shared office space provider, WeWork, actually has lower occupancy rates than conventional long-lease office buildings).	Noted. It is a very important comment but there is a lack of peer-reviewed quantitative research published. LAs are continuing searching for new publications to complement. OBS: Contrary to the WeWork example, sharing housing facilities improve affordable housing in many developing countries, which in turn increase the product-to-service rates of sanitation and cooking facilities. (S., D. Talukdar, and E. M. Bassett, 2018: A sharing economy? Unpacking demand and living conditions in the urban housing market in Kenya. <i>World Dev.</i> , 109, 57–72, <a href="https://doi.org/https://doi.org/10.1016/j.worlddev.2018.04.007">https://doi.org/https://doi.org/10.1016/j.worlddev.2018.04.007</a> .) Unfortunately, there is no quantitative data related to product-to-service ratio.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
11965	43	10	44	2	This table is useful, but needs editing. E.g. sources could be moved out of the table itself to simplify; it needs to be made clearer what the Notes relate to (relative potential, total potential or rebound etc.). what are the different categories within Mobility (why the separation here?).	Noted. All tables and figures will be improved by a design team.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
1325	43		47		Tables 5.2 and 5.3 on the potential emissions savings from sharing economy and circular economy measures are interesting, but there is little information on how these potential savings have been calculated. Is it possible to briefly discuss this in the text?	Noted. Since the chapter has a word limit some concessions have to be done. However, the tables provided the sources, in which one can find the information about how the savings have been calculated.	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
3771	43	6			space is needed	Noted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
33857	43				Ultimately it would be helpful to see this in a graph.	Noted. All tables and figures will be improved by a design team.	Debra Roberts	EThekweni Municipality	South Africa
31745	44	5	44	5	It would be good if the section also talked about the barriers to a circular economy. If it makes economic sense, it should automatically proliferate, right?	Rejected. Barriers are mentioned in the paragraph on page 45, line 40 to page 41, line 8: "There are two key concerns relating to the usefulness of the CE concept. First, many proposals and pamphlets on the CE insufficiently reflect on ..."	Ashok Sreenivas	Prayas (Energy Group)	India
26515	44	19	44	19	If this discussion of the circular economy is to relate to 'social aspects of mitigation', as in the chapter title, then a mention here of more grassroots versions of the circular economy might be helpful - which I have heard referred to as the 'social circular economy'. This could include the wide spread of repair cafes and other grassroots circular economy initiatives - see discussion of these phenomena in Schmid, B. & Smith TSJ (2020) <i>Social transformation and postcapitalist possibility: Emerging dialogues between practice theory and diverse economies</i> , <i>Progress in Human Geography</i> <a href="https://journals.sagepub.com/doi/full/10.1177/0309132520905642">https://journals.sagepub.com/doi/full/10.1177/0309132520905642</a>	Accepted. Text has been revised and contextualized, with references.	Thomas Smith	Masaryk University	Czech Republic
2987	44	5	46	7	Include discussion of the newly emergin concept of carbon circularity and circular carbon economy involving the 4Rs: reduce, Reuse, Recycle, and Remove of carbon from the consumption system. The circular carbon economy is currently discussed at G20.	Rejected. The current terminology, Circular Economy, encompass carbon footprint.	Mustafa Babiker	Aramco	Saudi Arabia
24387	44	5	46	7	This whole section on circular economy is strongly supply-side / upstream, and not explicitly linked to services or service provisioning. I think it should be deleted and/or offered to the industry end-use chapter. If the authors of this chapter want to cover all the ways in which service provisioning systems can be made more energy and material efficient, then circular economy is one of many, many strategies including material efficiency and decarbonisation which would then also need covering.	Noted. In addition, the text has been revised and contextualized with demand-side perspective, with references.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
30007	44	5	47	1	The framing of the circular economy in this sub-section, and elsewhere in this chapter is largely written from a waste minimisation perspective (although some passing references are made to the ASI elements of it). It is recommended that this section (and other text that refers to CE earlier in the document), be reworked to reflect that the CE framing also includes of ASI. otherwise there is a danger of a reader dipping into just this section of the chapter and understanding that CE refers to waste alone.	Accepted. Text has been revised and contextualized, with references.	Brett Cohen	The Green House consultants	South Africa



Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
10847	44		47		The broader concept of the green economy should also be considered alongside the circular economy, which is a subset of the broader green economy concept. This should incorporate not just the multi-R approach expressed in the circular economy but also wider ideas, in the consumption context, of satisficing, servicification and consumption contraction. These align clearly with the ASI framework and it is important to emphasise possibilities beyond the improved efficiency outlook of the circular economy approach. References for work in this area include: Schulz, C. & Bailey, I. (2014) The spatial dimensions of the green economy and post-growth regimes: opportunities and challenges for economic geography, <i>Geografiska Annaler B</i> 96 (3) 277-91.; Bailey, I. and Caprotti, F. (2014) The green economy: functional domains and theoretical directions of enquiry, <i>Environment and Planning A</i> , 46 (8), 1797-1813.	Noted. However, it is important mention that green economy is outside of the agreed outline for Chapter 5 during consensus meetings before the selection of lead authors, which included CE as the megatrend to be discussed.	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
29427	44	18			The phrase "inner circles" is jargon and probably not understandable by readers not familiar with this term. Please rephrase.	Accepted. Text has been revised and contextualized.	Stefan Pauliuk	University	Germany
42123	45	8	45	15	maybe rephrase - can imagine some very annoyed CE people	Noted.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
46587	45	8	45	32	There is a lack of methodology for the circular economy assessment. Besides the education and training in this emerging science, Life Cycle Assessment analysis which includes the business exposure to the problem of sustainability, should be generalized. However, LCA is often thought "ceteris paribus" instead to be consequential (LCA) and therefore under/ill-estimate the long term effect. On the other hand, CE assessment should be done thanks to long term planning, but is limited by linear programming so that feedback (e.g. energy trade-off for recycling or extracting) cannot be fully taken into account.	Noted. However, it is important to mention that LCA is a tool adopted by CE to benchmark improvements from circularity.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
6607	45	16	45	16	Please expand on the term "usefulness." Is this in regards to energy consumption? Material waste? Time? Effort?	Accepted. Text has been revised and contextualized.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
39307	45	16	45	16	I would suggest changing to « There are at least three key concerns relating to the usefulness of the CE concept ». You have listed two, but there is a third that is documented in this article: institutional conditions have an essential role to play in setting the rules that differentiate profitable from non-profitable activities, in a circular economy. Moreau, V., Sahakian, M., Griethuysen, P. v., & Vuille, F. (2017). Coming full circle: why social and institutional dimensions matter for the circular economy. <i>Journal of Industrial Ecology</i> , 21(3), 497-506 doi:10.1111/jiec.12598	Accepted. Text has been revised and contextualized, with references.	Marlyne Sahakian	University of Geneva	Switzerland
11967	45	16	45	22	This is an important point - please consider lifting to the exec summary	Noted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
6609	45	16	45	32	This paragraph discusses CE as a method of waste reduction and not GHG emissions. Perhaps it could be cut.	Rejected. The paragraph has been revised and contextualized, with references.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
46589	45	16	45	32	The size and integration of components should be addressed as a difficulty (energy rise) for promoting efficiency in CE. However, integration and size are often factor of better efficiency during the end-use so that CE has always a trade-off to perform according to the intensity of use.	Noted.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
18105	45	21	45	26	In my view this is a potential headline message: As long as humanity adds material stocks like mad, i.e. gross addition to stocks far exceeds outflows from stocks so that net additions to stock are large, by definition even a hypothetical 100% closing of material cycles (impossible for thermodynamic reasons) can only reduce but never abolish the need for more virgin material. See Krausmann et al., 2017, PNAS as well as results on the global steel cycle by Pauliuk discussed in this context in Haberl et al., 2019, <i>Nature Sustainability</i> , that show that in some world regions, almost all steel inflows are needed to build up new stocks. I think, this message gets somewhat lost in this text at the moment. Hence this positive message about what can be achieved through CE needs to be complemented by considerations about the need to reduce growth of stocks if resource use is to be reduced.	Noted. The paragraph in page 46, line 43 highlights that.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
23049	45	26	45	32	After the sweeping macro-level picture in the first part of the paragraph, this specific example is odd and misplaced.	Accepted. Text has been revised and contextualized.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
23047	45	33	45	35	Here, shared mobility and materials substitution are identified as CE strategies. While this may fit into the encompassing definition of the circular economy promoted by the Ellen MacArthur Foundation (which is not acknowledged in this chapter and which is not so useful for the IPCC as it includes bioenergy and other things which are already well-established), the same strategies are also mentioned in other places. I would find it most appropriate to restrict the definition of CE to things that indeed have to do with recycling, reuse, remanufacturing etc.	Accepted. Text has been revised and contextualized.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
5445	45	42	45	44	The script states "They also save monetary resources of consumers by reducing the need for consumption". This logic is flawed because it does not take into account the rebound effect. Although consumers' need for consumption may be reduced, they still have money: consumers must always spend or save all their money. But however they spend it or save it will be associated with some type of energy use, and hence carbon emissions will arise. References: Druckman, A., M. Chitnis, S. Sorrell and T. Jackson (2011). "Missing carbon reductions? Exploring rebound and backfire effects in UK households." <i>Energy Policy</i> 39: 3572–3581. Chitnis, M., S. Sorrell, A. Druckman, S. K. Firth and T. Jackson (2013). "Turning lights into flights: Estimating direct and indirect rebound effects for UK households." <i>Energy Policy</i> 55: 234–250.	Accepted. Text has been revised and contextualized, with references.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
6611	45	42	45	44	This section does not clarify how CE reduces need for consumption. More evidence is needed here	Accepted. Text has been revised and contextualized, with references.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
29429	45	1			"leverage effect" is neither referenced nor explained. Please do so.	Accepted. Text has been revised and contextualized, with references.	Stefan Pauliuk	University	Germany
23043	45	5			The following Resource Panel report has a lot of content on Remanufacturing which may be relevant here: Re-defining Value—The Manufacturing Revolution: Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy; a Report of the International Resources Panel. <a href="https://www.resourcepanel.org/reports/re-defining-value-manufacturing-revolution">https://www.resourcepanel.org/reports/re-defining-value-manufacturing-revolution</a>	Noted.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
23045	45	13			Much of the rigorous work on the Circular Economy has been conducted within Industrial Ecology. I am not sure there is a discipline called Industrial Economy (maybe economics). It would be appropriate to provide more references in connection to the statements within this paragraph. See <a href="https://onlinelibrary.wiley.com/doi/10.1111/jiec.12598">https://onlinelibrary.wiley.com/doi/10.1111/jiec.12598</a> for a special issue of JIE on CE	Accepted. Text has been revised and contextualized, with references.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
5447	45				The discussion on the Circular Economy (Section 5.3.2.3) appears to miss the fact that it is generally motivated by producers trying to reduce their costs. We need therefore to ask, what do producers do with the money saved? They may often invest it in more production facilities, in which case production will increase. Although this is alluded to, this it needs to be stated explicitly.	Accepted. Text has been revised and contextualized, with references. The demand-side perspective was added to mitigate that.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
25013	46	4	46	4	Delete "Table 5.3 Comparative"	Accepted. Text has been revised and contextualized.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
24479	46	9	46	9	In the context of circular economy, we may need to consider hazardous waste recycling benefits as there are many countries doing recycling of used batteries.	Noted. However, there is a lack of quantitative datasets.	SAN WIN	Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation	Myanmar
31747	46	9	46	9	The savings indicated in Fig 5.3 seem to be quite small, raising the question of the usefulness of circular economy.	Rejected. The comment is not clear/specific.	Ashok Sreenivas	Prayas (Energy Group)	India
28051	46	3	47	6	Incomplete sentences.	Accepted. Text has been revised and contextualized.	Yoshiyuki Shimoda	Osaka University	Japan
3773	46	3			erase "the comparative"	Accepted. Text has been revised and contextualized.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3775	46	4			space is needed	Accepted. Text has been revised and contextualized.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
23041	46				Last line in table - the order of magnitude for the potential savings from a mobile phone is not right, as the impacts of making a phone are on the order of 100 kg (10 <sup>6</sup> -7 Mt). I could not pull up the paper as their server is too slow.	Noted.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
25015	47	6	47	7	Delete "Comparative table ... potential", Replace Table "5.3" with "5.4"	Editorial - accept.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
12847	47	9	47	12	Again this section treats the sharing economy practices in much of the world as non-existent.	Accept. More acknowledgement of traditional sharing practices and their benefits added.	Dina Townsend	University of Witwatersrand	Austria
24389	47	22	47	36	I think these twin concepts of service provision adequacy and service provision efficiency are very useful organising concepts (and relate - it seems - to needs satisfaction and provisioning systems as introduced earlier). In contrast, I think DLS serves less well as an organising concept for the chapter; rather it is a particular definition of floor values for service provision adequacy in a development context.	Taken into account. New structuring and streamlining of chapter makes framing and content much more cohesive.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
10067	47	2	50	24	This section does not fully address behavioral barriers to ASI. Authors can consider integrate empirical evidence from psychology and behavioral economics on what impediments should be considered to achieve energy and GHG reductions from these strategies.	Accept. More discussion of barriers to ASI added.	Jia Li	U.S. Environmental Protection Agency	United States of America
25657	47	1			It would be interesting to sum the total CO2 eq potential (assuming that would be meaningful).	Reject. Not possible to sum up values due to different baselines and scenario assumptions.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
25659	47	1			The smartphone is the only row where total CO2 eq potential is per item, not aggregate for the industry. Would it be possible to estimate the number of phones that might be reused and thus calculate an aggregate for all smartphones, to make the table more consistent?	Taken into account. Table has been converted into a figure with consistent units used.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
33617	47	3			After presenting so clearly a longer list of services in Table 5.1, the previous section has only dealt with some of them, which contradicts this sentence. Important services that are not well represented are food, water, health. Each have emissions, sustainability and wellbeing implications.	Accept. More services are covered in the new section to address these gaps.	Debra Roberts	EThekweni Municipality	South Africa
3777	47	5		6	space to be eliminated	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3779	47	7			space needed before the bracket	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
33619	47	21			Please note that the provision of services that are not yet available (e.g. energy in Africa) are not reflected in the ASI framework – the entire dual concept so nicely developed in the opening sections of this chapter, of providing where it is missing, and reducing where there is too much. Currently this section is framed mainly from the 'too much' perspective (e.g. every time the word 'reduced' or 'smaller' is used).	Accept. Better balance between reducing overconsumption and raising consumption sustainably to sufficiency levels has been added.	Debra Roberts	EThekweni Municipality	South Africa
3781	47	34		36	The sentence is useless	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
30557	48	0	48	0	In Table 5.4, the units are kg CO2 per calorie produced but should be CO2 equivalents, given the significant contribution of non-CO2 GHG emissions to the GHG footprint of foods. Second, assessing GHG footprints per calorie consumed is not necessarily the standard functional unit because people do not eat similar quantities of calories across different food groups. GHG footprints per unit of protein (for protein foods) or per serving can also be used (Tilman & Clark, 2014; Poore & Nemecek 2018; Kim et al 2019). This functional unit used is also not consistent across other chapters of the report - others report GHG per kg product and per unit of protein. See also: Heller et al. (2013). Toward a life cycle-based, diet-level framework for food environmental impact and nutritional quality assessment: a critical review. Environmental science & technology, 47(22), 12632-12647 for thorough discussion.	Accept point about CO2 equivalents. Reject point about normalizing to nutrients, since this table is meant for macro-level view of service provision, and more detailed discussion of food occurs in Ch 12.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
30559	48	0	48	0	Might add in "dairy" to make "Dietary shifts from ruminant meat and dairy to other protein sources" to avoid potential rebound effects of replacing ruminant meat consumption with dairy consumption.	Accept.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
30561	48	0	48	0	Locally sourced food does not necessarily reduce the GHG footprint of foods due to variances between transportation mode (i.e. ship, rail, truck, or plane) or lost economies of scale that come with larger processing, storage, and distribution systems. This is particularly relevant given the relatively low percentage of the overall GHG footprint of foods attributable to transportation. Additionally some local foods might actually increase GHG footprint (e.g., hothouse grown or air-freighted produce compared to regionally aggregated seasonal produce or produce shipped by more efficient transportation means). See: Wakeland, W., Cholette, S., & Venkat, K. (2012). Food transportation issues and reducing carbon footprint. In Green Technologies in Food Production and Processing (pp. 211-236). Springer US.; Mariola, M. J. (2008). The local industrial complex? Questioning the link between local foods and energy use. Agriculture and Human Values, 25(2), 193-196.	Accept. This important nuance is now discussed in the text.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
23061	48	1	48	46	I understand that this is a table with illustrative examples. Yet, the examples can also be read as claims. It seems obvious that a shift from car to cycling, walking, or public transit reduces emissions (in most cases, but for public transit not always, depending on population density and fuel). However, some of the examples may also lead to increases in emissions in more than just particular circumstances, such as locally sourced foods or new manufacturing processes. I would hence encourage that you rethink this table and not list items that can also increase emissions. The question is to what degree example claims also need a substantiation in the literature.	Taken into account. A new figure showing ranges that also span into negative outcomes has been added.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
15781	48	3	48	4	Some countries have published articles and set themselves targets to achieve carbon neutral meat production, using for example Silvopastoral meat producing systems (SPS). For example, the Australian Beef Sustainability states that "In 2017 the Australian red meat industry set an ambitious target to be carbon neutral by 2030." and that "A new indicator has been added to the 2019 Annual Update to publicly track the industry's CN30 (Carbon Neutral by 2030) initiative. Since the baseline year of 2005, the industry has reduced absolute emissions by 55.7% (for the most recent reporting period of 2016) largely through a focus on improving productivity and vegetation management practices." Sources: <a href="https://www.sustainableaustralianbeef.com.au/managing-climate-change-risk">https://www.sustainableaustralianbeef.com.au/managing-climate-change-risk</a> and also "ABSF_2019_Australian_Beef_Sustainability_Annual_Update_web.pdf" in the UK, the NFU states "The NFU has reiterated that improvements in productivity, carbon capture and renewable energy production are the most effective ways to reach agricultural net zero targets, as part of its ambition to reach net zero by 2040." reference: <a href="https://www.nfonline.com/news/latest-news/nfu-reiterates-its-net-zero-aims-for-agriculture">https://www.nfonline.com/news/latest-news/nfu-reiterates-its-net-zero-aims-for-agriculture</a> . New peer reviewed research UK and Australia, as well in Brazil, Argentina, Colombia show that migrating to carbon neutral meat production is a feasible climate change mitigation action. In Brazil, EMBRAPA has published studies which support the viability of carbon neutral beef: "http://www.alice.cnptia.embrapa.br/alice/handle/doc/1118359" and also this article: <a href="https://www.alice.cnptia.embrapa.br/bitstream/doc/1118439/1/Economicanalysisof.pdf">https://www.alice.cnptia.embrapa.br/bitstream/doc/1118439/1/Economicanalysisof.pdf</a> and this third article <a href="https://link.springer.com/article/10.1007/s10457-019-00460-x">https://link.springer.com/article/10.1007/s10457-019-00460-x</a> In USA, studies are being done in this sense, for example by Yale "Silvopastoral systems and climate change mitigation in Latin America" by Montagnini, F., Ibrahimi, M., Murguieito, E. Restrepo at <a href="https://pdfs.semanticscholar.org/018b/34c7da1176d1e9134edd1aabe2a0a98a7f.pdf">https://pdfs.semanticscholar.org/018b/34c7da1176d1e9134edd1aabe2a0a98a7f.pdf</a> . In Colombia: Charry, A., Narjes, M., Enciso, K. et al. Sustainable intensification of beef production in Colombia—Chances for product differentiation and price premiums. Agric Econ 7, 22 (2019). <a href="https://doi.org/10.1186/s40100-019-0143-7">https://doi.org/10.1186/s40100-019-0143-7</a> IPCC should support these meat production mitigation initiatives, because they might offer carbon neutral protein solutions to humankind.	Taken into account. These references have been processed.	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnológico de Buenos Aires	Argentina
34483	48	1	49	1	See our comment n°12	Accept. Discussion of need to monitor and manage rampant demand growth due to digitalization added.	Emmanuel RAUZIER	NGO Association negaWatt	France
38215	48	1	49	1	The improve step should be before the shift step to avoid the lock-in effect. Furthermore, the measures described in each step are mixed-up. For example, the measures related to thermal comfort described in the avoid step are mainly behavioral measures related to individuals while those included in the shift step are also measures leading to avoid energy demand. They should be moved to the avoid step and the shift step should be about the use of RE for heating and cooling. See for reference: <a href="https://negawatt.org/IMG/pdf/181029_energy-sufficiency_negawatt-scenario_eng.pdf">https://negawatt.org/IMG/pdf/181029_energy-sufficiency_negawatt-scenario_eng.pdf</a> . The table should be updated based on the principle of reducing the demand (sufficiency measures including those related to individual behavior), improvement of efficiency and then the shift to clean energy production of the services and the goods otherwise, the proposed framework will contribute to increase the lock-in effect against which individuals are powerless.	Accept. This table has been redesigned to more accurately categorize levers into A, S, and/or I.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
3783	48	3		4	explain CCS in the Table 5.4 (in the shelter part)	Accept. Explanation of acronym added to text.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3785	48	3		4	I don't understand "Reduce sick and morbid days by calorie choice calories produced/calories consumed"	Taken into account. Sentence has been reworded for clarity.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
23051	48				I understand that this is a table with illustrative examples. Yet, the examples can also be read as claims. It seems obvious that a shift from car to cycling, walking, or public transit reduces emissions (in most cases, but for public transit not always, depending on population density and fuel). However, some of the examples may also lead to increases in emissions in more than just particular circumstances, such as locally sourced foods or new manufacturing processes. I would hence encourage that you rethink this table and not list items that can also increase emissions. The question is to what degree example claims also need a substantiation in the literature.	Taken into account. A new figure showing ranges that also span into negative outcomes has been added.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
1449	49	1	49	16	The different situation of food waste and losses among developed and developing countries should be described in more details. Studies show that food waste loss rate could be as high as 40-60% in developed countries such as Europe and the US, but as low as 19% in China (Hall et al., 2009; Liu et al., 2013). The underlying factors that cause food losses and waste are significantly different when comparing industrialized countries (where food waste and overeating is the bigger problem) and developing countries (where food losses and undernourishment are more extensive). There is consensus among scholars and decision-makers that these require different approaches. In developing countries and tropical regions, investments in improved storage, transport and cooling infrastructure are important. Increasing producers' access to food processing, packaging and new markets beyond their local ones is likewise critical (Liu et al., 2013). In industrialized countries and economies in transition, awareness-raising activities should target consumers, retailers and the food industry. Hall, K. D.; Guo, J.; Dore, M.; Chow, C. C. The progressive increase of food waste in America and its environmental impact. PLoS ONE 2009, 4 (11), e7940. Liu J., Lundqvist J., Weinberg J., Gustafsson J., 2013. Food losses and waste in China and their implication for water and land. Environmental Science & Technology 47(18): 10137- 10144.	Taken into account. These issues are taken up in Ch 12.	JUNGUO LIU	Southern University of Science and Technology	China
24391	49	2	49	16	This paragraph is a good example of why service adequacy and efficiency are more useful than DLS, as they also invite discussion of the ceiling, as well as the space between ceiling and floor.	Taken into account. New structuring and streamlining of chapter makes framing and content much more cohesive.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
31749	49	5	49	16	Though it is said that the challenge is to not only avoid food wastage but also increase nutrition levels to equitable standards globally, all the suggestions given only refer to avoiding food wastage - thus making the solutions purely climate centric rather than also development centric.	Accept. Better balance between reducing overconsumption and raising consumption sustainably to sufficiency levels has been added.	Ashok Sreenivas	Prayas (Energy Group)	India
12849	49	7	49	10	Possible inclusion of discussion of the manner in which products are promoted to consumers and possible perverse incentives to over-consume (where large quantities are cheaper per unit than smaller quantities, for example).	Reject. Beyond scope of chapter.	Dina Townsend	University of Witwatersrand	Austria
5645	49	24	49	26	To add to the empirical evidence that improved urban planning can reduce vehicle miles traveled and GHG emissions, the following complementary reference (which derives generalizable, analytical insights from a theoretical model) can be helpful.	Accept. Reference added.	Benjamin Leibowicz	The University of Texas at Austin	United States of America
44279	49	33	49	35	Leibowicz, B.D., 2020. Urban land use and transportation planning for climate change mitigation: A theoretical framework. European Journal of Operational Research 284, 604-616.	Accept.	BERTOLDI PAOLO	European Commission	Italy
24393	49	17	50	3	The reduction of standby mode is one of the success story of energy efficiency policies in several jurisdictions, in fact the reference you cite is quite old, 2012. What is now worrying is the on-mode energy consumption. I suggest to indicate the need for "sufficient and efficient appliances", i.e. in most families no need for large refrigerators or dryers if clothing can be dried outdoor, or super large TV screen. Sharing of appliances could also be an interesting solution.	Taken into account. Cross-chapter coordination efforts to address this.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
10969	49	36	51	10	These sectoral summaries could be deleted and/or moved to the end-use sector chapters. They lose the services-based emphasis, and they don't clearly relate to ASI framework which is dealt with more thoroughly later on. The uniqueness of this chapter 5 should be to comparatively look at all the Avoid strategies across sectors, and relate them to needs satisfaction and service provisioning. Then ditto for Shift strategies, and improve strategies. This would better fit later in section 5.4 when ASI is explored more fully.	Accept. More nuanced discussion of conditions when SE and CE lead to benefits and when they do not is added.	Rolf Frischknecht	treeze Ltd.	Switzerland
24395	50	4	50	10	Circular and shared economy are current buzz words. However, these concepts lack the (quantified) proof that they help substantially reducing the (life cycle based) greenhouse gas emissions to the required net zero emission level. Please add text and cite reliable references which give the necessary evidence.	Accept. Newer references added.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
22765	50	6	50	10	Another example of some very dated references given how much has changed in product-services systems since the Natural Capitalism era of the late 90s.	Accept. References added.	Giulio Mattioli	TU Dortmund University	Germany
30563	50	19	50	24	In the transport sector, it has been argued that a more sustainable business model would be for car companies to become 'mobility service providers,' capturing downstream revenue rather than relying on overproduction (Ceschin & Vezzoli, 2010; Orsato & Wells, 2007; Williams, 2006). REFERENCES: Ceschin, F., & Vezzoli, C. (2010). The role of public policy in stimulating radical environmental impact reduction in the automotive sector: the need to focus on product-service system innovation. International Journal of Automotive Technology and Management, 10(2-3), 321-341; Orsato, R. J., & Wells, P. (2007). U-turn: the rise and demise of the automobile industry. Journal of Cleaner Production, 15(11), 994-1006; Williams, A. (2006). Product-service systems in the automotive industry: the case of micro-factory retailing. Journal of Cleaner Production, 14(2), 172-184.	Accept. More discussion of rebound and knock-on effects added.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
46591	50	19	50	24	Another potential knock-on effect is how consumers who make certain dietary shifts may spend cost savings on other GHG-intensive goods and services: Grabs, J. (2015). The rebound effects of switching to vegetarianism. A microeconomic analysis of Swedish consumption behavior. Ecological Economics, 116, 270-279.	Noted	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
23109	50	25	50	46	As in other section of the chapter 5, avoiding the rebound effect requires to have a feedback control during the application of the setpoint. From a thermodynamic point of view, the rebound effect can be easily understood within the grand-canonical set and the number of "rebound" is controlled by the chemical potential.	Taken into account. The section on IAMs has been expanded to include other modeling approaches; these references have been evaluated.	Gibran Vita	Open University of the Netherlands	Netherlands
					<p>You could add the following discussion:</p> <p>5.3.3.2</p> <p>The Shared Socioeconomic Pathways (SSP), the SSP1 "Sustainability – Taking the Green Road", is the most compatible with 1.5 °C mitigation scenarios and enabling adaptation (Grubler et al., 2018; O'Neill et al., 2017; Riahi et al., 2017). Its central feature is low-carbon lifestyles i.e. high environmental awareness and moving towards less resource-intensive consumption, starting by high-income countries (O'Neill et al., 2017). However, detailed lifestyles changes are not easily represented in the SSPs research because the demand sectors of Integrated Assessments Models (IAMs) are often highly aggregated i.e., industry, energy and transportation (Riahi et al., 2017). There are opportunities in linking Life-Cycle Informed Models, such as Environmentally Extended MultiRegional Input-Output models with IAM-SSP research by adding heterogeneity and allowing for more stylized scenarios of lifestyle changes (Paullik, Arvesen, Stadler, &amp; Hertwich, 2017; Rao, Van Ruijven, Riahi, &amp; Bosetti, 2017; Vita et al., 2019).</p> <p>References:</p> <p>Grubler, A., Wilson, C., Bento, N., Boza-Kiss, B., Krey, V., McCollum, D. L., ... Valin, H. (2018). A low energy demand scenario for meeting the 1.5 °C target and sustainable development goals without negative emission technologies. Nature Energy, 3(6), 515–527. <a href="https://doi.org/10.1038/s41560-018-0172-6">https://doi.org/10.1038/s41560-018-0172-6</a></p> <p>O'Neill, B. C., Kriegler, E., Ebi, K. L., Kemp-Benedict, E., Riahi, K., Rothman, D. S., ... Solecki, W. (2017). The roads ahead: Narratives for shared socioeconomic pathways describing world futures in the 21st century. Global Environmental Change, 42, 169–180. <a href="https://doi.org/10.1016/j.gloenvcha.2015.01.004">https://doi.org/10.1016/j.gloenvcha.2015.01.004</a></p> <p>Paullik, S., Arvesen, A., Stadler, K., &amp; Hertwich, E. G. (2017). Industrial ecology in integrated assessment models. Nature Climate Change, 7(1), 13–20. <a href="https://doi.org/10.1038/nclimate3148">https://doi.org/10.1038/nclimate3148</a></p> <p>Rao, N. D., Van Ruijven, B. J., Riahi, K., &amp; Bosetti, V. (2017). Improving poverty and inequality modelling in climate research. Nature Climate Change, 7(12), 857–862. <a href="https://doi.org/10.1038/s41558-017-0004-x">https://doi.org/10.1038/s41558-017-0004-x</a></p> <p>Riahi, K., van Vuuren, D. P., Kriegler, E., Edmonds, J., O'Neill, B. C., Fujimori, S., ... Tavoni, M. (2017). The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. Global Environmental Change, 42, 153–168. <a href="https://doi.org/10.1016/j.gloenvcha.2016.05.009">https://doi.org/10.1016/j.gloenvcha.2016.05.009</a></p> <p>Vita, G., Lundström, J. R., Hertwich, E. G., Quist, J., Ivanova, D., Stadler, K., &amp; Wood, R. (2019). The Environmental Impact of Green Consumption and Sufficiency Lifestyles Scenarios in Europe:</p>				

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
38217	50	26	50	38	Here reference should be made to scenarios which take into account the avoid dimension such as the Negawatt scenario for France, see <a href="https://negawatt.org/IMG/pdf/negawatt-scenario-2017-2050_english-summary.pdf">https://negawatt.org/IMG/pdf/negawatt-scenario-2017-2050_english-summary.pdf</a> and the more recent scenario developed for Europe, see for reference: <a href="https://negawatt.org/IMG/pdf/negawatt-scenario-2017-2050_english-summary.pdf">https://negawatt.org/IMG/pdf/negawatt-scenario-2017-2050_english-summary.pdf</a>	Accept. Scenario evaluated and added.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
34485	50	26	50	46	It would be relevant to add reference to "avoid demand" scenarios that include sufficiency such as developed by the negaWatt association see <a href="https://negawatt.org/IMG/pdf/negawatt-scenario-2017-2050_english-summary.pdf">https://negawatt.org/IMG/pdf/negawatt-scenario-2017-2050_english-summary.pdf</a> and for Europe, see <a href="https://negawatt.org/IMG/pdf/negawatt-scenario-2017-2050_english-summary.pdf">https://negawatt.org/IMG/pdf/negawatt-scenario-2017-2050_english-summary.pdf</a>	Accept. Reference added.	Emmanuel RAUZIER	NGO Association negaWatt	France
25661	50	31	50	32	Reference could be made to the fact that there has been much more research on technology than on the social aspects of mitigation partly because only 0.12% of all research funding on climate change has been spent on the social science of climate mitigation (Overland and Sovacool, "The misallocation of climate research funding", Energy Research & Social Science, 2020).	Accept.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
18107	50	25	54	1	I propose to cross-check to what extent these low energy scenarios are represented in other chapters, in particular those on future scenarios (ch 3 and 4) and make sure they are adequately highlighted and cross-references are introduced	Taken into account. Cross-chapter coordination efforts to address this.	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
3787	50	13		18	The number of brackets is not correct	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3789	50	33			please to explain IAMs or to refer to table 5.5	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
12607	50				the chapter suggest many very optimistic solutions to show that reductions in demand is realistic, which is fine. However, the chapter should also include discussions of what it would take to actually make these societal shifts. E.g line 11-18 suggest how moving from single family housing and private cars to live in multifamily housing and use public transportation can reduce CO2 emission. This is obviously right, however, the chapter completely lack all social science aspects on why people do not do this, or what would make them do it	Accept. More discussion of barriers to ASI added.	Gram-Hanssen Kirsten	Aalborg University	Denmark
38219	51	1	51	14	For a better assessment of the behavior impact, see for reference: <a href="https://www.carbone4.com/wp-content/uploads/2019/06/Publication-Carbone-4-Faire-sa-part-pouvoir-responsabilite-climat.pdf">https://www.carbone4.com/wp-content/uploads/2019/06/Publication-Carbone-4-Faire-sa-part-pouvoir-responsabilite-climat.pdf</a>	Accept. Reference added.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
37327	51	1	51	46	There should be mention here of not only IAMs, but also bottom-up energy system models that tend to show lower energy system costs (measured for example by LCOE) and avoid the use of BECCS or other negative emissions technologies. These at least represent bounding cases in the literature. Teske, Breyer, Jacobson, Löffler are all representative	Taken into account. The section on IAMs has been expanded to include other modeling approaches; these references have been evaluated.	Michiel Schaeffer	Climate Analytics	Netherlands
45893	51	14	51	14	please consider inserting after "ASI strategies (compare...10.18)" the sentence: "A few studies attempt to develop scenarios that account for a recent developments in mobility behaviors (for example, the speed with which bicycle use has made a comeback in densely-populated cities, a competition with car ownership by telecommunication systems as an expression of freedom for young people,...). e.g Kaufman and Ravalet 2016 elaborated for France an alter-mobility and proxy-mobility scenario, where the latter includes effects of better urban planning, urban densification, amelioration of cycling infrastructures, integrated pricing of public transport and amelioration of its spatial and temporal coverage, leading to a 16% rail modal share (similar to Switzerland) and 8% cycling modal share (similar to the Netherlands) and a reduction of modal share by individual car from 74 to 47% between 2013 and 2050.  Kaufmann, Vincent, and Emmanuel Ravalet. 2016. "From Weak Signals to Mobility Scenarios: A Prospective Study of France in 2050." Transportation Research Procedia 19: 18–32. <a href="https://doi.org/10.1016/j.trpro.2016.12.064">https://doi.org/10.1016/j.trpro.2016.12.064</a> .	Accept. Reference added.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
1425	51	31	51	39	Fujimori et al. (2014) discusses the mitigation cost implications in the demand reduction. Fujimori S, Kainuma M, Masui T, Hasegawa T, Dai H. The effectiveness of energy service demand reduction: A scenario analysis of global climate change mitigation. Energy Policy 2014, 75(Supplement C): 379-391.	Accept. Reference added.	Shinichiro Fujimori	Kyoto University	Japan
37325	51	35	51	35	should that really be GAMS, like the programming language?	Editorial - accept. (Change GAMS to IAMS)	Michiel Schaeffer	Climate Analytics	Netherlands
789	51	40	51	46	For the discussion about the evolution of IAM modelling towards a better integration of demand, (Geels et al., 2016) would be very useful because it highlights epistemological issues and challenges when one thinks about bridging modelling and social sciences. It would provide a complementary and maybe less optimistic view than (Van Den Berg et al., 2019) about the possibility to integrate lifestyle dimension into IAM. (Rosenbloom, 2017) would also be useful in this discussion to underline the link between the type of pathways considered and the political implications. In particular, it raises interesting points about the political consequences of integrating a socio-technical dimension in pathways. Ref: (Geels, F.W., Berkhout, F., van Vuuren, D.P., 2016. Bridging analytical approaches for low-carbon transitions. Nature Climate Change 6, 576–583. <a href="https://doi.org/10.1038/nclimate2980">https://doi.org/10.1038/nclimate2980</a> ; Rosenbloom, D., 2017. Pathways: an emerging concept for the theory and governance of low-carbon transitions. Global Environmental Change)	Taken into account. References evaluated and added as appropriate.	MATHIEU SAUJOT	IDDR	France
24397	51	40	51	46	This seems like a critical paragraph, recognising the limitations of IAMs as global scenario analysis tools. Could the authors comment on what would be the outcome of all these limitations being addressed. What would be the net effect on mitigation? How would services-based measures fit within the cost-optimising framework of the tools, particularly as "costs" such as they are are transitional and transactional, not financial. If behaviour change is costless, would it not always be a first resource for the models, even in reality, it clearly is not.	Accept.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
3791	51	8			please to explain GCAM or to refer to table 5.5	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3793	51	12			18 space Gt	Editorial - accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
29079	52		52		Good summary. Seems the mitigation potentials overall for the scenario and not for the demand side actions considered in the scenario.	Accept. Text reworded for clarity.	Priyadarshi Shukla	Ahmedabad University	India
44281	52		52		I suggest to replace in table 5.5 stanby loss, with avoid larger appliance and avoid using them when not needed (e.g. run a washing machine obly at full load).	Accept.	BERTOLDI PAOLO	European Commission	Italy
30565	52	0	53	0	Cultured meat is included in several lifestyle change scenarios reported in the table as a potential demand reduction consideration (e.g., d, g), however its potential GHG implications are not discussed in the text in Chapter 5. There is high variability in the projected GHG emissions associated with cultured meat in the few anticipatory lifecycle assessments that currently exist. Cultured meat will not necessarily provide GHG mitigation potential over all types of meat (e.g., poultry), or even over beef (depending on the types of production systems under comparison), thus it should not necessarily be listed as a mechanism for reducing GHG emissions without more nuanced discussion. Mattick, C. S., Landis, A. E., Allenby, B. R., & Genovese, N. J. (2015). Anticipatory life cycle analysis of in vitro biomass cultivation for cultured meat production in the united states. Environmental Science & Technology, 49(19), 11941-11949.; Tuomisto, H. L., & Teixeira de Mattos, M Joost. (2011). Environmental impacts of cultured meat production. Environmental Science & Technology, 45(14), 6117-6123.; Lynch, J., & Pierrehumbert, R. (2019). Climate impacts of cultured meat and beef cattle. Front Sustain Food Syst, 3.	Taken into account. This issue is taken up in Ch 12.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
38221	52		54		This table should include regional/national scenarios based on demand reduction, see references included in comment 14. Also, it will be good to have a decomposition of the savings for each of teh pillars of teh ASI	Reject. Not possible given that the scenarios don't provide the necessary reporting resolution.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
10971	53	30	54	2	The installation of renewable energy on buildings is no more a matter of willingness but economical already today. This topic should thus be covered in Chapter 4 rather than 5, and its contents should be substantially amended, taking into account most recent technical and economy developments. I suggest to get in contact with IEA PVPS Technology Cooperation Programme chairs.	Taken into account. Cross-chapter coordination to address this.	Rolf Frischknecht	treeze Ltd.	Switzerland
24399	54	1	54	1	I think table footnote g is missing, so the footnotes g to l are all one-step mismatched with the table entries	Editorial - accept.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
5055	55	1	55	21	This chapter dealt with demand-side issues of energy with the emphasis on social aspects of this issue. "well-being" seems to be one of the keywords in this chapter. There are two concepts that lack in this chapter, stages of economic development and the role of the middle class when considering the consumption/demand-side issues. "Middle class" was referred only once, P78-L12, in the case of Kolkata transportation service. Well-beings in a society would have been changed as society's economy developed, so as consumption. This is not a static issue, it is a dynamic issue. This is a classic problem. How can we manage a fast increasing consumption of the developing world, while keeping the level of well-being of the people? In section 5.4, the authors discuss the transition, using the concepts of agency, structure, and meaning. This discussion definitely brought new insight into this kind of discussion. In the developing world, it may be promoted by the emerging high consumption people, which may be the members of the middle-class.	<i>Taken into account. Text revised though moved in large parts to a Social Science Primer for space reasons.</i> Though we may not refer to middle class explicitly, we are cognizant of the role of different strata of society. The dynamics of different stages of economic development are mostly outside of the scope of this chapter, though their implications on expectations and aspirations are and will be discussed.	Midori Aoyagi	National Institute for Environmental Studies	Japan
10065	55	2	55	16	Another reference of interdisciplinary social science review (from anthropology, sociology, geography, and archaeology) also supports this framing: S. Fiske, K. Hubacek, A. Jorgenson, J. Li, T. McGovern, T. Rick, J. Schor, W. Solecki, R. York, A. Zycherman. (2018). Drivers and responses: Social science perspectives on climate change, part 2. Washington, DC: USGCRP Social Science Coordinating Committee. <a href="https://www.globalchange.gov/content/social-science-perspectives-climate-change-workshop">https://www.globalchange.gov/content/social-science-perspectives-climate-change-workshop</a>	<i>Accepted - reference will be added though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons</i>	Jia Li	U.S. Environmental Protection Agency	United States of America
14981	55	2	55	22	It may not be necessary to have "agency" and "meaning" as separate nodes. In many social sciences, particularly psychology the elements defined in "meaning" are subsumed into "agency"	<i>Taken into account - Text revised.</i> We have changed the structure of this section and some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
14985	55	5	55	9	Are they driving moves to low carbon? So what is driving the status quo? Perhaps this needs to be rephrased as "can drive" thus denoting that the three nodes are important in driving as opposed to successful in driving - societies may want low carbon and it is happening in some cases but this general statement needs clarification beyond the citations	<i>Accepted - text revised though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons</i>	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
44039	55	24	56	6	I am intrigued that government is not included in the list of actors. Is there a reason for excluding it, or should it be integrated into this list? When I read the following pages, it seems as though government should be its own grouping, and that certain sections, such as how governments can "nudge" behavior, should fit into this section. Governments are responsive to a collective view of where society is going and to societal values (above and beyond any individual's set of values) as well as (theoretically) keeping the public good in mind in a way that individuals, NGOs, and businesses do not. This important role should be highlighted by breaking out government as an independent actor.	<i>Accepted - text revised.</i> In our revision of SECTION 5.4, we now list government (at all levels, down to the municipal level) as one of the actors	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
6621	55	24	60	14	This section is generally well-written and useful. The only amendment might be to add a paragraph on habits - how they affect a great deal of energy behavior, how they are developed and how they can be changed (e.g., habit discontinuity hypothesis)	<i>Accepted - text revised.</i> In our revision of SECTION 5.4, we now also include some discussion on the role of habits, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
46593	55	1	63	17	Due to its anteriority (1905), the issue of "transition" must be driven from the theory of Phase Transition in physics (see e.g. Phase Transition and Critical Phenomena, Serie Editor: Domb, Green and Lebowitz, Academic Press, with all its extension towards social sciences). Some insights from phase transition theory along with terminology would be helpful to gain in accuracy and relevant state of the art. Basically, the phase transition theory reduces the relevant/universal characteristics mainly to: (i) the dimension/geometry of the system (called structure in Fig. 5.12), and (ii) the description of the (social) interactions (connectivity, see above) along with the degrees of freedom of the individual agents (called meaning), undergoing (iii) a social pressure (called agency). The phase (of symmetry in physics) is defined thanks to an optimality principle (maximizing the entropy under constraint, at least the knowledge of averaged energy) which selects an averaged order (of symmetry). Under the existence of a transition (which means a small deviation of the "agency" modifies discontinuously the symmetry of a phase without mass), the inertia (provided by the capital) induces a pathways from the initial to the final phase. Hence the design of the kinetics of the transition depends on the adaptation of the "structure" and the "meaning" which should allow the existence of a transition, the control by the "agency" to achieve the pathways before a given time. This finite time induces irreversibility and losses of capital, which are not, strictly speaking, due to the transition but only to its finite-time achievement.	<i>Rejected - out of the scope of this chapter.</i> This is a very interesting framework onto which the agency, structure, meaning constructs of Section 5.4 are mapped, but page constraints prevent us from including it.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
48117	55	1	63	17	The theory is missing a crucial aspect of societal responses to policies, and that is an imperative to act. We see that often even with good attitudes and intentions actions are not taken unless there is a crucial point at which a decision is either mandated (no choice is allowed) or is forced. There is little decoupling between income and energy consumption so far, after decades of work in behavioural change for energy demand, and very little indication that the majority of society would change consumption patterns unless forced to.	<i>Accepted - text revised.</i> In our revision of section 5.4, we now address the attitude-behavior gap and mention the need for and role of policy, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons triggers to close it.	Rachel Freeman	University College London, Energy Institute	United Kingdom (of Great Britain and Northern Ireland)
38041	55	23	63	17	Municipalities are missing in 5.4.1. sub chapter. Local governments are important actors in promoting demand side mitigation actions, as well.	<i>Accepted - text revised.</i> In our revision of SECTION 5.4, we now list government (at all levels, down to the municipal level) as one of the actors	Tamás Pálvölgyi	Budapest University of Technology and Economics, Department of Environmental Economics	Hungary
24401	55	1	75	25	I find section 5.4.1 - 5.4.3 largely unnecessary (and at 20 pages, definitely way too long) for various reasons: (1) it is a general 'foundational' social science synthesis, rather than specifically tailored to services-based mitigation; (2) even as foundational social science it is not a consensus view - there are many other frameworks (including, most obviously, Giddens' structuration theory) which emphasise different elements, so why create this one. (3) however, the main issue is that this long background text is not tied into the dual narrative backbone of the chapter - service provisioning and needs satisfaction - consequently it seems largely superfluous other than making the (obvious) point that people and structures both matter - a point well illustrated in the case studies and ASI analysis that follows.	<i>Accepted - text revised.</i> We have moved the more conceptual background parts of Section 5.4 into a "Behavior" Primer that will form an Appendix to AR6.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
42125	55		75		I was wondering the absence of politics??	<i>Accepted - text revised.</i> In our revision of SECTION 5.4, we now list government (at all levels, down to the municipal level) as one of the actors and discuss politics	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
23059	55		89		I have problems understanding this section and what it tries to do. It seems to be poorly organized. There are overlaps, e.g. it is not clear how 'organizations and rules' are different from 'institutions' in the lengthy section 5.4.2. But the main point problem is that the pieces of social science research just stand next to each other and I do not see where and how they are integrated. You will also need more guideposts as to why you present what you present and how it connects.	<i>Accepted - text revised.</i> We have moved the more conceptual background parts of Section 5.4 into a "Behavior" Primer that will form an Appendix to AR6 and integrated them better. The practical take away of classifying the different drivers of the transition have also been better integrated in section 5.4	Edgar Hertwich	Norwegian University of Science and Technology	Norway
35747	55	1	96	47	There is no discussion at all on how we could reduce dependence on growth, e.g. how we could address growing unemployment if the economy is not growing. Some of these strategies may be much more feasible than geoengineering or the reduction of energy needs through efficiency measures that risk high rebounds. <a href="https://journals.sagepub.com/doi/10.1177/2053019618794212">https://journals.sagepub.com/doi/10.1177/2053019618794212</a> A discussion of the various types of dependencies on growth and the strategies to reduce these dependencies should be covered in this chapter. (Currently I am working on a review on the relationship between working time and environmental indicators because one strategy to reduce the negative unemployment effects of low/negative growth is working time reduction.)	<i>Rejected - out of the scope of this chapter.</i> This is an interesting topic, but page constraints prevent us from going into it.	Miklós Antal	Eötvös Loránd University	Hungary
25663	55		96		I found this section (5.4) rather long and much more detailed than the preceding sections. I think it could be much shorter, many of the examples are well summarised in tables such as table 5.5 and so perhaps don't need to be repeated in such detail in the text itself. The detailed case studies also seem to me more numerous and more detailed, in comparison with the previous sections.	<i>Accepted - text revised.</i> We have moved the more conceptual background parts of Section 5.4 into a "Behavior" Primer that will form an Appendix to AR6 and integrated them better. The practical take away of classifying the different drivers of the transition have also been better integrated in section 5.4	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
48115	55	1	97	39	In general a very thorough review of the topic. But with poor linkage to actual GHG reductions likely to be achieved through demand-side measures. The theory is well stated, but with little comparison to transitional changes achieved so far in different sectors. And few relations to the material earlier in chapter 5 on what a low-carbon demand society might look like	<i>Accepted - text revised.</i> We have moved the more conceptual background parts of Section 5.4 into a "Behavior" Primer that will form an Appendix to AR6 and integrated them better. The practical take away of classifying the different drivers of the transition have also been better integrated in section 5.4	Rachel Freeman	University College London, Energy Institute	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
22767	55	1			Section 5.4. A transition towards "low carbon demand societies would also arguably require not just innovation but also "exnovation" (see e.g. Davidson 2019). The transitions literature is overwhelmingly focused on how to foster positive/sustainable developments, while unsustainable trends (such as e.g. the rise of SUVs, fast fashion, shale gas, and air travel) are overlooked (Antal et al., 2020). It would be good if this section could refer to these issues as areas where more research is needed - perhaps in Section 5.4.5.2, or in 5.4.5.4 (p.86, starting from line 26 where it refers to "contentious topics", or in Section 5.5 ("Knowledge gaps"). REFERENCES: Antal, M., Mattioli, G., & Rattle, I. (2020). Let's focus more on negative trends: A comment on the transitions research agenda. Environmental Innovation and Societal Transitions; Davidson, D. J. (2019). Exnovating for a renewable energy transition. Nature Energy, 4(4), 254-256.	Accepted - text revised. We now discuss not only the need to encourage new patterns of behavior or new positive trends for the transition, but also the need to extinguish dysfunctional behavior or trends.	Giulio Mattioli	TU Dortmund University	Germany
12611	55	7			the reference of social practice theory are fine, though none of those referenced would agree that practice theory is linking meanings, agency and structure.	Taken into account - Text revised. We have deleted reference to social practice theory here	Gram-Hanssen Kirsten	Aalborg University	Denmark
16249	55	23			In Section 5.4.1 Agency, consider adding a subsection related to global militaries and governmental agencies as actors with power to affect climate change by their internal practices that generate GHG emissions. This might logically come after Subsection 5.4.1.3 Business Organizations, Financial Sector, and Professional Organizations. The presence of this subsection will give a clearer picture of how organizational culture and agency can influence climate change.	Accepted - text revised. In our revision of SECTION 5.4, we now list government (at all levels, down to the municipal level) as one of the actors. The section has been reorganized, so order of topics is different now.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
12609	55				figure 5.12 represent social practices as composed of meanings, agency and structure. The authors refer to (Sovacool and Hess, 2017) for inspiration for this figure (line 5 page 55). However, Sovacool and Hess do not use this figure to explain how practice theory is understood as consisting of meanings, agency and structure. Rather they use the figure to locate several different theories in this triangulation. Where some theories are closer to one rather than another of these concepts, then practice theory are equally long away from each of them, as this theory works in another way. It seems thus as the authors of the chapter has misunderstood this.	Accepted - text revised. We no longer attribute the Agency, structure, meaning distinction to Sovacool and Hess, 2017, and changed the legend of the Figure, which now has been moved to a "behavior" primer in an appendix to AR6	Gram-Hanssen Kirsten	Aalborg University	Denmark
17407	55				It is suggested that the dynamic approach and interaction between parameters be included in the section 5.4 description.	Accepted - text revised. Section has been reorganized thoroughly, but this point is now made	Zeyayean Sadegh	Islamic Republic of Iran Meteorological Organization (IRIMO)	Iran
15787	56	4	56	4	There is a new tool for climate change awareness, the EN ROADS simulator by Climate Interactive which can help people visualize the energy transition from a high carbon to a low carbon economy. The online EN ROADS simulator is not as much sophisticated as a IAM, but it can help different "agents", that is a) individuals and households, b) NGOs, social movements and c) the private sector understand which mitigation strategies are available and get a feeling of their impact on climate mitigation. Focusing on the available mitigation strategies and their projected impact with purpose of generating more awareness on what is needed to fully address climate change. Climate Interactive has made available the simulator at <a href="https://www.climateinteractive.org/tools/en-roads/">https://www.climateinteractive.org/tools/en-roads/</a> , with a list of key possible available mitigation strategies and climate actions that show in real time the projected temperatures created by applying mitigation strategies the climate actions in a worldwide scale. Here is a link to their latest article, Rooney-Varga, J. N., Kapmeier, F., Sterman, J. D., Jones, A. P., Putko, M., Rath, K., The Climate Action Simulator, Simulation & Gaming, <a href="https://journals.sagepub.com/doi/full/10.1177/1046878119890643">https://journals.sagepub.com/doi/full/10.1177/1046878119890643</a> A word of caution: this EN ROADS simulator is not an IAM, it is just an easy to use simulator for general public use in order to foster and to create more awareness on possible mitigation strategies that could lead to a 1.5 scenario. For example, it has been used by politicians, media, students, and public in general, as stated in Climate Interactive's page "A wide range of people have used En-ROADS, including members of the U.S. Congress, HSBC bank, the Hewlett Foundation, local community groups, the UN Secretary-General's Office, university professors around the world, leading science educator Bill Nye, and many others." at: <a href="https://www.climateinteractive.org/tools/en-roads/">https://www.climateinteractive.org/tools/en-roads/</a>	Accepted - reference will be added and simulation and its uses described, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnológico de Buenos Aires	Argentina
14983	56	5	56	5	"action" should be "actions"	Accepted - text revised	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
14987	56	11	56	11	"a consumers" should be "consumers"	Accepted - text revised	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
14989	56	16	56	27	it would be useful to explain that such ideas - rationality, incentives and externalities are the basis for environmental economics	Accepted - text revised	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
22769	56	16	56	27	One of the 'biases' highlighted in the transport literature is the importance of habit in modal choice - see e.g. Muggenburh, H., Busch-Geertsema, A., & Lanzendorf, M. (2015). Mobility biographies: A review of achievements and challenges of the mobility biographies approach and a framework for further research. Journal of Transport Geography, 46, 151-163.	Accepted - text revised and reference added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Giulio Mattioli	TU Dortmund University	Germany
14991	56	22	56	23	This is discounting the future	Yes, correct, present bias is one parameter/aspect of discounting	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
44283	56	29	56	29	It is recommended to cite the following book chapter (peer reviewed) on effective policies to change end-user behaviour: Paolo Bertoldi, Chapter 4.3 - Overview of the European Union policies to promote more sustainable behaviours in energy end-users, Editor(s): Marta Lopes, Carlos Henggeler Antunes, Kathryn B. Janda, Energy and Behaviour, Academic Press, 2020, Pages 451-477, ISBN 9780128185674, <a href="https://doi.org/10.1016/B978-0-12-818567-4.00018-1">https://doi.org/10.1016/B978-0-12-818567-4.00018-1</a> . ( <a href="http://www.sciencedirect.com/science/article/pii/B9780128185674000181">http://www.sciencedirect.com/science/article/pii/B9780128185674000181</a> )	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	BERTOLDI PAOLO	European Commission	Italy
25017	56	31	56	36	Delete ", such as automatic enrolment ... if that tax is too low." as these arguments are not aligned with sustainable development issues and equity	Rejected - no scientific evidence/publication provided to support changes suggested by the reviewer.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
29431	56	37	56	38	the phrase "more linear integration in conventional (integrated assessment) models" is somewhat clear but not very descriptive. Please rephrase. Maybe 'incremental' is an option here, or mention that emerging properties and effects are not captured in incumbent assessments.	Accepted - text revised, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Stefan Pauliuk	University	Germany
45149	56	41	56	41	The statement "emergence of tipping points or other nonlinear change dynamics" may be further supported with the reference "Positive tipping points in a rapidly warming world" from 2018 in Current Opinion in Environmental Sustainability < <a href="https://doi.org/10.1016/j.cosust.2018.01.012">https://doi.org/10.1016/j.cosust.2018.01.012</a> > that focuses on related policy interventions and modelling.	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Siir Kilikis	The Scientific and Technological Research Council of Turkey	Turkey
31751	56	26	57	4	Shouldn't the set of actors also include policy makers and governments, who can set regulations, influence behaviour etc. to achieve these goals?	Accepted - text revised, we now include such actors in our extensive revision of this section, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Ashok Sreenivas	Prayas (Energy Group)	India
25665	56	48	57	8	Great. It is excellent to see the progress that has been made over successive ARs in moving away from narrowly rational choice models.	Thank you	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
12613	56	7			the understanding of agency which is written here is extremely economic, where most sociologists, psychologist and even economist working with sustainable consumption would agree that actors are not rational agents	Accepted - text revised, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Gram-Hanssen Kirsten	Aalborg University	Denmark
3795	56	18			decision making	Accepted - text revised	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
14993	57	2	57	3	why not use the term homo economicus as soon as rationality introduced on the previous page?	Accepted - text revised	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
14995	57	3	57	8	and the way all of these interact	Accepted - text revised	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
10857	57	8	57	8	Could add as an additional reference to support this statement Barr, S. (2014): 'Practicing the cultural green economy: where now for environmental social science?', <i>Geografiska Annaler:Series B, Human Geography</i> 96 (3): 231–243.	Accepted - reference has been replaced with new provided reference	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
24403	57	24	57	35	Notwithstanding my previous comment, this paragraph is a good one in making clear the importance of both agency and structure. The 30-40% claim needs substantiating and explaining.	Accepted - a reference has been added for that claim.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
11969	57	24	57	37	These are important points about behaviour change - please consider lifting to the sections on behaviour change in the exec.summary	Accepted - text has been revised	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
30871	57	30	57	35	As a comment and important addition to this list of decision factors influencing individual and collective agency, a crucial additional area for consideration are the demand creating activities of organisations. These can be best considered as the Marketing activities undertaken to create and maintain consumer demands. These activities represent a vast persuasion industry that, for example spends, over 2,016 Billion USD on media space/time in which they then promote their products and services (Wilkofsky Gruen Associates, 2019). Such messages include buy more clothes, have a new car, fly to more destinations, have the latest technology, eat a broader range of cuisines. Demarketing, or restricting marketing has long been recognised within social marketing as an effective tactic are reducing demand (Moodie et al, 2008). For example, restricting how and where cigarette manufactures can promote their brands has been a pillar of tobacco consumption control since the late 1990's (Borland, 2004, Jacobsen and Warner, 1999). The same logic has been extended to environmentally damaging consumer goods and services and I would recommend that the AR6 chapter 5 includes a discussion on impact and importance of controlling marketing communication as a complimentary prohibition policy open to governments. Not only does such action remove highly persuasive messages encouraging greater consumption, these messages directly contradict Avoid strategies. Restricting marketing in public domains (such as was done by Sao Paulo Brazil with its Clean City law) creates space where different forms of being and living can be explored than the narrow consumer lifestyles portrayed by global brands such as Apple, Nike, Coca Cola, as set out by Kate Soper in her vision of Alternative hedonism (Soper, 2014; Schneider and Miller, 2011). Borland, R., 2004. Taming the tigers: the case for controlling the tobacco market. Moodie, C., MacKintosh, A.M., Brown, A. and Hastings, G.B., 2008. Tobacco marketing awareness on youth smoking susceptibility and perceived prevalence before and after an advertising ban. <i>European journal of public health</i> , 18(5), pp.484-490. Jacobson, P.D. and Warner, K.E., 1999. Litigation and public health policy making: the case of tobacco control. <i>Journal of Health Politics, Policy and Law</i> , 24(4), pp.769-804. Schneider, J. and Miller, G., 2011. The impact of "No impact man": Alternative hedonism as environmental appeal. <i>Environmental Communication: A Journal of Nature and Culture</i> , 5(4), pp.467-484. Soper, K., 2014. Alternative hedonism, cultural theory and the role of aesthetic revisioning. In <i>Cultural Studies and Anti-Consumerism</i> (pp. 59-79). Routledge. Wilkofsky Gruen Associates, 2019, <a href="https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-state-of-global-media-spending">https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-state-of-global-media-spending</a>	Accepted - references have been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
6613	57	31	57	31	The term "hardware and software" is not clear and does not serve to clarify the previous sentence very well.	Accepted - phrase has been deleted	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
14997	57	38	57	38	suggest deleting "disproportionately" as redundant	Accepted - word deleted	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
24405	57	44	57	44	Avoid is not reduce energy use, but reduce energy service consumption. For this chapter in particular this is a critical difference!	Accepted - text revised	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
688	57	45	58	2	This is a nice summary of factors that can drive individual choices. There is also evidence from the psychological literatures that the extent to which individuals can make sustainable behaviors intrinsically interesting (e.g., interesting, productive, or fun) predict behaviors and choices, especially over time. So adding this kind of intrinsic utility or values-based perception of sustainable behaviors may be a key component of change. This is probably covered elsewhere, so apologies if so.	Thank you, and yes, this point is made more explicitly in our extensive revision of this section	Robert G. Kent de Grey	University of Utah	United States of America
22771	57	45	58	2	Whether environmental concern triggers action also depends on the specific kind of behaviour. For example it has been shown that the 'attitude-behaviour gap' is particularly large for long-distance, holiday and air travel REFERENCES: Hares, A., Dickinson, J., & Wilkes, K. (2010). Climate change and the air travel decisions of UK tourists. <i>Journal of Transport Geography</i> , 18(3), 466-473; Hibbert, J. F., Dickinson, J. E., Gössling, S., & Curtin, S. (2013). Identity and tourism mobility: an exploration of the attitude-behaviour gap. <i>Journal of Sustainable Tourism</i> , 21(7), 999-1016; Higham, J., Reis, A., & Cohen, S. (2015). Climate change, aviation and the attitude-behaviour chasm. In: Wilson, E., Witsel, M. (Eds.). <i>CAUTHE 2015: Rising Tides and Sea Changes: Adaptation and Innovation in Tourism and Hospitality</i> . Gold Coast, QLD: School of Business and Tourism, Southern Cross University; 510-513.Holden, E., & Linnerud, K. (2011). Troublesome leisure travel: The contradictions of three sustainable transport policies. <i>Urban Studies</i> , 48(14), 3087-3106; Kroesen, M. (2013). Exploring people's viewpoints on air travel and climate change: understanding inconsistencies. <i>Journal of Sustainable Tourism</i> , 21(2), 271-290; Barr, S., Shaw, G., Coles, T., & Prillwitz, J. (2010). 'A holiday is a holiday': practicing sustainability, home and away. <i>Journal of Transport Geography</i> , 18, 474-481; Becken, S. (2007). Tourists' perception of international air travel's impact on the global climate and potential climate change policies. <i>Journal of Sustainable Tourism</i> , 15(4), 351-368; Czepkiewicz, M., Árnadóttir, A., & Heinoonen, J. (2019). Flights Dominate Travel Emissions of Young Urbanites. <i>Sustainability</i> , 11(22), 6340; Alcock, I., White, M. P., Taylor, T., Coldwell, D. F., Gribble, M. O., Evans, K. L., ... & Fleming, L. E. (2017). 'Green' on the ground but not in the air: Pro-environmental attitudes are related to household behaviours but not discretionary air travel. <i>Global environmental change</i> , 42, 136-147.	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Giulio Mattioli	TU Dortmund University	Germany
12851	57	36	60	13	Consider including more discussion of consumption without choice - for example, people living in remote or rural areas with limited access to products. Changing conditions may compel consumers to keep consuming despite increases in price where a product is basic or essential. Also problem of consumers being locked into consumption contracts. These consumers might be unfairly penalised by taxes or other behaviour-changing incentives when they have no freedom to change behaviour.	Taken into account - text revised to extent that relevant literature was found	Dina Townsend	University of Witwatersrand	Austria
44041	57	36	60	13	The behavior change community (although not specific to climate change) has something to contribute to this section. It is critical to think about what motivates individuals/households towards different behaviors and/or choices, and their learnings should help expand/deepen the research already presented here.	Taken into account - Text revised. Section has been better integrated with other sections that made this point	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
34489	57		99		This section covers several of my research topics and were extremely interesting to read. I agree with the way of presenting these topics and have no additional comments to make.	Thank you	Kerstin Weimer	Mid Sweden University, Department of Psychology and Social Work	Sweden
46595	57	37			power system does not dominate in % share. Only by its centrality due to the merging of control-dedicated energy and energy flow!	Taken into account - some of this qualification has been added.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
6615	58	1	58	2	It would be nice to have a reference here	Rejected - this is a general observation not an empirical claim, which is now stated more clearly	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
14999	58	6	58	6	"and" should be "an"	Accepted - text revised	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
15001	58	8	58	11	It may also be that local cultures and belief in individual agency partly defines how people perceive the risk to their countries (Oakes, 2019). Oakes, R., 2019. Culture, climate change and mobility decisions in Pacific Small Island Developing States. <i>Population and Environment</i> , 40(4), pp.480-503.	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
10859	58	13	58	14	Did the authors find any literature that also attributed older people's motivations to concern for future generations in their family?	The study cited there did not state anything particular about older people.	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
5033	58	18	58	20	It may be worth citing some research that shows that people who are more focused on future outcomes ("future time perspective") are more likely to engage in environmental actions across a sample of countries. Milfont, Wilson, and Diniz (2012). Time perspective and environmental engagement: A meta-analysis. <i>International Journal of Psychology</i> , 47, 5, 325-334.	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Alexander Maki	AAAS Science Policy Fellow	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30861	58	28	58	28	Whilst vast amounts of research has used the TPB as a frame to examine intentions to act and overall finds that the model's dimensions predict intentions to act, the evidence that these intentions are enacted is much weaker (Bray et al, 2011; Young et al, 2010). There are a large number of reasons for this, see for examples Carrington et al., 2010, 2014. Therefore, I suggest adding something similar to the following at the end of line 28. 'However, evidence also highlight that willingness to change is often not enacted due to a broad range individual, institutional and market barriers (Carrington, 2014).' Carrington, M.J., Neville, B.A. and Whitwell, G.J., 2010. Why ethical consumers don't walk their talk: Towards a framework for understanding the gap between the ethical purchase intentions and actual buying behaviour of ethically minded consumers. Journal of business ethics, 97(1), pp.139-158. Carrington, M.J., Neville, B.A. and Whitwell, G.J., 2014. Lost in translation: Exploring the ethical consumer intention-behavior gap. Journal of Business Research, 67(1), pp.2759-2767. Bray, J., Johns, N. and Kilburn, D., 2011. An exploratory study into the factors impeding ethical consumption. Journal of business ethics, 98(4), pp.597-608. Young, W., Hwang, K., McDonald, S. and Oates, C.J., 2010. Sustainable consumption: green consumer behaviour when purchasing products. Sustainable development, 18(1), pp.20-31.	Accepted - references have been added and qualification added	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
6617	58	31	58	33	I was unaware that education and income affect shift and improve behavior, whereas personal norms help increase avoid behaviors. Please provide a citation for this statement	Accepted - text revised and the reference from which this observation comes has been added.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
3797	58	28			ASI	Accepted - text revised	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
24407	59	3	59	5	This is a really key point about the relative appeal, feasibility, and requirements for Avoid ... emphasising that it's challenging. This really needs tying back into the chapter framing around needs satisfaction and service provisioning. The first half of the chapter normatively asserts the need to Avoid ... and here it's (rightly) emphasised as being hard. This points to the need for Avoid strategies to be structural rather than relying on agency, no? And potentially vice versa for Improve. More generally this is a point about making the various strands of the chapter more seamlessly connected so a coherent narrative builds and builds.	Accepted - text revised; thoughtful comment that was integrated into our thorough revision of this and other sections	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
6619	59	16	59	19	The authors may wish to refer to a recent experiment on valuation of fuel economy showing that the full EPA fuel economy label was the best way to present fuel efficiency information for encouraging consumers to value fuel economy): <a href="https://advocacy.consumerreports.org/wp-content/uploads/2018/06/FINAL-Kormos-and-Sussman-2018-%E2%80%93-Auto-buyers-valuation-of-fuel-economy-1.pdf">https://advocacy.consumerreports.org/wp-content/uploads/2018/06/FINAL-Kormos-and-Sussman-2018-%E2%80%93-Auto-buyers-valuation-of-fuel-economy-1.pdf</a>	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
13675	59	23	59	34	I'm uncomfortable with the use of the term 'consumer' here and in other places where it refers to peoples' essential energy needs, particularly those of the energy poor and otherwise vulnerable. The use of the term frames all householders as informed and able to make rational decisions about their energy use that can be facilitated by an effective market (an example of verbal overshadowing). Far better to use the term 'client', which frames them as users (with individual needs) of an essential and imperfect service. See: Baker, K.J., Mould, R., Stewart, F., Restrick, S., Melone, H., & Atterson, B., 2019. Never try and face the journey alone: Exploring the face-to-face advocacy needs of fuel poor and vulnerable householders. Energy Research and Social Science, Vol. 59, (2019) pp. 210-219.	Taken into account - thank you for the reference that has been added; however, the sentence you flag actually points out that people are much more than "consumers" so makes precisely your point; the term "client" is also somewhat problematic, having different meanings in different communities, so I did not use it	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
22773	59	28	59	30	In transport studies this is referred to as 'policy packaging' - see e.g. Givoni, M. (2014). Addressing transport policy challenges through policy-packaging, Transportation Research Part A: Policy and Practice, 60, 1-8	Accepted - new term and reference have been added	Giulio Mattioli	TU Dortmund University	Germany
5035	59	35	59	38	The other paper that is almost always cited when talking about environmental behavior spillover is Truelove, Carrico, Weber, Raimi, and Vandenbergh (2014). Positive and negative spillover of pro-environmental behavior: An integrative review and theoretical framework. Global Environmental Change, 29, 127-138.	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Alexander Maki	AAAS Science Policy Fellow	United States of America
5037	59	35	59	38	To the best of my knowledge, the Whitmarsh and O'Neill (2010) paper does not consider spillover across setting at all, including environmental behavior spillover from work to home. Perhaps a more relevant paper to cite would be Maki and Rothman (2017) Understand proenvironmental intentions and behaviors: The importance of considering both the behavior setting and the type of behavior. The Journal of Social Psychology, 157, 5, 517-531.	Accepted - reference has been replaced with new provided reference	Alexander Maki	AAAS Science Policy Fellow	United States of America
30863	59	38	59	41	This is a very narrow reference and example to use. The current description misuses the word 'materialistic'. Materialism is a psychological trait associated with an overvaluing of material objects in ones self-identity. The Whitmarsh, Capstock and Nash, 2017 paper examines actions with lower material impact i.e. ones that take less 'material', broadly defined to satisfy. If the authors are looking for evidence to support consumption avoidance linked to self-identity then rather than focus on the comparison of two countries, may I suggest Iyer and Muncy (2009) which highlights 4 different distinct types of anti-consumer. These types of anti-consumers: Simplifiers, Global impact consumers, Market activists, and Anti-loyal consumers provide more insightful differences in why people avoid consumption than nationality. This is recognised by the highly active International Centre for Anti Consumption Research (ICAR) as a key contribution in this field. Iyer, R. and Muncy, J.A., 2009. Purpose and object of anti-consumption. Journal of Business Research, 62(2), pp.160-168.	Accepted - wording has been changed and reference has been added	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
3799	59	35			meaning of SUV	Accepted - abbreviation is now spelled out	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
44285	60	2	60	3	the impact of feedback system on energy consumption (electricity and gas) has been recently analysed by Zangheri et al.: Zangheri, P., Serrenho, T., Bertoldi, P. Energy Savings from Feedback Systems: A Meta-Studies' Review. Energies 2019, 12, 3788 (available at <a href="https://www.mdpi.com/1996-1073/12/19/3788/htm">https://www.mdpi.com/1996-1073/12/19/3788/htm</a> ). It is recommended to cite it.	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	BERTOLDI PAOLO	European Commission	Italy
39309	60	8	60	13	In general, I would like to see a more nuanced presentation of 'nudge' approaches - or at least some emphasis placed on why such an approach can be problematic. See for example: Gumbert, T. (2019). Anti-Democratic Tenets? Behavioural-Economic Imaginaries of a Future Food System. Politics and Governance, 7(4), 94-104.	Accepted - reference has been added, though some text in this section needs to be moved in large parts to a Social Science Primer for space reasons	Marilyne Sahakian	University of Geneva	Switzerland
6639	60	14	60	14	Please include a discussion of group dynamics and how groups change to become more pro-environmental. For example, social networks, opinion leaders, transformational leadership, and leading by example (or modelling pro-environmental behavior) could be helpful to examine. Rogers' diffusion of innovation theory could be helpful here as well.	Accept advice on leadership and group dynamics in relation to collective action and potential adoption of innovations.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
44801	60	24	60	25	Because it's very difficult and not necessarily realistic for everyone to switch to a vegan lifestyle, this would be a good place to talk about/present a case study on movements such as Meatless Monday or MeatFree Monday which have a very broad recognition and have possibly (along with other initiatives) contributed to "normalizing" meals without meat, while being less extreme than efforts to switch to 100% vegan immediately.	Reject since this issue is taken account of in Meat/Diet case study	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
6623	60	25	60	27	Please expand and clarify the last sentence in this paragraph. Why is it relevant to the concept of tipping points?	Accept - clarify point about the rate of change in social norms	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
13677	60	28	60	28	Should be FridaysForFuture (plural)	accepted, text has been revised	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
29081	60	28	60	31	Reference is 2013. Climate emergency came later. Please cite recent reference	accepted, the text has been revised to be more clear. The citation is relevant, in terms of social movements opening up possibilities for structural change, but will be used more clearly and accurately.	Priyadarshi Shukla	Ahmedabad University	India
15003	60	28	60	35	Perhaps could also include Extinction Rebellion here?	With a limited word count, we can only refer to a limited number of examples of relevant social movements.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
48119	60	36	60	40	Transition towns are provided as an example of grassroots action; is there any evidence of actual GHG reductions in transition towns? As far as I know they have the same growth, traffic, and other problems as other towns. Social movements need to be linked to real-world improvements in GHG emissions, and biodiversity.	Accept and we will make it more evidence based in the next version of the text.	Rachel Freeman	University College London, Energy Institute	United Kingdom (of Great Britain and Northern Ireland)
25019	60	38	60	40	Delete "Aspirations to increase local resilience ... (Grossmann and Creamer 2017)." as the sentence is out of context	Reject - quote is relevant for understanding collective action on energy transitions	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria



Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
11247	60	14	62	13	This section acknowledges collective action research, but is largely relying on older work; there have been some recent and important developments in the domain of "collective pro-environmental action" that is making clear that the social processes are strong drivers of - even private - pro-environmental action. A recent model addressing this is the SIMPEA by Fritzsche et al., 2018, Psychological Review. This work is also highly relevant in terms of "agency" - or, as it is often referred to - self-efficacy. It makes clear that collective efficacy - or collective agency - maybe an important aspect of bringing change from the citizens' side.	Reject - since collective efficacy is already mentioned in the text and a detailed discussion of the dynamics of agency is outside of scope	Reese Gerhard	University of Koblenz-Landau	Germany
29433	60	14	63	29	In some paragraphs in this passage, many strong claims are made without that references are being provided. Please add more references to substantiate your claims!	Accept	Stefan Pauliuk	University	Germany
12615	60	15			Starting a sentence to say that individuals make decisions based on values and social norms, as if this is the only way to conceive this is misleading, and neglecting all sociological research especially social practice theory	accepted	Gram-Hanssen Kirsten	Aalborg University	Denmark
41971	60	35			The paragraph should be complemented by a reference to the negative reactions that the "Friday-for-future" has generated among very conservative and negationist sectors.	Noted. Will consider published evidence on this in SOD.	Francisco Javier Hurtado Albir	European Patent Office	Germany
31753	61	11	61	13	While this is true, one should be a little wary of romanticising community initiatives too, as they have many built-in inequities and biases also.	accepted	Ashok Sreenivas	Prayas (Energy Group)	India
11971	61	14	61	17	The figure could benefit from restructuring, making it clearer that both feedback loops spring from the timing of implementation as a first step, rather than being in two separate dimensions/spaces.	Accept	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
24409	61	14	61	17	The negative feedback loop is rather one-sided and negatively framed (pardon the pun). Can't Avoid strategies just be deeply unappealing due to (perceived) loss of wellbeing from service consumption.	Accept	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
1327	61	18	61	28	This paragraph cites literature that supports the role of community based initiatives for emission savings, but "hard data" on this is rare, and where it exists provides little evidence that community initiatives have impacts on emissions savings, largely because many people have already made "easy" behaviour changes and because community initiatives often "water down" messages to the wider public, e.g. see Bardsley, N., Büchs, M., James, P., Papafragkou, A., Rushby, T., Saunders, C., . . . Woodman, N. (2019). Domestic thermal upgrades, community action and energy saving: a three-year experimental study of prosperous households. Energy Policy, 127, 475-485. doi:https://doi.org/10.1016/j.enpol.2018.11.036 Büchs, M., Saunders, C., Wallbridge, R., Smith, G., & Bardsley, N. (2015). Identifying and explaining framing strategies of low carbon lifestyle movement organisations. Global Environmental Change, 35, 307-315. doi:http://dx.doi.org/10.1016/j.gloenvcha.2015.09.009	accepted	Milena Buchs	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
3801	61	6			),( to be erased	Accept	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3803	61	13			put ( Figure 5.13)	Accept	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
6625	62	1	62	3	Perhaps the author could explain how coops enable access to clean energy?	Accept - revised text does not mention energy access.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
48121	62	4	62	13	An assumption seems to be made that in developed regions there is increasing awareness of global inequalities and so a desire to lessen this inequality by reducing consumption. However, there is likely to be an even stronger desire by those in developing regions to have the same lifestyle that most in the West enjoy. So the logic here is weak. Reducing inequality may not mean less environmental damage.	accepted	Rachel Freeman	University College London, Energy Institute	United Kingdom (of Great Britain and Northern Ireland)
31755	62	8	62	9	This can be a double-edged sword. Indeed, in today's world, for better or worse, "American levels of consumption are what are typically aspired to, which doesn't bode well!	noted	Ashok Sreenivas	Prayas (Energy Group)	India
26517	62	14	62	14	This section would be greatly strengthened by looking beyond the bounds of what we see as 'conventional' business organisations. In particular this section takes for granted the capitalist context, which is a huge point to gloss over (see Feola's 2019 paper Capitalism in sustainability transitions research: Time for a critical turn?). As a middle ground, I would suggest here, literature such as Johanisova and Wolf's 'Economic democracy: A path for the future?', Johanisova et al's 'Social enterprises and non-market capitals: a path to degrowth?' or 'Schmid, B & Smith TSJ (2020) Social transformation and postcapitalist possibility: Emerging dialogues between practice theory and diverse economies, Progress in Human Geography https://journals.sagepub.com/doi/full/10.1177/0309132520905642'	Accepted	Thomas Smith	Masaryk University	Czech Republic
35883	62	14	62	14	Most CSR today is not focused on climate change but development. Inclinement of CSR towards climate and related activities can help mitigation.	Not applicable. This part has been deleted because of space constraints.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
6627	62	14	62	25	please provide references for more of the statements in this paragraph	Noted	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
6637	62	17	62	17	Perhaps the author could discuss the motivation of industries to engage in corporate social responsibility, including climate action. Some research shows that corporate social responsibility may be in part driven by passionate individuals within the organizations (Hemingway, Maclagan 2004). Discussion of organizational behavior and organizational decision-making could be useful here.	Taken into account.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
44405	62	24	62	24	The term natural disaster does not have academic support, rather the term should be just disaster. If the triggering event needs to be identified then it is recommendable disaster triggered by a natural hazard. All disasters are social, as exposure and vulnerability are the ultimate causes of disaster.	Accepted	Urbano Fra Paleo	University of Extremadura	Spain
44407	62	24	62	24	The term natural disaster does not have academic support, rather the term should be just disaster. If the triggering event needs to be identified then it is recommendable disaster triggered by a natural hazard. All disasters are social, as exposure and vulnerability are the ultimate causes of disaster. Quarantelli, E. L. (1985). «What is Disaster? The Need for Clarification in Definition and Conceptualization in Research», en Disasters and Mental Health: Selected Contemporary Perspectives. U.S. Department of Health and Human Services, National Institute of Mental Health, pp. 41-73. Quarantelli, E. L. (1998). What is a Disaster? London, Routledge.	Accepted	Urbano Fra Paleo	University of Extremadura	Spain
6629	62	28	62	30	please clarify the terms "economic reasoning", "weak actor bonds" and "differing perceptions of the rules of the game" in the context of climate change and businesses.	Rejected. This section has been restructured and is to be made concise. There will be no room to start clarifying every terminology.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
5449	62	31	62	33	Following on from the comment above, it is stated that "a reduction in energy use saves billions of dollars for businesses". Again, we need therefore to ask, what do businesses do with the money saved? They may often invest it in more production facilities, in which case production will increase. Although this is alluded to, this it needs to be stated explicitly.	Taken into account.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
6631	62	31	62	35	Does improved efficiency and reduced energy costs lead to higher productivity for businesses, thereby creating a rebound effect and eliminating energy savings?	Partially accepted. By improving efficiency most businesses can reduce its costs and improve productivity.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
6633	62	40	62	40	My understanding is that Rogers (2003) does not refer to businesses as "influencers". Influencers are individual consumers.	Taken into account.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
5451	62	14	63	17	This section would benefit from the addition of a paragraph on the role of Professional Bodies. For example, in the UK, bodies such as the Institute for Civil Engineers set standards for practice and for education/skills required to become a professional member. The lack of sustainability in such standards requires review, and the opportunities for making positive steps should be discussed.	Taken into account. Will read more on the literature to see how best that this point can be taken into account. It would have been nice to receive some pointers and publications on this subject matter.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
39529	62	14	63	17	In Section 5.4.1.3 - Why are there no examples or references to the role businesses can play in shifting food consumption patterns? Many of the statements currently framed around energy consumption in this section could also be applied to food demand, and adding in more food examples would balance out this section. An example could be the role of the food retail environment (determined by retailers) in influencing consumer food purchasing decisions (See Castro IA, Majmundar A, Williams CB, Baquero B. Customer Purchase Intentions and Choice in Food Retail Environments: A Scoping Review. Int J Environ Res Public Health. 2018;15(11):2493. Published 2018 Nov 8. doi:10.3390/ijerph15112493)	Accepted	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
44043	62	14	63	17	I would suggest that this section misses two major points: 1) the focus on short-term profits for any company that is a publicly traded company, which devalues LT investment approaches that recognize social and environmental goods, and 2) the movement to require publicly-traded companies to report on climate risk to their business operations. Both of these issues are critical to thinking about how businesses choose to invest/not invest in improved technologies or in making choices about mitigating business risk.	Accepted	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
24411	62	15	63	17	It's not clear to me what this business organisation section is about - businesses as final consumers (of resources), businesses as intermediary providers of individual and household consumption, businesses as leverage points for systems change ... please clarify	Accepted	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
30567	62	36	63	7	Another example of how professional actors affect climate mitigation is procurement managers who decide which types of foods will be available on menus to consumers in cafeterias, restaurants, prisons, etc. Smith, J., Andersson, G., Gourlay, R., Karner, S., Mikkelsen, B. E., Sonnino, R., & Barling, D. (2016). Balancing competing policy demands: the case of sustainable public sector food procurement. Journal of Cleaner Production, 112, 249-256.	Accepted	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6635	62	49	63	7	Separate the positive effects of businesses from the negative potential effects (move this section and the last paragraph together to the end, before "5.4.2")	Editorial	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
36265	62	18			stranded assets issues are also and more importantly for countries also	Accepted	Youba Sokona	South Centre	Switzerland
12617	62	38			here is a reference to Shove 2003, which is a very relevant book for this chapter. However what is taken out of this book is so far from what the book is about that it makes no sense. This book argues that collective norms of comfort, cleanliness and convenience are driving consumption in still more consuming directions, and that we have to change this if we should make a greener world. A very relevant point which is not at all presented in this chapter	Taken into account.	Gram-Hanssen Kirsten	Aalborg University	Denmark
44803	63	7	63	7	Could add some food examples, such as the overemphasis of the nutritional value of meat by the industrial meat industry and downplaying climate impact of animal agriculture by emphasizing technological advances in food production (efficiency)	Accepted	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
11973	63	14	63	17	This is an important point - please consider expanding if there are sufficient literature available	Accepted	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
22775	63	14	63	17	Mattioli et al. (2020) review evidence of this kind of lobbying in the transport sector. REFERENCES: Mattioli, G., Roberts, C., Steinberger, J., & Brown, A. (2020). The political economy of car dependence: A systems of provision approach. Energy Research and Social Science.	Accepted	Giulio Mattioli	TU Dortmund University	Germany
25021	63	14	63	17	Delete "Some corporates also play ... (Oreskes and Conway 2010)." as recent actions contradict with a statement taken from a 2010 paper	Accepted	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
23053	63	26	63	29	How? What is the evidence?	Taken into account : Yes it is a true question : we have to bring more examples at the very beginning of the section to demonstrate that issue.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
31757	63	31	63	47	This paragraph is very difficult to understand	Taken into account :Section 5.4 will be completely re structured and this part shortened. The subsection will be shortened and at least typo will be corrected: For instance, a study by (Oldenziel et al. 2016) of the introduction of cycling lanes revealed the nature of multiple systems in flux, including the staged societal transformations with specific forms of governance and intervention associated with each phase of cycling lane history.	Ashok Sreenivas	Prayas (Energy Group)	India
46597	63	40	63	47	There is a confusion between the transition and its kinetics (pathways). However if an option leads to a lower reliability of the power system, the change will not be only on the lifestyles or outages, but on the whole organisation of the society (according to line 37). This is additionally the thorough signification of a transition!	Taken into account : The term "transition" which was not adequately used has been removed line 43.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
24413	63	19	65	14	This section on structure is particularly hard to follow, very jargon-intensive, flits between infrastructures and technologies (which are not clearly 'structural'), and is obliquely related to the chapter topic - services-based mitigation. The main message of the section seems to be "everything matters". I don't think this section is necessary and would suggest deleting it. If it's kept, it needs to speak much more tightly and directly to issues of service provisioning systems (adequacy and efficiency) and needs satisfaction.	Taken into account : Yes indeed, we want to insist on the fact that it is non relevant to only rely on the transformation of technologies : reaching low carbon target must include the (structure/meaning/agency) transformations mentioned here. Section 5.4 will be completely re structured and this part shortened.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
12861	63	30	65	14	Discussion of consumers and transport without mention of increased needs for transport for impoverished/rural consumers.	Rejected : the examples here are chosen because of their link with infrastructures	Dina Townsend	University of Witwatersrand	Austria
39531	63	18	67	14	Section 5.4.2 and its examples lack relevant discussion of institutional and business actions/policies that can also impact food demand. One example could be institutional food procurement that encourages more sustainable food consumption while also using a large institution's purchasing power to shift demand. (A real-life example is the Good Food Purchasing Program in the U.S., which is being adopted by schools, cities, other institutions across the country: <a href="https://goodfoodpurchasing.org/">https://goodfoodpurchasing.org/</a> ). Many examples exist on food procurement policy from health and local food perspectives, in particular. see Nieblyski, M.L.; Lu, T.; Campbell, N.R.C.; Arcand, J.; Schermel, A.; Hua, D.; Yeates, K.E.; Tobe, S.W.; Twohig, P.A.; L'Abbe, M.R.; Liu, P.P. Healthy Food Procurement Policies and Their Impact. Int. J. Environ. Res. Public Health 2014, 11, 2608-2627.	Rejected : food issues are linked to health in the mentioned paper; Food issues are not the center here, they are already treated in a special IPCC report and in chapter 12.	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
3805	63	27			what means "a study"?	Rejected : i don t see what the comment refers to	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
1445	64	1	64	15	I found here infrastructure mainly refers to traditional human-made infrastructure. This is called gray infrastructure. How about green infrastructure? Palmer et al. (2015) found that "green" infrastructure can be more flexible and cost effective for providing benefits for e.g. water provision. Hence, supplementing or integrating gray infrastructure with biophysical systems is critical to meeting current and future carbon emissions. Palmer M.A., Liu J., Matthews J.H., Mumba M., D'Odorico P., 2015. Manage water in a green way. Science 349 (6248): 584-585.	Rejected : This is out of scope of the section (and chapter). The question of sustainability of infrastructures themselves is addressed in Chapter 6	JUNGUO LIU	Southern University of Science and Technology	China
22777	64	3	64	4	On this see also: Klinger, T. (2017). Moving from monomodality to multimodality? Changes in mode choice of new residents. Transportation Research Part A: Policy and Practice, 104, 221-237; Scheiner, J., & Holz-Rau, C. (2013). Changes in travel mode use after residential relocation: a contribution to mobility biographies. Transportation, 40(2), 431-458; On the other hand, the vast literature on "residential selection" shows that people to some extent choose their residential location based on their travel preferences, meaning that they are less likely to change their travel behaviour when relocating	Rejected. The papers by Klinger and Scheiner & Holz-Rau, while important, are not a case of infrastructure influencing values, which is the rationale of this paragraph. We loyally agree on the importance of self-selection for understanding transport demand and would hope that the chapter of transportation has addressed this point. We do not see how this passage should address it.	Giulio Mattioli	TU Dortmund University	Germany
6641	64	16	64	22	Please explain how the Frank et al (2019) study demonstrates that change in infrastructure causes an increase in active transportation. Is this evidence that one causes the other, or is it possible that infrastructure changes are caused by an increase in active transportation (or is it merely a correlation)?	Rejected. The paper is indeed rare that it claims a causal relationship of a new urban greenway on local residents' physical activity. We agree that it is more generally possible that increased active travel demand leads to better active travel infrastructure, but that's not the direction to be highlighted here.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
45895	64	22	64	22	please consider inserting after "... Javaid et a.)" the sentence: "Based on the analysis of data on cycling mode shares for twenty-one countries and regions ,more than eight hundred cities, (Mason et al. 2015) evaluate that by 2050 in a High Shift Cycling scenario, cycling and e-bikes might account for 14 percent of urban kilometers of travel, ranging from about 25 percent in the Netherlands and China to about 11 percent in the United States and Canada.	Rejected. The paper by Mason and colleagues is indeed important. However, it is a general point about future urban transport demand, which we hope is covered by the chapter on transportation. This section is specifically about how infrastructure frames urban transport decisions, not about general urban transport trends.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
26265	64	25	64	25	"ing" is missing in "district heating"	Accepted : Text revised	Levlhn Fabian	KTH - Royal Institute of Technology	Sweden
6643	64	36	64	37	Psychologists such as Ajzen (1991) also argue that perceived behavioral control is important.	Accepted. The text on technology adoption has been combined with earlier text on agency (which already mentioned perceived behavioral control). This has led to a new section on (consumer and household) behaviour.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
39311	64	41	64	41	There are several references which could be added here, in relation to practice theoretical deliberations: Bartiaux, F. o., Gram-Hanssen, K., Fonseca, P., Ozolnā, L. g., & Christensen, T. H. (2014). A practice-theory approach to homeowners' energy retrofits in four European areas. <i>Building Research &amp; Information</i> , 42(4), 525-538. Sahakian, M. (2019). 'More, bigger, better' household appliances: Contesting normativity in practices through emotions. <i>Journal of Consumer Culture</i> , first online. doi:https://doi.org/10.1177/1469540519889983 Wilhite, H. (2016). The political economy of low carbon transformation: breaking the habits of capitalism: Routledge studies in low carbon development.	Noted. The sentence was already supported with four references to practice theory, so the added value of including more references is unclear. More importantly, we have decided to add a more prominent discussion of practice theory in a new section on (consumer and household) behaviour. We will consider using the suggested references there.	Marlyne Sahakian	University of Geneva	Switzerland
22779	64	44	64	46	This creates lock-in, as for example when the skills required to conduct low-carbon practices (e.g. commuting by modes alternative to the car) get lost - see e.g. Cass, N., & Faulconbridge, J. (2016). Commuting practices: New insights into modal shift from theories of social practice. <i>Transport Policy</i> , 45, 1-14.	Noted. But the point of this section was to discuss different (disciplinary) views on technology adoption, not to address lock-in (which is discussed elsewhere in the chapter)	Giulio Mattioli	TU Dortmund University	Germany
12619	64	41			This is the only place in this chapter giving words to theories of practice in a way, which is recognizable for someone like myself working within this field. However, it is very little to leave 7 lines to this approach in a document on 100 pages.	Accepted. We have decided to add a more prominent discussion of practice theory in a new section on (consumer and household) behaviour. This new section will discuss agentic approaches (e.g. economic, psychological) and more contextual approaches (like practice theory).	Gram-Hanssen Kirsten	Aalborg University	Denmark
9983	65	8	65	8	Also: - Song, L., Lieu, J., Nikas, A., Arsenopoulos, A., Vasileiou, G., & Doukas, H. (2020). Contested energy futures, conflicted rewards? Examining low-carbon transition risks and governance dynamics in China's built environment. <i>Energy Research &amp; Social Science</i> , 59, 101306.	Accepted. We included the suggested reference.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
22781	65	16	65	22	In the transport sector, it has been argued that a more sustainable business model would be for car companies to become 'mobility service providers', capturing downstream revenue rather than relying on overproduction (Ceschin & Vezzoli, 2010; Orsato & Wells, 2007; Williams, 2006). REFERENCES: Ceschin, F., & Vezzoli, C. (2010). The role of public policy in stimulating radical environmental impact reduction in the automotive sector: the need to focus on product-service system innovation. <i>International Journal of Automotive Technology and Management</i> , 10(2-3), 321-341; Orsato, R. J., & Wells, P. (2007). U-turn: the rise and demise of the automobile industry. <i>Journal of Cleaner Production</i> , 15(11), 994-1006; Williams, A. (2006). Product-service systems in the automotive industry: the case of micro-factory retailing. <i>Journal of Cleaner Production</i> , 14(2), 172-184.	Accepted : example and references added, text revised.	Giulio Mattioli	TU Dortmund University	Germany
18109	65	16	65	38	Is this the right place to discuss lessons from the large discussion on "demand-side management" or "integrated resource planning" in the electricity utility industry? This was a huge discourse in the 90s and early 2000s that by transforming the business models of electric service utilities towards selling services (energy services) instead of electricity, their interest in raising electricity demand would be reduced, and they would rather seek to optimize demand- and supply side options to deliver services on an equal footing, thereby reducing the energy required to deliver those services. Tons of papers have been written on these issues, and high hopes were placed in new concepts such as "Energy Service Companies" (ESCOs), but enthusiasm seems to have waned. Still, I think this literature needs to be assessed at least to a certain extent in a chapter like this, and perhaps here is the right place to do so?	Taken into account : these elements are worth to be included	Helmut Haberl	Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna	Austria
46599	65	16	65	47	See line 37 for the externally issue!	Taken into account : externality refer to digitalization (see comment 46583) and section 5.3 address this issue	Vincent MAZAUIC	Schneider Electric / International Chamber of Commerce (ICC)	France
23055	65	23	65	34	Too much pronouncement, too little reasoning.	Taken into account : will be completely re structured and this part integrated in BM subsection revised and shortened.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
44287	65	25	65	25	Rebound effect is extensively described in Ch.9, therefore it is suggested to insert a cross reference to Ch. 9	Accepted	BERTOLDI PAOLO	European Commission	Italy
6645	65	35	65	38	This paragraph uses a great deal of jargon and terms that should be explained. For example, what does it mean that demand-side strategies are dominated by supply-side approaches?	Taken into account : demand side strategies of mitigation	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
23057	65	35	65	38	What des this mean? I am not sure how to read the first sentence. Also, the second sentence does not make much sense, but maybe I do not know what you mean by supply-side approaches.	Taken into account : see comment 969. Supply-side approaches are developed to supply the demand with low-carbon technology options.	Edgar Hertwich	Norwegian University of Science and Technology	Norway
42129	65	39	65	47	I thought this a great paragraph	Accepted !	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
24415	65	16	66	29	This section is also all over the place - business models, rules, social construction of energy needs, then two lengthy paragraphs on education. See previous comment - this should be linked tightly and directly to service provisioning and needs satisfaction, or deleted.	Taken into account: Section 5.4 re structured and this part reorganized.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
42127	65	15			section 5.4.2.2 - business models can also only shift if they can make money somehow and even a sentence acknowledging this is absent	Accepted and included .	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
46601	65	40			see line 20 for Swiss!	Rejected : I don t see what the comment refers to	Vincent MAZAUIC	Schneider Electric / International Chamber of Commerce (ICC)	France
6647	66	1	66	29	It's not clear to me how these paragraphs about education are related to "organizations and rules." Generally speaking, these paragraphs are also somewhat disjointed and hard to understand because the sentences do not flow well from one to the next.	Taken into account: Section 5.4 re structured and paragraph reorganized in different subsections.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
48123	66	14	66	29	the school strikes have brought environmental concerns more into the mainstream. What is missing is a clear indication that the striking schoolchildren are themselves willing to voluntarily reduce their consumption. Many are driven to school in private vehicles, fly on holidays, have the latest gadgets, There seems to be little connection between the rhetoric and actions of individuals. For this reason the strikes have created more polarisation on climate than before, in some countries due to accusations of hypocrisy.	Taken into account. Mentioned in various subsections. Unfortunately no reference suggested.	Rachel Freeman	University College London, Energy Institute	United Kingdom (of Great Britain and Northern Ireland)
31759	66	26	66	29	The Thunberg school strike fits under civil society rather than under organizations and rules.	Noted. About social movement text included	Ashok Sreenivas	Prayas (Energy Group)	India
31761	66	34	66	36	Governments also plan and build infrastructure, which also contributes to energy usage and emissions.	Accepted. Text revised	Ashok Sreenivas	Prayas (Energy Group)	India
26519	66	31	67	14	There is a bit of an implication in this short section that policy is overall benign, but just moves slowly. I have looked at how this conception contradicts the complexity of social change, as portrayed by theories of social practice for instance, as well as not being empirically well-founded (there are few policy priorities shared 'across the political spectrum' as stated, and more attention could be given here to the role of lobbyists and money in the politics of the states mentioned). In particularly corrupt contexts, this conception of policy makers simply doesn't stand up to scrutiny. It is for this reason that Ostrom and others call for coupling government policy with forms of 'polycentric governance'. E.g. see the 2019 paper Policy, polycentrism, and practice: Governance imaginaries in sustainability transitions, and Ostrom's 'beyond markets and states: polycentric governance of complex economic systems'.	Accepted: text re-written to bring in the role of institutions and actors in shaping policy landscapes	Thomas Smith	Masaryk University	Czech Republic
24417	66	32	67	14	I would argue that rules are clearly part of institutions - as per North's canonical definition of institutions. Otherwise, the current section on institutions is just about policies.	Accepted: text is re-written to focus on institutions; and how the 'rules' affect policy outcomes.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
3807	66	2		3	twin citation	Accepted	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3809	66	5		6	; instead of (between the references	Accepted	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
25023	67	4	67	7	Delete "An example of this is ... Rentschler and Bazilian 2017)." as this is not consistent with sustainable development issues, and does not refer to inefficient subsidies	Noted. Text has been fully revised, and the reference has been deleted.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
22783	67	8	67	14	There are also differences between sectors here, with e.g. transport typically considered as harder to decarbonise and more politically contentious - see e.g. the frequent protests against motor fuel price rises, and the relative absence of protests when domestic energy prices increase	Rejected. This section has been revised to focus on institutions and has been made concise. There will be no room to go into specifics related to political economy. This will be picked up in the new section 5.6.	Giulio Mattioli	TU Dortmund University	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
44289	67	12	67	12	Sufficiency policies are discussed in details in: Paolo Bertoldi, Are current energy efficiency policies promoting a change in behaviour, conservation and sufficiency in line with the Paris Agreement? Review of existing policies and recommendations for new and effective policies, 2020 (forthcoming in Energy Policy).	Noted. The text has been fully revised to focus on institutions. We have included this discussion in section 5.6 focusing on policy and governance.	BERTOLDI PAOLO	European Commission	Italy
6649	67	26	67	33	The author may wish to refer to Gifford (2011) - Dragons of Inaction, when discussing worldviews (such as religious worldviews) that prevent action on climate change	Noted but we already cite literature directly relevant to religious beliefs and institutions in the text so it is not clear why this citation will add to these.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
6651	67	37	67	37	Could the definition of Anthropocene be explained in a simpler and clearer way?	This concept has been removed from the text.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
11253	67	16	68	24	This is an important section, and I believe it deserves a lot of attention. In addition to the narratives and the way we talk about (frae) climate crises is also evident in the use of labels and labeling. There is some seminal work by Whitmarsh (2008, Pub Understanding of Science) suggesting that merely changing the wording from climate change to global warming alters perceptions of, for example, causes of climate change. Similarly, resonating with the work by Morris et al (cited in line 24 on page 68), Drews & Reese 2018, Environmental Communication, found that the way we speak about economic alternatives - in terms of degrowth vs. post-growth vs. prosperity without growth etc. pp - results in different emotional reactions.	Accepted - we include labelling in discussions of narratives and discourse.	Reese Gerhard	University of Koblenz-Landau	Germany
24419	67	17	68	3	This first section on meaning is all about narrative, which, while interesting, is not synonymous with meaning. And again, it's also not linked directly and tightly to the topic of the chapter.	Accept	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
4991	67	15	75	25	Agent-based models (ABM) allow to study the behavior and interactions between agents of societies, categorize them into active, passive, adaptive communities, etc.	Noted. But unclear relation to scope of chapter.	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
5013	67	15	75	25	This strategy will facilitate the decision makers the structural and non-structural measures to be implemented.	Noted.	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
16251	67	15			In Section 5.4.3 Meaning, norms, values, lifestyles, consider adding a subsection dealing with schools and education. Schooling can have an immense impact on shaping meaning, and including a subsection on schooling, including sustainability education, which is a nascent field, will add to the comprehensiveness of the section. For organization, this new subsection on schools might logically be placed either before or after the subsection on religion.	Reject - outside of scope	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
22785	67	15			I thought section 5.4.3. could do with more discussion to how meaning, norms, values and lifestyles can contribute to lock-in current patterns of high-carbon consumption	Accept	Giulio Mattioli	TU Dortmund University	Germany
22787	68	3	68	24	An helpful reference for this section is: Roberts, C., & Geels, F. W. (2018). Public Storylines in the British Transition from Rail to Road Transport (1896–2000): Discursive Struggles in the Multi-Level Perspective. <i>Science as Culture</i> , 27(4), 513–542.	Noted.	Giulio Mattioli	TU Dortmund University	Germany
37329	68	12	68	12	"common sense" should be in quotes for this to really make sense	Accept	Michiel Schaeffer	Climate Analytics	Netherlands
30865	68	15	68	16	The narrative of GDP growth equating to societal and economic progress is a particular pervasive narrative restraining the movement to a wellbeing economy and institutionally restrains 'Avoid' strategies. It does the later by placing rejection and reduction of consumption, the most powerful energy reducing strategies, in direct conflict with position of growth and greater consumption as the key measure of economic and societal progress. Replacing the GDP growth narrative with one based on wellbeing and collective action therefore becomes a critical target for mitigation strategies. Actions to change this narrative include deliberately changing the language used by governments in their legislation and communications and creating spaces where the role of the market is drastically reduced such as prohibiting marketing communications, brand signage and product availability (Black et al, 2017). Trebeck, K. and Williams, J., 2019. The economics of arrival: Ideas for a grown-up economy. Policy Press. Black, I.R., Shaw, D. and Trebeck, K., 2017. A policy agenda for changing our relationship with consumption. <i>Journal of cleaner production</i> , 154, pp.12-15.	Accept	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
24421	68	16	68	19	This is an interesting sentence - that climate justice narratives are polarising. This is absolutely the opposite of the meaning conveyed earlier in the chapter: that equity and justice are a sine qua non of services-based mitigation.	Accept in the sense of making more clear the tensions between different parts of the chapter text	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
12853	68	18	68	18	Patriotic values' - consider defining or contextualising	Accept	Dina Townsend	University of Wiltwatersrand	Austria
6653	68	34	68	39	The author should explain why technologies that take power away from individuals may not always be more effective than asking individuals to change behavior. In some cases, technologies that automate behavior may save more energy (perhaps installing a sensor light switch is more effective than a sign asking people to turn off lights, for example), but in other cases taking power away from consumers may be harmful for environmental efforts. Heather Truelove wrote a meta-analysis of behavior spillover and found that when people engage in one pro-environmental behavior they are subsequently more likely to engage in others. This may be a good argument for keeping behavior in the hands of individuals, rather than always trying to automate it away.	Accept, although would note that a) 'effective' outcomes must consider SDGs not just emissions; b) evidence for spill-over is mixed	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
24423	69	1	69	33	Same comment as for this whole section on agency, structure and meaning. It's not clearly linked to the topic of the chapter (services-based mitigation) so reads more like a generic social science primer. Not needed.	Accept	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
4131	69	3	69	14	This paragraph is good, but should more explicitly state that the NIMBY characterization has been inaccurate, or at the very least inadequate. It would also be helpful to cite some literature here on more powerful alternative explanations to NIMBY. For example, in the renewable/wind energy sphere, issues of procedural justice and distributive justice and quickly being recognized as much more powerful forces in shaping local responses/resistance. Could cite: Walker, C., & Baxter, J. (2017). "It's easy to throw rocks at a corporation": wind energy development and distributive justice in Canada. <i>Journal of Environmental Policy &amp; Planning</i> , 19(6), 754-768. and Ottinger, G., Hargrave, T. J., & Hopson, E. (2014). Procedural justice in wind facility siting: Recommendations for state-led siting processes. <i>Energy Policy</i> , 65, 662-669. At the end of the same paragraph, when talking about expertise and local knowledge, it would also be important to cite work in Indigenous contexts (and maybe even speak to this in the text). A good citation would be: Stefaneli, R. D., Walker, C., Kornelsen, D., Lewis, D., Martin, D. H., Masuda, J., ... & Castleden, H. (2019). Renewable energy and energy autonomy: how Indigenous peoples in Canada are shaping an energy future. <i>Environmental Reviews</i> , 27(1), 95-105. and/or Lam, D. P., Hinz, E., Lang, D., Tengö, M., Wehrden, H., & Martín-López, B. (2020). Indigenous and local knowledge in sustainability transformations research: a literature review. <i>Ecology and Society</i> , 25(1).	Accept	Chad Walker	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
12855	69	15	69	27	Seems to be focused on only a segment of the global population. Consider including meaning of place and landscape for indigenous peoples and for rural peoples.	Accept	Dina Townsend	University of Wiltwatersrand	Austria
10861	69	27	69	27	Another important set of meanings not discussed but warranting its own sub-section is that of meanings of process and fairness related to the acceptance or rejection of demand- or service-based interventions based on perceptions of whether decision-making related to the intervention have come about as a result of rigorous, consultative and open-minded processes. Multiple studies of this issue exist in the literature on conflict over renewable energy technology siting (services) or the introduction of carbon pricing to influence demand (directly or indirectly) for energy. I will just give examples of two of my own works in this area but there are lots of others, including those cited in the bibliographies: (renewable energy) Bailey, I. and Darkal, H. (2018) (Not) talking about justice: justice self-recognition and the integration of energy and environmental-social justice into renewable energy siting. <i>Local Environment</i> , 23 (3): 335-351. (carbon pricing) Bailey, I. (2017) Spatializing climate justice: Justice claim-making and carbon-pricing controversies in Australia, <i>Annals of the American Association of Geographers</i> , 107 (5): 1128-1143.	Accept - could be integrated into point about Participation and acceptance (see Figure 5.1.3)	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
39313	69	28	69	28	This is a rather limited understanding of social norms, which disregards the literature in sociology. Could a first line be added, "The notion of social norms has different meanings in relation to varying disciplinary approaches. In a Durkheimian tradition, social norms bring attention to the explicit or implicit rules of conduct that form an integral part of practices. Transgressions of social norms incur some form of social disapproval or sanction. In social psychology, human behaviour is affected by ..."	Noted but outside scope of chapter text. Instead we will address this issue in the Social Science Primer.	Marilyne Sahakian	University of Geneva	Switzerland
26965	69	31	69	32	"social influence seems more influential in some countries than others(Pettifor et al. 2017)." This short sentence can be extended as this fact has implication for the kind of intervention that is suitable to employ in different countries and cultures. One of the cultural dimensions that may moderate the relation between social norms and pro-environmental behavior is individualism-collectivism (Eom et al., 2016; Tam and Chan, 2017). Individualism refers to the degree to which a culture places priority on personal goals over the goals of the collective. The established link between social norms and pro-environmental behavior is assumed to be moderated by the cultural context, so that social norms may be more influential in collectivistic than in individualistic cultures (Eom et al., 2016). The few studies that investigated this assumption indeed confirmed it(Chan and Lau, 2002; Eom et al., 2016, Kaplan Mintz & Kurman, 2019). Chan, R., Lau, L., 2002. Explaining green purchasing behavior: a cross-cultural study on American and Chinese consumers. <i>J. Int. Consum. Mark.</i> 14, 9–40. Eom, K., Kim, H.S., Sherman, D.K., Ishii, K., 2016. Cultural variability in the link between environmental concern and support for environmental action. <i>Psychol. Sci.</i> 27, 1331–1339. Kaplan Mintz, K., Henn, L., Park, J., & Kurman, J. (2019). What predicts household waste management behaviors? Culture and type of behavior as moderators. <i>Resources, Conservation and Recycling</i> , 145, 11-18. Kim, H.S., Markus, H.R., 1999. Deviance or uniqueness, harmony or conformity: a cultural analysis. <i>J. Pers. Soc. Psychol.</i> 77, 785–800. Tam, K.P., Chan, H.W., 2017. Environmental concern has a weaker association with proenvironmental behavior in some societies than others: a cross-cultural psychology perspective. <i>J. Environ. Psychol.</i> 53, 213–223.	Accept	Keren Kaplan Mintz	Shamir Research Institute, University of Haifa	Israel

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
5029	69	36	69	37	It may be worthwhile to tweak the end of the last sentence ending on line 37 from "although the effects are not always strong (Gardner and Abraham 2008; Farrow et al. 2017)." to remove the period and add "strong (Gardner and Abraham 2008; Farrow et al. 2017) or direct (Bamberg & Moser, 2007)." This will demonstrate that sometimes injunctive norms influence other cognitions, not necessarily behavior directly, and it adds an important meta-analysis to the references that readers can seek out themselves. (Bamberg & Moser, 2007; Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psych-social determinants of pro-environmental behaviour; Journal of Environmental Psychology, 27, 14-25.	Accept	Alexander Maki	AAAS Science Policy Fellow	United States of America
5031	69	43	69	45	There is a lot of relevant research on feedback and social/descriptive norms, and a few other papers may deserve to be cited, as I think the meta-analytic evidence is mixed as to how effective feedback/norm intervention approaches are. Karlin, Zinger, and Ford (2015) The effects of feedback on energy conservation: A meta-analysis, Psychological Bulletin, 141, 6, 1205-1227, has perhaps the largest number of studies included, and estimates overall energy savings. Delmas, Fischlein, and Asensio (2013) Information strategies and energy conservation behavior: A meta-analysis of experimental studies from 1975 to 2012 in Energy Policy, 61, 729-739, also explores feedback messages. Those meta-analyses suggest stronger effects than Abrahamse and Steg (2013). The Delmas meta-analysis is mentioned in Chapter 9, pg. 90, lines 9-12, which states norms are one of the most effective approaches to reducing home energy use, which seems inconsistent with what is said here in Chapter 5.	Noted. Additional citation will ultimately depend on added value weighted against space limitations.	Alexander Maki	AAAS Science Policy Fellow	United States of America
26963	69	28	70	24	It should be noted that social norms can be internalized and lead to a development of internal sources of behavior as well (Bertoldo and Castro, 2016; 2018; Thøgersen, 2006). Bertoldo, R., Castro, P., 2016. The outer influence inside us exploring the relation between social and personal norms. Resour. Conserv. Recycl. 112, 45-53. Bertoldo, R., Castro, P., 2018. Online) from legal to normative: a combined social representations and sociocognitive approach to diagnosing cultural change triggered by new environmental laws Cult. Psychol. Thøgersen, J. (2006). Norms for environmentally responsible behaviour: An extended taxonomy. Journal of Environmental Psychology, 26(4), 247-261.	Noted - this point will be emphasized in the Social Science Primer.	Keren Kaplan Mintz	Shamir Research Institute, University of Haifa	Israel
22789	69	28	70	33	There are also positive norms sustaining current high-carbon lifestyles, for example with regard to air travel - see e.g.: Gössling, S., & Stavrinidi, I. (2016). Social networking, mobilities, and the rise of liquid identities. Mobilities, 11(5), 723-743; Hibbert, J. F., Dickinson, J. E., Gössling, S., & Curtin, S. (2013). Identity and tourism mobility: an exploration of the attitude-behaviour gap. Journal of Sustainable Tourism, 21(7), 999-1016; Cohen, S.A., & Gössling, S. (2015). A darker side of hypermobility. Environment and Planning A, 47(8), 166-179; Gössling, S., & Stavrinidi, I. (2015). Social Networking, Mobilities, and the Rise of Liquid Identities. Mobilities; Randles, S. and Mander, S. 2009. Aviation, consumption and the climate change debate: 'Are you going to tell me off for flying?' Technology analysis & strategic management, 21(1), pp.93-113.	Accept	Giulio Mattioli	TU Dortmund University	Germany
11249	69	28	70	34	This is a well balanced section with regard to the large field of norms; however, one particularly aspect is missing, namely that the effects of norms are most prominent when injunctive and descriptive norms are aligned (Hamann, Reese, Löscher, & Seewald, 2015, Journal of Environmental Psychology). In other words, when it comes to using social normative information, it is vital that both descriptive and injunctive norms work in the same direction. For example, when it comes to electric mobility, it would not help to communicate an injunctive norm (we should do it) while there is no descriptive norm activated (no one is using it)	Noted but this point is already made in the text.	Reese Gerhard	University of Koblenz-Landau	Germany
24425	69	29	70	33	Surely norms should be included under rules? And again, this section is not linked specifically to the chapter topic.	Restructure of chapter has addressed this point	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
26521	70	14	70	15	See previous comment.	See above	Thomas Smith	Masaryk University	Czech Republic
26967	70	37	70	43	It is also important to note that when asked for the most effective strategy they could implement to conserve energy, most participants in a national survey mentioned curtailment (e.g., turning off lights, driving less) rather than efficiency improvements (e.g., installing more efficient light bulbs and appliances), in contrast to experts' recommendations (Attari et al., 2010). Attari, S. Z., DeKay, M. L., Davidson, C. I., & De Bruin, W. B. (2010). Public perceptions of energy consumption and savings Proceedings of the National Academy of sciences, 107(37), 16054-16059.	Accept	Keren Kaplan Mintz	Shamir Research Institute, University of Haifa	Israel
3811	70	8			a dot to erase	Accept	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3813	70	16			appraise5	Accept	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3815	70	18			is instead of in?	Reject	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
26969	71	7	71	11	Biospheric values are also important in predicting energy consumption and willingness to reduce consumption (Steg & de Groot, 2012). For example, in a study that examined factors influencing the acceptability of energy policies aimed to reduce the emission of CO <sub>2</sub> by households, biospheric values were significantly related to feelings of moral obligation to reduce household energy consumption when intermediate variables were controlled for (Steg et al., 2005). Steg, L., Dreijerink, L., & Abrahamse, W. (2005). Factors influencing the acceptability of energy policies: A test of VBN theory. Journal of environmental psychology, 25(4), 415-425. Steg L, and de Groot JI. 2012. Environmental values. In S. Clayton, (ed.) Handbook of environmental and conservation psychology. Oxford University Press, Oxford, United Kingdom.	Accept	Keren Kaplan Mintz	Shamir Research Institute, University of Haifa	Israel
26971	71	7	71	11	Prof. Linda Steg has published several other papers on this subject	Accept	Keren Kaplan Mintz	Shamir Research Institute, University of Haifa	Israel
24427	71	18	71	19	Surely 'reduce' = improve. These strategies can be more clearly linked to the ASI framework.	Accept	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
26145	71	23	71	33	The discussion about lifestyle in this section seems a little bit ambiguous. As it is positioned in the category of MEANING, lifestyle should not be explained as a style or pattern of living, which would be a broader concept referring to structure, social practice and role of actors. Besides, the 'lifestyle' discussed in the social practice theory by Gert Spargaren should be an important component of this discussion.	Accept - point addressed by restructure of chapter text in 5.4 and addition of new text about Social Practices	Wenling Liu	Beijing Institute of Technology	China
12857	71	27	71	27	Consider also including reference to people living in communities for whom community is a determinative aspect of lifestyle (tribal and indigenous communities, for example).	Accept	Dina Townsend	University of Witwatersrand	Austria
5453	71	38	71	39	Lifestyles are described in the text as "how people spend their money and their time". However, this chapter does not take into account the time use perspective. Viewing lifestyle changes through the lens of how people use their time can be a promising way forward. See for example: Druckman, A., I. Buck, B. Hayward and T. Jackson (2012). "Time, gender and carbon: A study of the carbon implications of British adults' use of time." Ecological Economics 84: 153-163. Druckman, A. and B. Gatersleben (2019). "A time-use approach: high subjective wellbeing, low carbon leisure." Journal of Public Mental Health 18(2): 85-93. Jalas, M. and J. K. Juntunen (2015). "Energy intensive lifestyles: Time use, the activity patterns of consumers, and related energy demands in Finland." Ecological Economics 113(0): 51-59. Wiedenhofer, D., B. Smetschka, L. Akenji, M. Jalas and H. Haberl (2018). "Household time use, carbon footprints, and urban form: a review of the potential contributions of everyday living to the 1.5° C climate target." Current Opinion in Environmental Sustainability 30: 7-17.	Accept	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
6655	71	23	73	12	This section on lifestyles is unnecessarily long and does barely touches on climate change. It could be cut or reduced to one paragraph (keeping only climate-relevant pieces)	Accept	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
12621	71	1			This is true only to some people working from a psychological perspective, whereas many other would argue against it from both a psychological and a sociological perspective	Accept	Gram-Hanssen Kirsten	Aalborg University	Denmark
3817	71	10			One instead of On	Accept	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
30869	72	4	72	6	The two examples given here both reflect an external context oriented view. Considering the importance of the reflexive identity based view of lifestyles (Ch5 p71, line 46-47, it would be important to highlight lifestyle changes brought internal factors including multifaceted and deep-seated changes see after life transitions. These transitions, for example to motherhood, are recognised as important junctures at which greater commitment to Rejection (Avoidance) Reduction (Avoid), and reuse (Shift) based lifestyles become possible (Black and Cherrier, 2010) due to changes in identity and role expectations. Black, I.R. and Cherrier, H., 2010. Anti-consumption as part of living a sustainable lifestyle: daily practices, contextual motivations and subjective values. Journal of Consumer Behaviour, 9(6), pp.437-453.	Accept point that certain life-stage transitions may open windows of opportunity for significant changes in lifestyles (e.g. work by Verplanken)	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
45897	72	6	72	6	please consider inserting after "Ghasrodashti et al. 2018)", the sentence: "or well structured combinations of bicycle parking and both ends of train journeys (Jonkeren et al. 2019)." Jonkeren, Olaf, Roland Kager, Lucas Harms, and Marco te Brömmelstroet. 2019. "The Bicycle-Train Travellers in the Netherlands: Personal Profiles and Travel Choices." Transportation, October. <a href="https://doi.org/10.1007/s11116-019-10061-3">https://doi.org/10.1007/s11116-019-10061-3</a> .	Reject change to text here since just an example but can be addressed in the Case Study text	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
15005	72	21	72	23	and so behaviour can sometimes be part of a lifestyle	Accept	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
15007	72	28	72	28	and find the causes of lifestyles (as discussed above)	Accept	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
46603	72	33	72	40	One step beyond, this kind of analyses allows to understand/point the correlations between the dimensions at an intermediate level to define a larger cluster acting as a new agent able to undergo as a whole the transition. This is related to the concept of scaling for critical transition (Widom 1979) and renormalization (Wilson 1984) if the cluster behaves like the individual/initial agent.	Reject - outside of scope	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
22791	73	21	73	27	On the 'attitude-behaviour gap' in air travel see: Hares, A., Dickinson, J., & Wilkes, K. (2010). Climate change and the air travel decisions of UK tourists. <i>Journal of Transport Geography</i> , 18(3), 466-473; Hibbert, J. F., Dickinson, J. E., Gössling, S., & Curtin, S. (2013). Identity and tourism mobility: an exploration of the attitude-behaviour gap. <i>Journal of Sustainable Tourism</i> , 21(7), 999-1016; Higham, J., Reis, A., & Cohen, S. (2015). Climate change, aviation and the attitude-behaviour chasm. In: Wilson, E., Witse, M. (Eds.). <i>CAUTHE 2015: Rising Tides and Sea Changes: Adaptation and Innovation in Tourism and Hospitality</i> . Gold Coast, QLD: School of Business and Tourism, Southern Cross University; 510-513. Holden, E., & Linnerud, K. (2011). Troublesome leisure travel: The contradictions of three sustainable transport policies. <i>Urban Studies</i> , 48(14), 3087-3106; Kroesen, M. (2013). Exploring people's viewpoints on air travel and climate change: understanding inconsistencies. <i>Journal of Sustainable Tourism</i> , 21(2), 271-290; Barr, S., Shaw, G., Coles, T., & Prillwitz, J. (2010). 'A holiday is a holiday': practicing sustainability, home and away. <i>Journal of Transport Geography</i> , 18, 474-481; Becken, S. (2007). Tourists' perception of international air travel's impact on the global climate and potential climate change policies. <i>Journal of Sustainable Tourism</i> , 15(4), 351-368; Czepkiewicz, M., Árnadóttir, A., & Heinenon, J. (2019). Flights Dominate Travel Emissions of Young Urbanites. <i>Sustainability</i> , 11(22), 6340; Alcock, J., White, M. P., Taylor, T., Coldwell, D. F., Gribble, M. O., Evans, K. L., ... & Fleming, L. E. (2017). 'Green' on the ground but not in the air: Pro-environmental attitudes are related to household behaviours but not discretionary air travel. <i>Global environmental change</i> , 42, 136-147.	Noted, but space limitations will restrict scope to cite much of these examples.	Giulio Mattioli	TU Dortmund University	Germany
23111	73	28	73	30	Please insert the following lines to provide evidence of double dividend, while emphasizing on the higher lock-in domains and discussing consumer scapegoatism.  Vita et al show that members of European grassroots initiative have 16% lower total carbon footprint, and 43% and 86% lower carbon footprints for food and clothing respectively, compared to their "non-member" regional socio-demographic counterparts. Grassroots members also show 11'13% higher life satisfaction compared to non-members (Vita et al. 2020). However, these changes are not enough to attain substantial reductions in the domains of housing and transport, which are more structurally constrained (Ivanova et al. 2018). Moreover, even though initiatives membership is associated with lower climate impacts, the average CF of initiative members is still about five times higher than the per capita quota of 1.6 tCO2eq to remain within 1.5°C warming (O'Neill et al. 2017).  Demand-side policies should beware of consumer scapegoatism, which is the practice of expecting too much from individual behaviors, without the adequate changes on structural and institutional hindrances for lifestyles of low-carbon wellbeing (Akenji 2014).  Akenji, Lewis. 2014. "Consumer Scapegoatism and Limits to Green Consumerism." <i>Journal of Cleaner Production</i> 63: 13–23. <a href="https://doi.org/10.1016/j.jclepro.2013.05.022">https://doi.org/10.1016/j.jclepro.2013.05.022</a> .  Ivanova, Diana, Gibrán Vita, Richard Wood, Carine Lousselet, Adina Dumitru, Karen Krause, Irina Macsinga, and Edgar G. Hertwich. 2018. "Carbon Mitigation in Domains of High Consumer Lock-In." <i>Global Environmental Change</i> 52 (February): 117–30. <a href="https://doi.org/10.1016/j.gloenvcha.2018.06.006">https://doi.org/10.1016/j.gloenvcha.2018.06.006</a> .  O'Neill, Daniel W, Andrew L. Fanning, William F. Lamb, Julia K. Steinberger, Daniel W. O'Neill, Andrew L. Fanning, William F. Lamb, and Julia K. Steinberger. 2017. "A Good Life for All within Planetary Boundaries." <i>Nature Sustainability</i> 1 (February): 88–95. <a href="https://doi.org/10.1038/s41893-018-0021-4">https://doi.org/10.1038/s41893-018-0021-4</a> .  Vita, Gibrán, Diana Ivanova, Adina Dumitru, Ricardo García-Mira, Giuseppe Carrus, Konstantin Stadler, Karen Krause, Richard Wood, and Edgar G. Hertwich. 2020. "Happier with Less? Members of European Environmental Grassroots Initiatives Reconcile Lower Carbon Footprints with " <i>Energy Research &amp; Social Science</i> 60 (February): 101329. <a href="https://doi.org/10.1016/j.erss.2019.101329">https://doi.org/10.1016/j.erss.2019.101329</a> .	Accepted.	Gibrán Vita	Open University of the Netherlands	Netherlands
25025	73		73		Replace "green" and "low-carbon" with "low-emission"	Noted. I accept 'green' can be ambiguous but 'low carbon' is relevant and important.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
24429	74	15	74	39	These paragraphs on lifestyles in scenario modelling should be moved or linked to earlier material inc. Table 5.5. I also think the whole section lifestyles would fit better earlier on in relation to services, rather than here related to meaning.	Accept	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
25027	74	20	74	20	Avoid using undefined terms such as "green values"	Accept	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
31763	74	36	74	39	Do the studies also touch upon the speed at which the reduction potential can be achieved at the societal level, given typically enshrined cultures, behaviours etc.? Would that be sufficient to meet the climate challenge?	Noted. Rate of transformative change will be addressed in updated draft.	Ashok Sreenivas	Prayas (Energy Group)	India
44045	74	40	74	42	I appreciated that this section mentioned behavior change more than I have seen in other sections of the report.	Accept	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
3819	74	29		30	One bracket is missing	Accept	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
787	75	5	75	6	This is an important statement. Here it takes quite a narrow form (lifestyle) whereas we can think that this observation of a frontier of CC research is maybe also valid for estimating the effectiveness of low demand scenario in a more global manner. As explained in the Meaning section, lifestyle gather multiples dimensions, incorporating values and norms. Meaning is a key part of the framework [Agency - Structure - Meaning], used to describe and understand the change toward low carbon futures. So we could consider that the estimating of the effectiveness and feasibility of the new low demand scenario is also a frontier of CC research, notably because it requires mobilizing together social sciences, energy economics, modelling sciences... (these various dimensions being clearly described in the chapter).	Noted.	MATHEU SAUJOT	IDDR1	France
25029	75	7	75	25	Delete section 5.4.3.8 on religion	Reject - religion is an important aspect of social and cultural dimensions of mitigation. Social science primer has a section	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
6657	75	10	75	10	I believe some evidence suggests that evangelicals are split in their perception of environmental issues - some believe the earth was given to humans to dominate, and other others believe the earth was given to humans to steward and care for. Danielsen 2013 discusses this fracture. There may be newer research on this topic as well that I am not familiar with.	Accept	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
46275	75	10	75	12	A comprehensive overview on the development of the responsibility of religions for the protection of the environment could be found here: Hummel, D./ Daassa, M., 2019: <a href="https://doi.org/10.18060/23273">https://doi.org/10.18060/23273</a> , pages 25 - 28	Accept	Amin Hasanein	Islamic Relief Deutschland	Germany
46271	75	15	75	19	Suggestion: to mention works of protagonists of other religions beside the encyclical of Pope Francis - like the book of Fazlun M Khalid: Signs on the Earth - Islam, Modernity and the Climate Crisis, 2019 (includes in the appendix the "Islamic Declaration on Global Climate Change" of 2015 (in the pre-text of the Paris Agreement). And maybe there are also other works of other religions worth to be mentioned.	Accept	Amin Hasanein	Islamic Relief Deutschland	Germany
46273	75	23	75	25	Very important statement. But there should be something exemplary explaining the term "with local contexts" (line 25), like: "(...) with local contexts, differing for example whether the community comprehends of marginalized people in developing countries and/or developed countries or not so marginalized people."	Accept	Amin Hasanein	Islamic Relief Deutschland	Germany
25031	75	29	75	33	PV's evolution was the result of subsidies. The first paragraph of section 5.4.4.1 needs to be revised as well as the remaining text, also stressing on the environmental footprint of producing PV specific equipment	Noted.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6659	75	38	75	38	Please provide a citation supporting the idea that PV adoption is often not policy driven. It's my impression that PV policy has been critical to adoption. The German example is a good one. Authors may also wish to describe the American Sunshot initiative, which had a stated goal of reducing the cost of solar to be competitive with other electricity sources. <a href="https://rael.berkeley.edu/wp-content/uploads/2015/04/Mileva_and_Kammen-et-al_EST-Sunshot_solar.2013.pdf">https://rael.berkeley.edu/wp-content/uploads/2015/04/Mileva_and_Kammen-et-al_EST-Sunshot_solar.2013.pdf</a>	Accept - the revised case study text deals with the interactions between consumer pressure and policy responses over time. Noted US example.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
9985	75	28	76	22	To show the complexity in forces of change in PV adoption, there should also be reference to the non-linear growth pattern (and the associated interplay among transition processes/functions), e.g. in Germany, and to how huge consumer response in conjunction with reckless regulatory opportunities backfired, e.g. in Spain or Greece: - Dewald, U., & Truffer, B. (2011). Market formation in technological innovation systems—diffusion of photovoltaic applications in Germany. <i>Industry and Innovation</i> , 18(03), 285-300. - Sorman, A. H., Pizarro-Irizar, C., García-Muros, X., González-Eguino, M., & Arto, I. (2019). On a rollercoaster of regulatory change—risks and uncertainties associated with renewable energy transitions. <i>Narratives of Low-Carbon Transitions</i> , 121. - Nikas, A., Stavrakas, V., Arsenopoulos, A., Doukas, H., Antosiewicz, M., Witajewski-Baltviks, J., & Flamos, A. (2018). Barriers to and consequences of a solar-based energy transition in Greece. <i>Environmental Innovation and Societal Transitions</i> .	Rejected as outside of scope.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
24431	75	28	76	27	The solar PV case study is interesting, but very hard to see what it has to do with services-based mitigation, particularly when the flow of electrons is a non-differentiated energy carrier not a service. I also think the effort to interpret this case study through the agency-structure-meaning lens is laudable, but contrived. To ensure consistency with the chapter, it should be interpreted through the lens of services-based mitigation, or if not, deleted.	Accept - a second draft will mention the service angle more clearly	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
46605	75	28	76	28	It is not a demand side case study! Is it for example? Or for self consumption in housing? In such a case fig. 5.14 should be adapted. Besides: (i) add the annual market value on Fig. 5.14; (ii) what is the annual generation in TWh? (iii) stress the issue for the massive implementation in the power system (curtailment/storage/backup...)	Accept - redraft will focus more on service aspects.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
42137	75	27	79	25	I thought these case studies are a really useful way to bring all the very diverse issues of the sections together in a practical way.	Accept	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
33621	75	7			Given how many people are adherents of religion, and given how valuable faith groups are in addressing other social and humanitarian causes, it would be a mistake to underestimate the potential power of faith groups in climate change mitigation. Climate-change denialists among North American Evangelicals are only a small group (despite all the literature about them), and they are more or less alone. They do not need a special mention in this section, except in context. Eco-churches are a powerful vehicle in developed countries. Here is just one of many example from conservation agriculture in Africa: DOI: 10.1007/s10460-019-09925-2. A more detailed and balanced handling is warranted if this section is to contribute to the narrative constructively.	Accept	Debra Roberts	EThekwin Municipality	South Africa
3821	75	32			US or USA?	Accept - USA.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
25033	76	12	76	12	Delete "oil dependence" as the argument mainly relates to coal	Accept.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
9987	76	23	76	24	Figure 5.14 is hardly readable.	Accept - figure will be revised in SOD.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
26147	76	23	76	24	the figure should be update with higher resolution.	Accept.	Wenling Liu	Beijing Institute of Technology	China
1447	76	23	76	25	pls improve the quality of this figure.	Accept.	JUNGUO LIU	Southern University of Science and Technology	China
11975	76	23	76	27	The resolution on this figure is too poor to read - please improve	Accept.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
31765	76	29	76	29	This is a good example for a developmental action case study, but is it a good case study for a low-C shift? Because in many cases (e.g. Brazil, India, Indonesia), the shift is from traditional biomass to LPG or equivalent - which is highly desirable but not necessarily climate friendly.	The case will investigate technological shifts in cookstoves of different kinds and assess their value for shifts in service provision	Ashok Sreenivas	Prayas (Energy Group)	India
3823	76	3			erase top	Accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
24433	77	1	77	31	This is the opposite of the solar PV case study, as it is about services (cooking), but unlike the PV case, it's not interpreted through the agency-structure-meaning lens, which I think could actually be quite useful to explain why adoption rates are so underwhelming (given the numerous benefits).	Accept - the underlying processes influencing uptake of cookstoves will be addressed in the next draft	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
44047	77	3	77	31	There needs to be recognition here that preferences around cooking fuel extend far beyond the cost and access to various fuels. A quick scan of the published research shows very low uptake of improved methods, even when price is lower, with people having personal preferences guiding decisions when they can choose. I would suspect that in this case the grey literature in the development world goes far beyond what has been published in scientific journals to highlight that as income goes up and people have access to greater choice, including choosing to buy biomass, they may return to more traditional fuels for cooking even as they prefer more efficient fuels for other activities (lighting, heating, etc.). Even if the IPCC cannot reflect such literature because it has not gone through a traditional peer review, there needs to be some recognition that the academic literature only tells a part of the story, and that there are serious barriers in terms of preferred behaviors.	Reasons for uptake of improved cookstoves are fully covered in the case study. Grey literature will be drawn upon if it provides additional value to peer reviewed academic research.	Tegan Blaine	Blue Cairn Climate Consulting	United States of America
9989	77	11	77	11	"Numerous studies" with the two references should be strengthened, e.g.: - Van de Ven, D. J., Sampedro, J., Johnson, F. X., Bailis, R., Forouli, A., Nikas, A., ... & Doukas, H. (2019). Integrated policy assessment and optimisation over multiple sustainable development goals in Eastern Africa. <i>Environmental Research Letters</i> , 14(9), 094001. - Taylor, R., Wanjiru, H., Johnson, O. W., & Johnson, F. X. (2019). Modelling stakeholder agency to investigate sustainable charcoal markets in Kenya. <i>Environmental Innovation and Societal Transitions</i> . - Silaen, M., Taylor, R., Böfner, S., Angra-Kraavi, A., Chewpreecha, U., Badinotti, A., & Takama, T. (2019). Lessons from Bali for small-scale biogas development in Indonesia. <i>Environmental Innovation and Societal Transitions</i> .	Additional citations will be drawn upon as space allows.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
31767	77	14	77	16	0.36 MJ / cap / day as input energy seems too low to be realistic to meet all cooking needs. Most literature uses 2 - 3 MJ / cap / day of useful energy requirement, which means input energy would have to be higher than that.	Noted.	Ashok Sreenivas	Prayas (Energy Group)	India
13679	77	42	77	42	Should be 'own bicycles'	Accept.	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
3825	77	13			one bracket ) is missing	Accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3827	77	26			meaning of ICS	Improved Cook Stoves.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3829	77	28			meaning of HAP	Household Air Pollution	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
3831	77	44			meaning of BRT	This has been deleted from the text.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
5053	78	5	78	13	This chapter dealt with demand-side issues of energy with the emphasis on social aspects of this issue. "well-being" seems to be one of the keywords in this chapter. There are two concepts that lack in this chapter, stages of economic development and the role of the middle class when considering the consumption/demand-side issues.	Noted. Influence of middle class is taken into account in revised text.	Midori Aoyagi	National Institute for Environmental Studies	Japan
25035	78	24	78	24	Delete "green"	Accept.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
39533	78	44	78	45	Although it does look like UK meat consumption dipped in 2014, it went back up: <a href="https://ourworldindata.org/meat-production/per-capita-meat-consumption">https://ourworldindata.org/meat-production/per-capita-meat-consumption</a> . This should be acknowledged, because overall in the world we are still seeing an increase in meat consumption so the example of the UK shouldn't necessarily be framed as a success story.	Accepted. FAO data on meat consumption in UK show ups and downs, but the overall trend since 2006 has been downward. This pattern has been noted and FAO data included, in the CS.	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
6661	78	43	79	25	Why was this case study chosen? Is it because this illustrates policies that encourage anti-climate action (subsidies for meat producers lead to more meat production). Please be clear about this at the start of the section. Numerous other pro-climate policies exist, beyond the three that are highlighted. These include parking prices, toll roads, HOV lanes, congestion pricing, decoupling utility profits from electricity sales, building energy codes, etc. Why were these three chosen, in particular?	We have clarified the rationales for selecting the case studies at the start of the section.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
11251	78	43	79	25	Here, I suggest to include more recent work that also makes a strong case for the role of social norms within a complex set of systemic processes affecting dietary change, by Eker et al., Nature Sustainability, 2019; it links nicely to the section on norms	Noted: Thank you for the suggestion. After reviewing the article, which aims to model the drivers of dietary shift by linking a model of human behaviour to	Reese Gerhard	University of Koblenz-Landau	Germany
17453	78	43	79	25	The report rightly emphasizes the potential of dietary shifts for enabling healthier and more sustainable lifestyles. In particular, moving from meat-based to increasingly plant-based diets is identified as an effective demand-side measure for mitigating climate change. However, changing food practices is a very complex challenge, which requires integrated approaches in terms of regulation, legislation, social and environmental restructuring, and communication, among other policy categories. These integrated approaches need to be informed by systematic and comprehensive reviews of the best available evidence. Thus, with regard to the case study on plant-forward transitions, my view is that an evidence-based report aimed at a global audience (which includes decision makers) should build on more than isolated inputs from a selection of individual studies on meat consumption/reduction (i.e., section 5.4.4.4 CS4: Dietary change and reduced meat consumption). My recommendation on this matter is that the case study should draw on (and provide an overview of) the findings of recent, comprehensive, integrative and systematic reviews on the topic, which can include: Bianchi, F., Dorsel, C., Garnett, E., Aveyard, P., & Jebb, S. A. (2018). Interventions targeting conscious determinants of human behaviour to reduce the demand for meat: a systematic review with qualitative comparative analysis. <i>International Journal of Behavioral Nutrition and Physical Activity</i> , 15(1), 102. <a href="https://doi.org/10.1186/s12966-018-0729-6">https://doi.org/10.1186/s12966-018-0729-6</a> Bianchi, F., Garnett, E., Dorsel, C., Aveyard, P., & Jebb, S. A. (2018). Restructuring physical micro-environments to reduce the demand for meat: a systematic review and qualitative comparative analysis. <i>The Lancet Planetary Health</i> , 2(9), 384-397. <a href="https://doi.org/10.1016/S2542-5196(18)30188-8">https://doi.org/10.1016/S2542-5196(18)30188-8</a> Graca, J., Godinho, C. A., & Truninger, M. (2019). Reducing meat consumption and following plant-based diets: Current evidence and future directions to inform integrated transitions. <i>Trends in Food Science &amp; Technology</i> , 91, 380-390. <a href="https://doi.org/10.1016/j.tifs.2019.07.046">https://doi.org/10.1016/j.tifs.2019.07.046</a> Harguess, J. M., Crespo, N. C., & Hong, M. Y. (2020). Strategies to reduce meat consumption: A systematic literature review of experimental studies. <i>Appetite</i> , 144, 104478. <a href="https://doi.org/10.1016/j.appet.2019.104478">https://doi.org/10.1016/j.appet.2019.104478</a> Hartmann, C., & Siegrist, M. (2017). Consumer perception and behaviour regarding sustainable protein consumption: A systematic review. <i>Trends in Food Science &amp; Technology</i> , 61, 11-25. <a href="https://doi.org/10.1016/j.tifs.2016.12.006">https://doi.org/10.1016/j.tifs.2016.12.006</a> Stoll-Kleemann, S., & Schmidt, U. J. (2017). Reducing meat consumption in developed and transition countries to counter climate change and biodiversity loss: a review of influence factors. <i>Regional Environmental Change</i> , 17(5), 1261-1277. <a href="https://doi.org/10.1007/s10113-016-1057-5">https://doi.org/10.1007/s10113-016-1057-5</a> Taufik, D., Verain, M. C., Bouwman, E. P., & Reinders, M. J. (2019). Determinants of real-life behavioural interventions to stimulate more plant-based and less animal-based diets: A systematic review. <i>Trends in Food Science &amp; Technology</i> , 93, 281-303. <a href="https://doi.org/10.1016/j.tifs.2019.09.019">https://doi.org/10.1016/j.tifs.2019.09.019</a> An overview of the findings and conclusions from these systematic reviews can be framed under the Agency-Meaning-Structure (Social Practices) overarching framework that is being used in the current chapter. This will provide more reliable and integrated inputs to the audiences of the IPCC Sixth Assessment Report, for enabling healthier and more sustainable food practices.	Agreed: Thank you for the suggestions. The recommended reviews have been reviewed and most have been included in the CS text.	João Graça	Institute of Social Sciences, University of Lisbon	Portugal
39537	78	43	79	25	The diet shift case study seems to focus heavily on reasons why shifting diets is difficult to achieve - but there are examples of people and policymakers actually taking action to shift diets, esp. at an institutional level, which could be included in a case study. I'm not as familiar with examples from the UK, but there are examples such as the Cool Food Pledge and Good Food Purchasing Program in the US where civil society organizations are working with local governments and schools to use institutional purchasing power to purchase and encourage consumption of more plant-based foods.	Noted. Word length restricts the numbers of examples referred to in the text.	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
30569	78	47	79	1	Cost - which has been reported by several consumer surveys as the primary factor driving reduced meat consumption- is conspicuously missing from the list of reasons for which consumers are reducing meat consumption. Evidence around the relative importance of animal welfare as a driving factor is mixed. See Neff et al (2018). Reducing meat consumption in the USA: a nationally representative survey of attitudes and behaviours. <i>Public Health Nutrition</i> , 21(10), 1835-1844.; Latvala et al. (2012) Diversifying meat consumption patterns: consumers' self-reported past behaviour and intentions for change. <i>Meat Sci</i> 92, 71-77.; Verbeke et al. (2010) European citizen and consumer attitudes and preferences regarding beef and pork. <i>Meat Sci</i> 84, 284-292; Clonan et al. (2015) Red and processed meat consumption and purchasing behaviours and attitudes: impacts for human health, animal welfare and environmental sustainability. <i>Public Health Nutr</i> 18, 2446-2456	Accepted: cost has been included in the list of personal motivations for reducing meat consumption.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
39535	78	47	79	1	Peer-reviewed literature I've seen suggests that health is a larger driver for reducing meat consumption than animal welfare. (See Neff, R., Edwards, D., Palmer, A., Ramsing, R., Righter, A., & Wolfson, J. (2018). Reducing meat consumption in the USA: A nationally representative survey of attitudes and behaviours. <i>Public Health Nutrition</i> , 21(10), 1835-1844. doi:10.1017/S1368980017004190; AND Stoll-Kleemann, S., Schmidt, U. J. Reducing meat consumption in developed and transition countries to counter climate change and biodiversity loss: a review of influence factors. <i>Reg Environ Change</i> 17, 1261-1277 (2017). <a href="https://doi.org/10.1007/s10113-016-1057-5">https://doi.org/10.1007/s10113-016-1057-5</a> )	Accepted: CS text has been re-phrased to address this point.	Erin Bieh	Johns Hopkins Center for a Livable Future	United States of America
3833	78	15			air pollution	Accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3835	78	16			environmental	Accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3837	78	16			congestion	Accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3839	78	42			in the reference, S is in excess	Accept.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
39315	79	1	79	1	To conclude the sentence that starts on p. 78, could you add another references to this statement about why people reduce meat? In addition to Dobb and Fitzpatrick 2014, there is: Ang, C.-S., Chan, N.-N., & Singh, L. (2019). A comparison study of meat eaters and non-meat eaters on mind attribution and moral disengagement of animals. <i>Appetite</i> , 136, 80-85. doi:10.1016/j.appet.2019.01.019; Benningstad, N., & Kunst, J. (2020). Dissociating meat from its animal origins: A systematic literature review. <i>Appetite</i> , 147. doi:10.1016/j.appet.2019.104554.; Sahakian, M., Godin, L., & Courtin, I. (2020 first online). Promoting 'pro', 'low', and 'no' meat consumption in Switzerland: The role of emotions in practices. <i>Appetite</i> . doi: <a href="https://doi.org/10.1016/j.appet.2020.104637">https://doi.org/10.1016/j.appet.2020.104637</a> . Among others	Noted/Accepted: Thank you for the suggestions. Ang et al 2019: The issue of moral disengagement and perceived mind attribution on animals is not considered a key driver explaining the changing meat consumption in the UK, falls outside the scope of the CS and is not included.	Marilyn Sahakian	University of Geneva	Switzerland



Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
15783	79	1	79	8	The real value of proposing low protein / low meat diets has been put in doubt. The WHO has recently retired its former support to the EAT Lancet diet, low in proteins, based on health issues and other reasons. For example: British Medical Journal BMI reports WHO withdraw support for the "Planetary Diet" <a href="https://www.bmj.com/content/365/bmj.11700">https://www.bmj.com/content/365/bmj.11700</a> , so there seems to be some discussion on whether such a diet would be applicable to all the world's population and whether it is indeed healthy. I checked the WHO recommended diet at <a href="https://www.who.int/en/news-room/fact-sheets/detail/healthy-diet">https://www.who.int/en/news-room/fact-sheets/detail/healthy-diet</a> and there is no reference on recommended protein or carbohydrate intake. There are other critics who state that the "EAT Lancet report not backed by rigorous science": <a href="https://www.nutritioncoalition.us/news/eatlancet-report-one-sided">https://www.nutritioncoalition.us/news/eatlancet-report-one-sided</a> The US Dietary Guidelines, one key pillar of the EAT Lancet report, is also questioned: <a href="https://www.nutritioncoalition.us/there-is-concern-about-the-dietary-guidelines">https://www.nutritioncoalition.us/there-is-concern-about-the-dietary-guidelines</a> Stating that "low meat diets are healthier" needs to be supported by research. For example, this article states that "Unless vegans regularly consume foods that are fortified with these nutrients, appropriate supplements should be consumed. In some cases, iron and zinc status of vegans may also be of concern because of the limited bioavailability of these minerals." Others state "The reduced mortality from cancer among those not eating meat is not explained by lifestyle related risk factors, which have a low prevalence among vegetarians. No firm conclusion can be made about deaths from ischaemic heart disease. These data do not justify advice to exclude meat from the diet since there are several attributes of a vegetarian diet apart from not eating meat which might reduce the risk." cited from Risk of death from cancer and ischaemic heart disease in meat and non-meat eaters BMJ 1994; 308 doi: <a href="https://doi.org/10.1136/bmj.308.6945.1667">https://doi.org/10.1136/bmj.308.6945.1667</a> (Published 25 June 1994) BMJ 1994;308:1667 <a href="https://www.bmj.com/content/308/6945/1667.abstract">https://www.bmj.com/content/308/6945/1667.abstract</a> Meat producing countries are starting to use silvopastoral systems (SPS) for sustainable carbon neutral meat production. Some countries have published articles and set themselves targets to achieve carbon neutral meat production. For example, the Australian Beef Sustainability states that "In 2017 the Australian red meat industry set an ambitious target to be carbon neutral by 2030." and that "A new indicator has been added to the 2019 Annual Update to publicly track the industry's CN30 (Carbon Neutral by 2030) initiative. Since the baseline year of 2005, the industry has reduced absolute emissions by 55.7% (for the most recent reporting period of 2016) largely through a focus on improving productivity and vegetation management practices." Sources: <a href="https://www.sustainableaustralianbeef.com.au/managing-climate-change-risk-and-also-ABSF-2019-Australian-Beef-Sustainability-Annual-Update_web.pdf">https://www.sustainableaustralianbeef.com.au/managing-climate-change-risk-and-also-ABSF-2019-Australian-Beef-Sustainability-Annual-Update_web.pdf</a> In the UK, the NFU states "The NFU has reiterated that improvements in productivity, carbon capture and renewable energy production are the most effective ways to reach agricultural net zero targets, as part of its ambition to reach net zero by 2040." reference: <a href="https://www.nfuonline.com/news/latest-news/nfu-reiterates-its-net-zero-aims-for-agriculture">https://www.nfuonline.com/news/latest-news/nfu-reiterates-its-net-zero-aims-for-agriculture</a> . New peer reviewed research UK and Australia, as well in Brazil, Argentina, Colombia show that migrating to carbon neutral meat production is a feasible climate change mitigation action. In Brazil, EMBRAPA has published studies which support the viability of carbon neutral beef: "http://www.alice.cnptia.embrapa.br/alice/handle/doc/1118359" and also this article: <a href="https://www.alice.cnptia.embrapa.br/bitstream/doc/1118439/1/Economicanalysisof.pdf">https://www.alice.cnptia.embrapa.br/bitstream/doc/1118439/1/Economicanalysisof.pdf</a> and this third article <a href="https://link.springer.com/article/10.1007/s10457-019-00460-x">https://link.springer.com/article/10.1007/s10457-019-00460-x</a> In USA, studies are being done in this sense, for example by Yale "Silvopastoral systems and climate change mitigation in Latin America" by Montagnini, F, Ibrahim, M, Murgueitio, E, Restrepo at <a href="https://pdfs.semanticscholar.org/018b/34c7da1176d1e9134edd1aabe2a0ab98a7f.pdf">https://pdfs.semanticscholar.org/018b/34c7da1176d1e9134edd1aabe2a0ab98a7f.pdf</a> In Colombia: Charry, A., Narjes, M., Enciso, K. et al. Sustainable intensification of beef production in Colombia—Chances for product differentiation and price premiums. Agric Econ 7, 22 (2019). <a href="https://doi.org/10.1186/s40100-019-0143-7">https://doi.org/10.1186/s40100-019-0143-7</a> IPCC should support these meat production mitigation initiatives, because they might offer carbon neutral protein solutions to humankind.	Noted. The CS does not make any normative assertions about the shift the EAT Lancet Diet. The CS, which focuses on the UK, analyses the dynamics that have accompanied changing meat consumption. As such, discussion of technologies of meat production are beyond the scope of the CS.	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnológico de Buenos Aires	Argentina
44135	79	3	79	4	Could be cited: The Lancet, 2018. We need to talk about meat. The Lancet 392, 2237. <a href="https://doi.org/10.1016/S0140-6736(18)32971-4">https://doi.org/10.1016/S0140-6736(18)32971-4</a> ,	Noted: Thank you for the suggestion. Having reviewed the article, which can be described as a "Think piece" it has been concluded that it adds little to the explanation of dynamics of change in the UK, which is the focus of the CS.	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
30571	79	9	79	15	Technologically new "meat alternatives" are not the only way to reduce consumption of GHG-intensive foods, and not necessarily the most effective either. Many cultures around the world already consume pulses on a daily basis, which have the lowest GHG footprint among all protein foods for human consumption (Poore & Nemecek 2018) and provide many other health benefits for consumption as compared to more processed "meat alternatives."	Noted. The CS does not make any claims that technologically new 'meat alternatives' are the only way to reduce GHG emissions of meat eating, rather that is one strategy pursued by firms in the context of increased consumer attention to the issue.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
30573	79	9	79	15	If focusing on "meat alternatives," it is worth differentiating exactly how this report defines meat alternatives - does "veggie burger" include bean and vegetable-based burgers, or meat substitute products that try to completely replicate the taste, texture and nutrient profile of minced meat? Does this definition include traditional alternatives that do not attempt to replicate meat but can be used in similar ways (e.g., tofu, tempeh, seitan)?	Agreed: The CS text has been revised to note that " 'meat alternatives' vary in material form, with more 'radical' products such as cultured meat, or algae and insect-based proteins, facing substantial structural barriers".	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
30575	79	22	79	25	Another constraint for enacting dietary change is what is available on menus, particularly in countries where consumers spend nearly half of their budget on foods consumed away from home.	Agreed: Availability out of home is noted in the discussion of consumer constraints on meat reduction.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
29435	79	12			also: regulatory barriers exist for some meat replacement products.	Agreed. This point has been addressed, noting the regulations imposed by European Parliament's agriculture committee in 2019 to prohibit these new companies from using the terms	Stefan Pauliuk	University	Germany
30577	80	0	80	0	Vegan diets are not the only diets low in GHG emissions.	Noted: The CS does not mention vegan diet in relation to low GHG emissions.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
24435	80	1	80	4	I think this is a nice attempt to visually summarise and compare dynamics in three of the case studies, but it would benefit from being more explicitly linked to agency, structure and meanings (if this section is not deleted).	Accepted	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
15009	80	1	80	70	Figure 5.15 is not well presented. Text is difficult to read	Noted.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
24437	81	4	81	15	I think the first two paragraphs of this section are all that's needed on agency, structure and meaning, and the preceding 20 pages can be deleted or moved to 'social science primer' style Appendix.	Noted, changed substantially and we have created a social science primer	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
46607	81	4	81	37	As previously discussed (line 36), the pathways is related to the kinetics of the transition whereas a transition a steady-state concept. As a result, the higher the pace for changing, the higher the losses (irreversibility-induced loss in capital). The two issues addressed are: (i) does a transition exist by the design of "structure" and "meaning"? (ii) what is the pace to achieve it in time by controlling "agency"?	Noted. There are different understandings of the 'pathways' concepts. Rosenbloom (2017) distinguishes emission pathways, techno-economic pathways, and socio-technical transition pathways. We use the latter conceptualisation in the text, which looks at co-evolutionary interactions, including agency, structures and meanings. Rosenbloom, D., 2017, Pathways: An emerging concept for the theory and governance of low-carbon transitions, Global Environmental Change, 43, 37-50.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
15011	81	16	81	16	"impulse" is ambiguous. Suggest change to importance or influence	Accepted. We revised the word to 'influence'.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
30581	81	27	81	29	As discussed in comment 14 above, this statement excludes cost. It also suggests that animal welfare is not necessarily an important motivator for shifting towards low-meat diets, contradicting the text on pg. 78 line 47	Accepted. We revised the text to include costs and give more prominence to animal welfare as motivator.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
44291	81	33	81	37	Very good point, I suggest to add that this shift also requires financing, public education and information (benefits, timetables, etc.) and in some situations even incentives (unless private transport is penalised with charges).	Accepted. We revised the text to mention a few more structural elements (like financing arrangements and incentives)	BERTOLDI PAOLO	European Commission	Italy
24439	81	25	82	15	These paragraphs linking the ASI framework to the required changes in agency, structure and meaning are helpful. However, I would avoid talking about ASI transition pathways, as ASI describes measures, options and policies more narrowly (rather than whole pathways which could comprise some of A, S and I).	Accepted. We revised the text, using the pathways concept more limitedly and more precisely.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
3841	81	21		24	This sentence is not clear enough	Accepted. We split the long sentence into two to improve clarity.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3843	81	44			meaning of ICS	Accepted. Will be changed.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
15013	82	1	82	1	"radically shared mobility towns" does not make sense	Accepted. Will be changed.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
6663	82	1	82	7	Please cite a reference for the statement that cycling levels saturate at 10-20% of the population. Also, this sentence is awkward and confusing.	Accepted. Will be changed.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
15015	82	3	82	3	"concerning personal safety" does not make sense	Accepted. Will be changed.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
22793	82	5	82	7	The emphasis on Dutch and Danish cities as role models is inappropriate. These are characterised by high levels of cycling, but low levels of public transport use, so that levels of car use are similar to other countries (see <a href="https://t.co/VVeRe8FGHK?amp=1">https://t.co/VVeRe8FGHK?amp=1</a> ), and even higher if mileage is taken into account. For example Denmark car distance per capita is higher than the EU-28 average ( <a href="https://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2018_en">https://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2018_en</a> ). Denmark has one of the highest per capita carbon footprints for transport fuel use in Europe - see Fig.2 in Ivanova, D., Vita, G., Steen-Olsen, K., Stadler, K., Melo, P. C., Wood, R., & Hertwich, E. G. (2017). Mapping the carbon footprint of EU regions. Environmental Research Letters, 12(5), 054013.	Accepted. Will be changed.	Giulio Mattioli	TU Dortmund University	Germany
45899	82	7	82	7	please consider adding after: "over decades" the sentence: "Based on the experience accumulated in certain European cities and the low cost of the cycling infrastructure it seems now feasible to implement a quite complete urban cycle network in a few years, see e.g. the example of Paris 'plan velo 2015-2020' with its 1000 km of cycling paths <a href="https://www.paris.fr/pages/pistes-cyclables-la-ville-passe-a-la-vitesse-superieure-7126">https://www.paris.fr/pages/pistes-cyclables-la-ville-passe-a-la-vitesse-superieure-7126</a>	Accepted. Will be changed.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
6665	82	8	82	9	Please provide a reference for the statistic of 10% saturation	Accepted. Will be changed.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
30583	82	12	82	15	There are very few places where "the rate of vegan lifestyles is already high." Places where there are high rates of malnutrition and stunting may have diets that include relatively few animal-source foods, but likely include at least some animal-source foods (e.g., fish, dairy, bush meat, insects) and would not necessarily describe their diets as "vegan." And the type of diets themselves are not necessarily related to the high rates of malnutrition and stunting, and are affected by many variables including household income, dietary diversity, and food access.	Accepted. Will be changed.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
15017	82	14	82	14	"previously rare" does not make sense. Does this mean "missing"?	Accepted. Will be changed.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
15785	82	14	82	15	The necessity of a transition to a "plant based diets" is now in question, it is in doubt. The WHO has recently retired its former support to the EAT Lancet diet, low in proteins, based on health issues and other reasons. For example: British Medical Journal BMJ reports WHO withdraw support for the "Planetary Diet" <a href="https://www.bmj.com/content/365/bmj.11700">https://www.bmj.com/content/365/bmj.11700</a> , so there seems to be some discussion on whether such a diet would be applicable to all the world's population and whether it is indeed healthy. I checked the WHO recommended diet at <a href="https://www.who.int/en/news-room/fact-sheets/detail/healthy-diet">https://www.who.int/en/news-room/fact-sheets/detail/healthy-diet</a> and there is no reference on recommended protein or carbohydrate intake. There are other critics who state that the "EAT Lancet report not backed by rigorous science: <a href="https://www.nutritioncoalition.us/news/eatlancet-report-one-sided">https://www.nutritioncoalition.us/news/eatlancet-report-one-sided</a> The US Dietary Guidelines, one key pillar of the EAT Lancet report, is also questioned: <a href="https://www.nutritioncoalition.us/there-is-concern-about-the-dietary-guidelines">https://www.nutritioncoalition.us/there-is-concern-about-the-dietary-guidelines</a> Stating that "low meat diets are healthier" needs to be supported by research. For example, this article states that "Unless vegans regularly consume foods that are fortified with these nutrients, appropriate supplements should be consumed. In some cases, iron and zinc status of vegans may also be of concern because of the limited bioavailability of these minerals." Others state "The reduced mortality from cancer among those not eating meat is not explained by lifestyle related risk factors, which have a low prevalence among vegetarians. No firm conclusion can be made about deaths from ischaemic heart disease. These data do not justify advice to exclude meat from the diet since there are several attributes of a vegetarian diet apart from not eating meat which might reduce the risk." cited from Risk of death from cancer and ischaemic heart disease in meat and non-meat eaters BMJ 1994; 308 doi: <a href="https://doi.org/10.1136/bmj.308.6945.1667">https://doi.org/10.1136/bmj.308.6945.1667</a> (Published 25 June 1994) BMJ 1994;308:1667 <a href="https://www.bmj.com/content/308/6945/1667.abstract">https://www.bmj.com/content/308/6945/1667.abstract</a> Meat producing countries are starting to use silvopastoral systems (SPS) for sustainable carbon neutral meat production. Some countries have published articles and set themselves targets to achieve carbon neutral meat production. For example, the Australian Beef Sustainability states that "In 2017 the Australian red meat industry set an ambitious target to be carbon neutral by 2030." and that "A new indicator has been added to the 2019 Annual Update to publicly track the industry's CN30 (Carbon Neutral by 2030) initiative. Since the baseline year of 2005, the industry has reduced absolute emissions by 55.7% (for the most recent reporting period of 2016) largely through a focus on improving productivity and vegetation management practices." Sources: <a href="https://www.sustainableaustralianbeef.com.au/managing-climate-change-risk-and-also">https://www.sustainableaustralianbeef.com.au/managing-climate-change-risk-and-also</a> "ABSR_2019_Australian_Beef_Sustainability_Annual_Update_web.pdf" in the UK, the NFU states "The NFU has reiterated that improvements in productivity, carbon capture and renewable energy production are the most effective ways to reach agricultural net zero targets, as part of its ambition to reach net zero by 2040." reference: <a href="https://www.nfuonline.com/news/latest-news/nfu-reiterates-its-net-zero-aims-for-agriculture">https://www.nfuonline.com/news/latest-news/nfu-reiterates-its-net-zero-aims-for-agriculture</a> . New peer reviewed research UK and Australia, as well in Brazil, Argentina, Colombia show that migrating to carbon neutral meat production is a feasible climate change mitigation action. In Brazil, EMBRAPA has published studies which support the viability of carbon neutral beef: "http://www.alice.cnptia.embrapa.br/alice/handle/doc/1118359" and also this article: <a href="https://www.alice.cnptia.embrapa.br/bitstream/doc/1118439/1/Economicanalysisof.pdf">https://www.alice.cnptia.embrapa.br/bitstream/doc/1118439/1/Economicanalysisof.pdf</a> and this third article <a href="https://link.springer.com/article/10.1007/s10457-019-00460-x">https://link.springer.com/article/10.1007/s10457-019-00460-x</a> in USA, studies are being done in this sense, for example by Yale "Silvopastoral systems and climate change mitigation in Latin America" by Montagnini, F., Ibrahim, M., Murguieito, E. Restrepo at <a href="https://pdfs.semanticscholar.org/018b/34c7da1176d1e9134edd1aa8ef2a0ab98a7f.pdf">https://pdfs.semanticscholar.org/018b/34c7da1176d1e9134edd1aa8ef2a0ab98a7f.pdf</a> in Colombia: Charry, A., Narjes, M., Enciso, K. et al. Sustainable intensification of beef production in Colombia—Chances for product differentiation and price premiums. Agric Econ 7, 22 (2019). <a href="https://doi.org/10.1186/s40100-019-0143-7">https://doi.org/10.1186/s40100-019-0143-7</a> IPCC should support these meat production mitigation initiatives, because they might offer carbon neutral protein solutions to humankind.	Partially accepted. There is other evidence that supports eating less meat is healthy. Will be changed and better justified.	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnológico de Buenos Aires	Argentina
6667	82	23	82	25	What is meant by "orienting positively toward existing practices over alternatives"? This statement is confusing	Accepted. We revised the text.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
37331	82	35	82	38	Worsham and Brecha J Environ Stud Sci DOI 10.1007/s13412-017-0431-z	Accepted. Suggested reference has been added.	Michiel Schaeffer	Climate Analytics	Netherlands
24441	82	17	83	13	The section on lock-in rather begs the question - how is lock-in escaped for services-based mitigation? If this question is answered in the next section on 'phases in transitions', this should be made clear?	Accepted. The weakening of lock-in mechanisms was already discussed in the section 'phases in transition' (see end of third phase text). But text has been revised to emphasise this more.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
42131	82	17	83	13	I thought a strong section	Noted.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
3845	82	11			encompassing	Accepted. Spelling mistake has been corrected.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3847	82	12			industrial	Accepted. Spelling mistake has been corrected.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
22795	82	17			The following paper provides a review of lock-in in the ground transport sector from a political economy perspective: Mattioli, G., Roberts, C., Steinberger, J., & Brown, A. (2020). The political economy of car dependence: A systems of provision approach. Energy Research and Social Science; Gössling, S., Fichert, F., & Forsyth, P. (2017). Subsidies in aviation. Sustainability, 9(8), 1295.	Noted. The previous text on lock-in has been drastically shortened to prevent overlap with section 5.4. The suggested reference has therefore not been included in the suggested place.	Giulio Mattioli	TU Dortmund University	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
46609	82	17			the concept of lock-in is associated with frustration in the theory of phase transition. Frustration has the effect to provide first order transition, with discontinuity and extra costs, and hysteresis.	Noted. But the chapter draws more on social science theories (including with regard to transitions and lock-in) than on natural science inspired theories (e.g. with regard to phase transition).	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
26523	83	15	83	15	This section appears framed too heavily around 'the market', not to mention assuming that past transitions will necessarily reflect future ones. Many of the world's most important innovations or interventions have come from civil society or the state, and have not been market-viable, and to implicitly assume the latter will be the case in future transitions raises many serious problems. It also replicates a scalar imaginary (scaling 'up' through various niche/regime/landscape formulations) which is only one way of viewing things: Schmid, B & Smith TSJ (2020) Social transformation and postcapitalist possibility: Emerging dialogues between practice theory and diverse economies, Progress in Human Geography <a href="https://journals.sagepub.com/doi/full/10.1177/0309132520905642">https://journals.sagepub.com/doi/full/10.1177/0309132520905642</a>	Accepted. The text on transition phases has been amended to include social and grassroots innovations besides market-oriented innovations.	Thomas Smith	Masaryk University	Czech Republic
31769	83	15	83	15	Perhaps it would be good to mention in this section that not all "innovations" necessarily go through the four phases. Indeed, most would fall by the way-side along the way.	Accepted. A new sentence explicitly acknowledges this point.	Ashok Sreenivas	Prayas (Energy Group)	India
37333	83	16	83	21	list the four phases here explicitly	Accepted. The four phases are now mentioned explicitly at start of the section.	Michiel Schaeffer	Climate Analytics	Netherlands
46611	83	15	84	33	The concept of "phase in transitions" is associated to the different stages observed during the kinetics. The different levels are related to the observation of the fluctuation patterns, which obeys the scaling property (Widom 1979). Conversely, a slow kinetics during the phase 3 (where the diffusion occurs in lower dimensional clusters) is probably the mean to reduce the irreversibility of the whole pathways.	Noted. But the chapter draws more on social science theories (including with regard to transitions and phases) than on natural science inspired theories.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
24443	83	16	84	19	This is another long, quite jargony section with (1) no clear link to services-based mitigation, and (2) no clear relationship with agency, structure and meaning. As such ... it's bathwater not baby.	Accepted. The text on transition phases has been rewritten and streamlined, including more alignment with services and the analytical discussion in section 5.4.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
26525	84	24	84	25	It isn't clear on what basis electric vehicles and LEDs are being defined here as 'radical' options, especially in the context of evidence that electric cars, as objects, are not particularly eco-friendly, let alone the individualistic mobility patterns which they replicate. The former (life cycle impacts) is contested and depends hugely on the underlying energy mix. There are links to relevant research (and a response) here: <a href="https://www.theguardian.com/environment/2019/nov/25/are-electric-vehicles-really-so-climate-friendly">https://www.theguardian.com/environment/2019/nov/25/are-electric-vehicles-really-so-climate-friendly</a>	Accepted. The text has been rewritten and now more clearly distinguishes between incremental improve options (which upgrade existing technologies) and radical improve options (which build on a different technological knowledge base). This distinction between incremental and radical innovation comes from evolutionary economics and innovation studies, e.g. Christensen, 1997 Christensen, C., 1997. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Harvard Business School Press, Boston, MA	Thomas Smith	Masaryk University	Czech Republic
22797	84	31	84	33	The emphasis on Dutch and Danish cities as role models is inappropriate. These are characterised by high levels of cycling, but low levels of public transport use, so that levels of car use are similar to other countries (see <a href="https://t.co/VVeR8fGK?amp=1">https://t.co/VVeR8fGK?amp=1</a> ), and even higher if mileage is taken into account. For example Denmark car distance per capita is higher than the EU-28 average ( <a href="https://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2018_en">https://ec.europa.eu/transport/facts-fundings/statistics/pocketbook-2018_en</a> ). Denmark has one of the highest per capita carbon footprints for transport fuel use in Europe - see Fig 2 in Ivanova, D., Vita, G., Steen-Olsen, K., Stadler, K., Melo, P. C., Wood, R., & Hertwich, E. G. (2017). Mapping the carbon footprint of EU regions. Environmental Research Letters, 12(5), 054013.	Noted. Transition in terms of modal share still relevant. Example to be reconsidered.	Giulio Mattioli	TU Dortmund University	Germany
15019	84	34	84	34	a figure would be useful to depict the four stages and rebound effect	Noted. The text on rebound effect has been removed, so a Figure linking the four stages and rebound is not needed.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
37335	84	35	84	45	I disagree with the characterization of rates of growth. What is shown in Fig 15 is effectively a logistic curve. A logistic curve is defined mathematically by an exponential growth that then reaches a saturation level. However, the rate of growth at what are labeled A, B, C, and perhaps even D are characterized by the same exponential growth rate in the logistic function. It may be starting from a low level, and therefore the incremental absolute changes are small in each time interval, but the rate of change is constant at a certain percentage per year.	Accepted. 'Rates of change' has been replaced with 'transitional change', which relates change to outcomes.	Michiel Schaeffer	Climate Analytics	Netherlands
3849	84	42			J. in excess	Accepted. Editorial.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
6669	85	5	85	10	Please provide a citation for this sentence	Accepted. References added.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
46613	85	23	85	44	The outline corresponds to the universal properties observed in physics: (i) the transition is more difficult in high dimensional systems (here: technical, economic, social dimensions); (ii) the local interactions: connectivity, range and possibly frustration complicate the transition. Conversely, local agents with a continuous behavior (not binary) facilitate it. (iii) the agency (external fields) controls the transition along the 'convenient' pathway within the phase diagram.	Noted. Agree with comment. But space limitations do not allow to expand on existing text.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
5647	85	27	85	29	The following reference provides more recent and comprehensive evidence on the very long time scales associated with the diffusion of large, infrastructure-dependent transportation systems.  Leibowicz, B.D., 2018. Policy recommendations for a transition to sustainable mobility based on historical diffusion dynamics of transport systems. Energy Policy 119, 357-366.	Accepted. Reference added.	Benjamin Leibowicz	The University of Texas at Austin	United States of America
6671	85	35	85	44	The authors do not mention the importance of the cohesiveness of the social network in which the innovation or technology is being introduced. Similarly, they do not mention the importance of opinion leaders or people with many network connections. Rogers (2003) discusses these important issues, as do others.	Noted. Space limitations do not allow to add this additional layer of complexity. Rogers reference quoted in text.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
42133	85	3			word recent does not link to references (2009 and 2013)	Accepted. Editorial.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
3851	85	14		15	The value given to the variables is correlated. Is it true for complexity also?	Comment not understood.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
1003	85	23			Editorial and substantive point: the absence (anywhere in Volume III) of Reducing Working Time (in rich countries) as a synergic demand-side policy is striking. Has it been overlooked or is this a deliberate decision? There is considerable literature of its effectiveness in cutting emissions, via its scale effect and its composition effect. It should figure in this Chapter somewhere! eg. Schor, J.B. 1991. Global equity and environmental crisis: An argument for reducing working hours in the North. World Development, 19, 73-84. Schor, J.B. 2005. Sustainable consumption and worktime reduction. Journal of Industrial Ecology, 9, 37-50. Nässén, J. and Larsson, J. 2015. Would shorter working time reduce greenhouse gas emissions? An analysis of time use and consumption in Swedish households. Environment and Planning C: Government and Policy, 33(4), 726-745. Knight, K.W., Rosa, E.A. and Schor, J.B. 2013. Could working less reduce pressures on the environment? A cross-national panel analysis of OECD countries, 1970-2007. Global Environmental Change, 23, 691-700.	Rejected. This section is on rates of change (fast vs. slow) and does not discuss alternative mitigation options (incl. work-time reductions).	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
3861	86	45	47		one bracket is missing	Accepted. Editorial.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
15021	86	1	86	13	Could this be linked to Gerschenkron's more general advantage of backwardness?	Noted. Indeed yes. But space limitations do not allow to expand this text box.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
24445	86	1	86	13	This is another example of text with outdated references which fail to capture more recent scholarship which problematises leapfrogging both as a concept and as an empirical reality.	Noted. More recent references will be added.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
46615	86	1	86	13	Leapfrogging is associated to a brutal association of one extra-dimension in the structure and/or a brutal change in the range of interaction (meaning).	Noted, but comment not understood.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
11733	86	3	86	3	Comment: check goldenberg ref/date: the paper I have is Goldemberg, J. (1998). Leapfrog energy technologies. Energy Policy, 26(10), 729–741. <a href="https://doi.org/10.1016/S0301-4215(98)00025-1">https://doi.org/10.1016/S0301-4215(98)00025-1</a>	Noted, no follow up. Goldemberg 1991 is the original reference where he first discussed leapfrogging. The 1998 paper is a sequel.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
18015	86	27	86	28	Disagree with "high technological risk". CCS technologies are proven at large-scale. See GCCSI Global Status Report (2019), IEAGHG reports 2015-06 Boundary Dam project, 2018-05 Port Arthur project, 2019-04 Quest project.	Rejected. CCS is NOT proven at large scale. The projects referred to are all rel. small scale and minuscule compared to the size postulated in some of the IPCC scenarios.	Tim Dixon	IEAGHG	United Kingdom (of Great Britain and Northern Ireland)
44755	86	29	86	31	"There is continuing debate if and how policies could counterbalance these impacts in order to accelerate transitions (Nordhaus 2019; Lovins 2015)." Yes, there is a debate, but the reference to Lovins 2015 seems a bit odd as it is clearly an opinion piece that is not very factual. Some statements are incorrect, and some of the links to sources ment to substantiate the claims of Lovins do not work. If Lovins is of relevance to refer to here, why not refer to any of his articles with similar statements found in peer reviewed journals? On the other hand the reference to Nordhaus can also be questioned, and there are surely suitable articles by him as well to refer to.	Noted critique of references, but no suitable alternatives suggested. Nordhaus and Lovins and their arguments are very representative of this debate. No change in text.	Daniel Westlén	Liberal party Swedish parliament	Sweden
11735	86	46	86	47	Comment: The Jevons reference should be 1865: Jevons, W. S. (1865). The Coal Question: an Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of our Coal-mines (A. W. Flux (ed.); 3rd (1905)). Augustus M. Kelley.	Noted. Section on Rebound now deleted due to space limitations.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
690	86	42	87	26	Somewhere in the discussion of rebound effects, it should be noted that the cause may not only be economic. Even consumers conscious of sustainability and dedicated to consuming less may adjust their behavior for psychological reasons. For instance, they may feel less guilt about using a product/resource/appliance because it is more efficient in terms of resource consumption/emissions, not due to direct economic cost alone. In this sense, these effects are perhaps a kind of "moral licensing" phenomena, in which consumers feel justified in consuming more not only in the area in which efficiency has been improved, but in others as well. "I can take this flight or eat this meat because I'm doing my part by driving an electric vehicle and I installed a smart thermostat." Through moral licensing effects, savings in one domain can result in a kind of mental accounting credit, which the consumer may feel they can spend in unrelated energy domains.	Noted. Section on Rebound now deleted due to space limitations.	Robert G. Kent de Grey	University of Utah	United States of America
29145	86	42	87	26	Chapter 16 has different assessment of rebound effect. Please see section 16.2.1.4 Energy efficiency improvements and rebound effects for consistency	Noted. Section on Rebound now deleted due to space limitations.	Minal Pathak	Ahmedabad University	India
38223	86	43	87	4	There is no rebound on efficiency. However, there is a misunderstanding of what efficiency versus energy savings could deliver. Efficiency is about reducing energy consumption and not energy demand. While energy savings is about reducing at the same time energy demand and energy consumption. I should have a reference on this for the SOD.	Noted. Section on Rebound now deleted due to space limitations.	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
5455	86	43	87	26	The Rebound Effect section is missing 2 key discussions: a) The magnitude of the rebound effect varies with income group. For example Chitnis et al (2014) found that rebounds are highest in the UK for low income groups. b) Sorrell et al (2020) found that rebound effects for sufficiency actions can be substantial, and erode a significant proportion of expected energy/emission savings. References: Chitnis, M., S. Sorrell, A. Druckman, S. K. Firth and T. Jackson (2014). "Who rebounds most? Estimating direct and indirect rebound effects for different UK socioeconomic groups." Ecological Economics 106(0): 12-32. Sorrell, S., B. Gatersleben and A. Druckman (2020). "The limits of energy sufficiency: A review of the evidence for rebound effects and negative spillovers from behavioural change " Energy Research & Social Science 64 (2020) 101439. <a href="https://doi.org/10.1016/j.erss.2020.101439">https://doi.org/10.1016/j.erss.2020.101439</a>	Noted. Section on Rebound now deleted due to space limitations.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
44293	86	43	87	26	The rebound effect is also analysed in Chapter 9.	Noted. Section on Rebound now deleted due to space limitations.	BERTOLDI PAOLO	European Commission	Italy
3853	86	13			; better than ) (	Noted. Section on Rebound now deleted due to space limitations.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3855	86	23				Noted. Section on Rebound now deleted due to space limitations.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3857	86	24			meaning of IAM	Noted/Accepted. Integrated Assessment Model will be spelled out.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3859	86	31		37	This sentence is not clear	Noted. Text revision will be considered to improve clarity.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3863	86	42			Maybe, give the precision that this is one definition of rebound effects among others (e.g. time spending). It is the definition chosen here.	Noted. Section on Rebound now deleted due to space limitations.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
12623	86	42			Here comes a paragraph on rebound effect. However why is this so long after the paragraphs on efficiency, which listed all the good things which efficiency can achieve. It would be better to have this as an integrated discussion. What actual rebounds do we see in real life? In addition, based on this research it is not realistic to continue to state that all the efficiency gains can be achieved.	Noted. Section on Rebound now deleted due to space limitations.	Gram-Hanssen Kirsten	Aalborg University	Denmark
22799	86	42			An example of rebound effect is that reduced car driving in dense urban areas might lead to more air travel - see e.g.: Ottelin, J., Heinonen, J., & Junnila, S. (2014). Greenhouse gas emissions from flying can offset the gain from reduced driving in dense urban areas. Journal of Transport Geography, 41, 1-9; Ottelin, J., Heinonen, J., & Junnila, S. (2014). Greenhouse gas emissions from flying can offset the gain from reduced driving in dense urban areas. Journal of Transport Geography, 41, 1-9; Czepkiewicz, M., Heinonen, J., & Ottelin, J. (2018). Why do urbanites travel more than do others? A review of associations between urban form and long-distance leisure travel. Environmental Research Letters, 13(7), 073001.	Noted. Section on Rebound now deleted due to space limitations.	Giulio Mattioli	TU Dortmund University	Germany
2615	87	11	87	12	Aluminium production also emits significant amounts of PFC gases such as CF4 and C2F6, which have high GWPs and long atmospheric lifetimes. On the other hand, aluminium (according to the IA) is the most widely recycled material, with 70% of all aluminium ever produced still being in use.	Noted. But this further detail is not needed in text when Aluminium is simply referred as one material used for "lightweighting" designs.	Michael Czerniak	Atlas Copco - Edwards	United Kingdom (of Great Britain and Northern Ireland)
6673	87	13	87	26	The authors may wish to discuss the opposite effect of rebound - behavioral spillover (in which individuals who do one pro-environmental behavior are subsequently more likely to engage in other pro-environmental behaviors). Some evidence from psychology suggest the opposite is also possible (moral licensing), but one meta-analysis shows that spillover is generally more likely than moral licensing: Truelove et al 2014 (Positive and negative spillover of pro-environmental behavior: An integrative review and theoretical framework); and Maki et al. 2019 (Meta-analysis of pro-environmental behaviour spillover)	Noted. Section on Rebound now deleted due to space limitations.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
37337	87	13	87	26	It seems there must be a distinction as well between rebound effects in an unbounded system (energy efficiency where other outlets and sources of energy consumption are available) vs a bounded system such as would be the case under carbon policies (a cap, for example) in which no "room" is left for the rebound to occur along that dimension (carbon emissions). I don't know of specific literature in this direction, but can't imagine that the distinction hasn't been made.	Noted. Section on Rebound now deleted due to space limitations.	Michiel Schaeffer	Climate Analytics	Netherlands
11737	87	16	87	16	Comment: author is Sorrell (2007), not Sorrel (2007)	Noted. Section on Rebound now deleted due to space limitations.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
11739	87	17	87	18	"First, the rebound effect is real, highly variable, but generally low (10-30% of anticipated energy savings)." Comment: The research has moved on a great deal since then. Many of the early studies referred to direct and indirect rebound. There are now a wide range of empirical studies which study all aspects of rebound, including economy-wide / macro rebound. Their results suggests that the total, economy-wide rebound may be much higher, above 50%. This more recent literature should be reflected in this paragraph. examples fall into two camps of CGE models and other/non-CGE models. For CGE models, e.g. Böhlinger C, Rivers N. The energy efficiency rebound effect in general equilibrium. CESifo Working Paper Series No. 7116. 2018;54. Available from: <a href="https://www.econstor.eu/handle/10419/179795">https://www.econstor.eu/handle/10419/179795</a> ; Broberg T, Berg C, Samakolis E. The economy-wide rebound effect from improved energy efficiency in Swedish industries-A general equilibrium analysis. Energy Policy, Elsevier; 2015;83:26–37; Duarte R, Sánchez-Chóliz J, Sarasa C. Consumer-side actions in a low-carbon economy: A dynamic CGE analysis for Spain. Energy Policy, 2018;118:199–210. Available from: <a href="https://doi.org/10.1016/j.enpol.2018.03.065">https://doi.org/10.1016/j.enpol.2018.03.065</a> For non-CGE models, e.g. Bruns, S. B., Moneta, A., & Stern, D. I. (2019). Macroeconomic Time-Series Evidence That Energy Efficiency Improvements Do Not Save Energy. CAMA Working Paper 21/2019 February 2019. Saunders, H. D. (2015). Recent Evidence for Large Rebound: Elucidating the Drivers and their Implications for Climate Change Models. The Energy Journal, 36(1), 23–48.	Noted. Section on Rebound now deleted due to space limitations.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
4957	87	17	87	26	Though estimates of the direct rebound effect in developed economies are low as stated estimates of the economy-wide rebound are often large, though as you correctly state there is more uncertainty about these. I think you should at least give some range of estimates for economy wide rebound. If rebound is around 100% as some studies (including our own <a href="https://ideas.repec.org/p/ssa/lemwps/2019-27.html">https://ideas.repec.org/p/ssa/lemwps/2019-27.html</a> ) find then the policy implications are quite different than stated here. I am happy to send a copy of a survey paper: "How Large is the Economy-Wide Rebound Effect?" I recently submitted to Energy Policy (they invited it) on this topic. There are also several papers by Harry Saunders on this topic or Sorrell's 2009 paper in Energy Policy, which you don't cite.	Noted. Section on Rebound now deleted due to space limitations.	David Stern	Australian National University	Australia
9991	87	17	87	26	Third, the rebound effect and the Jevons paradox hold differently across energy efficiency measures and stages of technological diffusion: - Sorrell, S. (2009). Jevons' Paradox revisited: The evidence for backfire from improved energy efficiency. Energy policy, 37(4), 1456-1469.	Noted. Section on Rebound now deleted due to space limitations.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
15023	87	18	87	18	is 10-30% low?	Noted. Section on Rebound now deleted due to space limitations.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
11741	87	21	87	23	"Lastly, confidence and robustness in rebound effect estimates as well as their magnitude decrease when moving from direct to indirect, and from micro- to macro-level analyses". Comment: This is simply not true, certainly in terms of the magnitudes of rebound effects. Please see earlier comment on lines 17-18 above. There is growing evidence that overall, economy-wide rebound is much higher than we have thought. if you place Gillingham et al text in here, then you should also be adding that there is growing evidence of large, economy-wide rebound.	Noted. Section on Rebound now deleted due to space limitations.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
44295	87	23	87	26	The assessment of policies, which help to reduce the rebound effect can be found in: Ruzzenenti, F., Bertoldi, P. Energy Conservation Policies in the Light of the Energetics of Evolution. In Complex Systems and Social Practices in Energy Transitions; Green Energy and Technology; Labanca, N., Ed.; Springer: Cham, Switzerland, 2017	Noted. Section on Rebound now deleted due to space limitations.	BERTOLDI PAOLO	European Commission	Italy
10863	87	27	87	27	One important consideration that should be added to the discussion is consideration of the potential for changes in public attention to climate change and the effects of this on the effectiveness of demand-side measures. The world is currently at a high level of consciousness on climate change and arguably more receptive to demand-side measures but there is no guarantee that this will continue. Some discussion is needed, therefore, to the implications of declining public attention, building perhaps on Downs' (1972) article, Up and Down with Ecology the issue attention cycle. There is a small amount of additional literature, mostly examining the strength of the cycle and its effects on policy activity that I can supply if this idea is taken up. Alternatively, I can provide some brief text so that the issue is considered without disrupting the chapter significantly.	Accepted. Text has been added on attention cycles, and how these may go up as well as down (as appears to have happened due to the Covid-19 pandemic)	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
38225	87	44	87	44	Typically, LEDs is a shift towards a completely different technology (see comment #14 on the warning about mixing-up ASI measures)	Rejected. LEDs have indeed a different technological knowledge base, but are still part of the same mode of provision as incandescent lightbulbs (namely electric lighting). LEDs are thus an improvement of the existing mode of provision. Similarly, electric vehicles are an efficiency improvement of existing petrol or diesel cars. We define 'shift' as a different mode of provision (e.g. public transport instead of cars, daylighting instead of electric lighting)	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
24447	87	34	88	17	These paragraphs linking ASI to demand-side mitigation challenges are very helpful. However: (1) Table 5.6 runs out of steam a bit in the comparative synthesis by labelling most of the cells "substantial", "somewhat", "limited", and (2) if the agency-structure-meaning lens is preserved, would this not a helpful lens to explain why different feasibility criteria apply to the ASI strategies? Most particularly, structure is slower to change, so those ASI strategies which rely on material or social structures changing are less feasible.	Accepted. Some of the cells in Table 5.6 have been rewritten using clearer labels. The columns in Table 5.6 now align with the five analytical dimensions from section 5.4.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
41973	87	4			"thermal comfort, mobility" (within brackets) should be complemented with "energy efficient la,mps", which are a good example of an energy efficient technology which could eventually raise energy consumption	Noted. Section on Rebound now deleted due to space limitations.	Francisco Javier Hurtado Albir	European Patent Office	Germany
3865	87	12			the last bracket is missing	Noted. Section on Rebound now deleted due to space limitations.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3867	87	16			3 references to be harmonized with previous ones	Noted. Section on Rebound now deleted due to space limitations.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
12625	87	26			the paragraph on rebound effect end by saying we should have policy to account for rebound effect. Which is fine, however up until now we have not seen any policy, which actually works as regards this. This should be reflected in the chapter to acknowledge that these things are difficult to change. The chapter overall end up being over-optimistic in its approach	Noted. Section on Rebound now deleted due to space limitations.	Gram-Hanssen Kirsten	Aalborg University	Denmark
999	87	28			have very high mitigation potential	Accepted. Added 'very' in the text.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
13681	88	3	88	4	First opened bracket needs closing	Accepted. Closing bracket has been added.	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
22801	88	9	88	12	"Shift and avoid options ... face larger feasibility barriers in the case of ... restricting long-haul flights". I wonder if the ongoing coronavirus pandemic shows that demand for air travel is actually much more amenable to reduction than we make it to be.	Noted. But if the enactment of some policy measure requires hundreds of thousands of deaths, the feasibility barriers are arguably high.	Giulio Mattioli	TU Dortmund University	Germany
34487	88		88		On table 5.6, it seems that the given examples don't respect the ASI classification. For instance are electrical vehicles an improve or a shift ? It would be relevant to separate sufficiency and efficiency. See our comment 12	Rejected. Shift is defined as a switch to a new mode of provision (e.g. from private cars to public transport). Although electric vehicles are a radically new technology, they constitute climate-relevant improvements of existing vehicles (not a shift towards a new mode of provision).	Emmanuel RAUZIER	NGO Association negaWatt	France
38227	88		88		Here as well, ASI measures are mixed-up. Electric vehicles is typically a shift towards a different technology and a different energy source. It's not an improvement of combustion engines (see comment #14).	Rejected. Shift is defined as a switch to a new mode of provision (e.g. from private cars to public transport). Although electric vehicles are a radically new technology, they constitute climate-relevant improvements of existing vehicles (not a shift towards a new mode of provision).	Yamina Saheb	OpenExp, Ecole des Mines de Paris	France
11977	88	18	89	1	This table is useful - please retain and consider adding more material if possible	Noted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway

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3869	88	4			One bracket is missing	Accepted. Missing bracket has been added.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
46765	89	18	89	18	please consider adding after "adoption subsidies (e.g." the words "e.g. for bicycles, cargo-bikes, deep retrofit of buildings including wall insulation"	Accepted	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
44297	89	18	89	19	One of the most successful information policies for energy efficiency of appliances is the EU energy labelling now in force for almost 30 years. A description is in: Chapter 2 - Policies, Recommendations and Standards (International Technical Standards, Main Laws and Regulations; EU Directives; Energy Labeling), Editor(s): Francesco Asdrubali, Umberto Desideri, Handbook of Energy Efficiency in Buildings, Butterworth-Heinemann, 2019, Pages 5-73, ISBN 9780128128176, <a href="https://doi.org/10.1016/B978-0-12-812817-6.00002-4">https://doi.org/10.1016/B978-0-12-812817-6.00002-4</a> , ( <a href="http://www.sciencedirect.com/science/article/pii/B9780128128176000024">http://www.sciencedirect.com/science/article/pii/B9780128128176000024</a> )	Noted. We have included this discussion in section 5.6.2.	BERTOLDI PAOLO	European Commission	Italy
16253	89	2			In Section 5.4.6 Policy and Governance, consider adding a description of government institutions (e.g. militaries, agencies) and the scope of the impact of their internal cultures and policies on GHG emissions, for emphasis.	Noted. The text has been revised to include governance, wellbeing and trust. But we don't go into great detail about internal cultures and policies as it is beyond the scope of the section.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
10865	90	1	90	8	The list of options for policy and governance interventions would benefit from the addition of citations. Bailey, I. and Compston, H. (2012) Feeling the Heat: The Politics of Climate Policy in Rapidly Industrializing Countries, Basingstoke, Palgrave Macmillan covers most of the options discussed in its introduction chapter but references to individual techniques could also be used to link to more specific demonstrations whether these techniques have been used.	Noted. But there is more recent reference.	Ian Bailey	University of Plymouth	United Kingdom (of Great Britain and Northern Ireland)
46767	90	3	90	3	please consider adding after " regulation and standards (e.g. for building, cars, appliances, cycling infrastructure)	Accepted.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
48125	90	8	90	21	this paragraph is very important and needs more unpicking. The reason that policies are focused on improve and not so much on shift and avoid are of course that shift and avoid often interfere with the convenience, comfort, usability, desirability of end use equipment. This can create political pushback. In democratic countries, political pushback over policies can bring down governments. In non-democratic countries strongly pushing on society to achieve an unpopular set of changes is also risky. But mass demand side changes will not happen without strong and consistent policy making, as we see how little has been achieved on the demand side so far. The realities of realpolitik are important to understand.	Noted. This is a good point and in the revised text, we have we have reflected on the realities of 'realpolitik' in relation with shift and avoid.	Rachel Freeman	University College London, Energy Institute	United Kingdom (of Great Britain and Northern Ireland)
11979	90	9	90	16	These are important points - please consider lifting to the exec summary	Noted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
44299	90	12	90	14	This is a very important statement that should be also highlighted in the Executive Summary. To strongly support this statement you can quote Paolo Bertoldi, Are current energy efficiency policies promoting a change in behaviour, conservation and sufficiency in line with the Paris Agreement? Review of existing policies and recommendations for new and effective policies, 2020 (forcoming in Energy Policy).	Noted. In the re-write, we have used the suggested reference to link energy efficiency policies with behaviour change and conservation as a response to the Paris Agreement.	BERTOLDI PAOLO	European Commission	Italy
44301	90	14	90	16	I tend to disagree with this statement, in many jurisdiction the most common policy instrument for energy efficiency is regulation. I suggest to delete the sentence.	Accepted.	BERTOLDI PAOLO	European Commission	Italy
25037	90	33	90	33	Delete "for cheap petrol or fuel oil"	Accepted.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
31771	90	41	90	41	It is not clear why "higher energy bills" and "household emissions" are mentioned as trade-offs for compact urban planning. Would be good to explain.	Accepted, text revised	Ashok Sreenivas	Prayas (Energy Group)	India
11981	90	40	91	1	This is a useful table, but please consider adding possible related policy instruments	Accepted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
29093	90	41	91	1	The co-benefits overlap with content in the sectoral chapters. Could stay here but please review Section 8.7.1 and Table 10.9	Noted.	Minal Pathak	Ahmedabad University	India
29437	90	41	91	1	Table 5.7 could also appear much higher up to better illustrate the ASI framework from the start.	Noted. We are doing just that, and produced an integrated table with earlier sections.	Stefan Pauliuk	University	Germany
22803	90	41			Table 5.7: it confusing that transport policies are reported both in the first ("Human settlement") and second row ("Mobility")	Noted. The table has been adjusted to reflect the different policy entrypoints for 'human settlement' and 'mobility'	Giulio Mattioli	TU Dortmund University	Germany
30585	91	0	91	0	This table emphasizes "promoting vegetarian or low carbon diet" (see comment 19 about vegetarianism vs. other dietary shifts) and also "locally grown food" (see comment 10 about effectiveness of local food purchasing for climate mitigation).	Noted. Table adjusted for a range of policy interventions.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
41975	91				Potential improvements for the text in first column (from right), first row "no access or difficult access to ICT"	Noted. Table reviewed and integrated with other sections.	Francisco Javier Hurtado Albir	European Patent Office	Germany
41977	91				Potential improvements for the text in second column (from left), second row "improving aerodynamics, data processing aiming to efficiency improvement, optimisation of rolling resistance, weight reduction , new materials for tyres, improvements to bearings, optimized components or subsystems (e.g. lighting, actively controlled glasses), energy harvesting concepts as power supply for auxiliaries' energy consumption (e.g. photovoltaic sun-roof)"	Noted. Table reviewed and integrated with other sections.	Francisco Javier Hurtado Albir	European Patent Office	Germany
41979	91				Potential improvements for the text in first column (from right), third row "no access or difficult access to "Economic impact on livestock industries if meat consumption is reduced"	Noted. Table reviewed and integrated with other sections.	Francisco Javier Hurtado Albir	European Patent Office	Germany
22805	92	7	92	15	There are also important limits to what spatial planning policies can achieve with regard to climate mitigation - for a review see: Holz-Rau, C., & Scheiner, J. (2019). Land-use and transport planning—A field of complex cause-impact relationships. Thoughts on transport growth, greenhouse gas emissions and the built environment. Transport Policy, 74, 127-137.	Accepted. Revised text includes the limitations of spatial planning for GHG reduction.	Giulio Mattioli	TU Dortmund University	Germany
22807	92	7	92	15	A limitation of spatial planning measures is that they are very long-term, so too slow relative to the urgency of climate mitigation	Accepted. This point is reflected in the section dealing with transitions.	Giulio Mattioli	TU Dortmund University	Germany
22809	92	7	92	15	It would be good if the discussion of spatial planning measures could highlight important differences between countries that are experiencing rapid urbanisation (where it's a question of how to plan urban expansion), and those where this is not the case (where it's a question of retrofitting existing urban structures)	Noted. This is discussed in length in the chapter on human settlements.	Giulio Mattioli	TU Dortmund University	Germany
15025	92	13	92	13	"In getting the However" typo	Noted.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
25039	92	13	92	13	Delete "In getting the"	Noted.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
15027	92	16	92	31	Here or elsewhere it would be useful to explain the range of polities involved in policy and governance. For example, cities are mentioned without explicit acknowledgement that policies are made and implemented from global to local.	Accepted. This is addressed in the re-write where we deal with policy packages and sequencing.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
31773	92	43	92	44	Is there likely to be a conflict between such approaches of using local materials etc. and having high-density urban forms - as local materials may not permit, say, high-rises?	Rejected. This is beyond the scope of this short policy section.	Ashok Sreenivas	Prayas (Energy Group)	India

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3871	92	3			"Table 5.7" to remove	Rejected. No reason provided for the suggestion.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3873	92	13			I do not understand "In getting the However"	Noted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
6675	93	6	93	6	Subheadings could be used to break up this section. For example, "Shift" could be a subheading for this section.	Noted. The text is re-written with distinct separations.	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
15029	93	8	93	9	Here it would be good to also cite Willet. Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A. and Jonell, M., 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. The Lancet, 393(10170), pp.447-492.	Accepted.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
18531	93	8	93	9	Propagating a shift away from all meat may be too simplistic: it is beef that seems to be the big polluter, other types of meat seem to be far less problematic (and many types of plant-based products can be worse) in terms of contribution to greenhouse gasses. There are other environmental considerations to take on board as well: avocados and various types of mushroom require far more water than virtually all animals/meat (beef again excluded) - as far as water goes, eating meat (other than beef) seems to be better for the environment than a hipster diet.	Noted. This is a good point that has been brought in the re-write of the section.	Marcel Wissenburg	Radboud University, Nijmegen, The Netherlands	Netherlands
30587	93	9	93	18	Might be worth emphasizing that while studies have shown that eating in accordance with NRDs may reduce the GHG emissions associated with diets in high-income countries, currently recommended diets would not reduce the impacts enough to align with targets established by the EAT-Lancet Commission to help ensure that the UN Sustainable Development Goals (SDGs) and Paris Agreement are achieved. The EAT-Lancet Commission proposed a global greenhouse gas (GHG) emissions target of 5 Gt CO <sub>2</sub> e/year for sustainable food production by 2050 (Willett et al., 2019), or 514 kg CO <sub>2</sub> e/capita/year (uncertainty range: 483–555 kg CO <sub>2</sub> e/capita/year). Previous studies have estimated that diets aligned with the United States' Dietary Guidelines for Americans, for example, as currently defined using standard food patterns, require 657 (Behrens et al. 2017) to 1314 (Heller & Keoleian 2014) kg CO <sub>2</sub> e/capita/year to 1579 kg CO <sub>2</sub> e/capita/year (Ritchie et al 2018). Of the 7 NRDs that Ritchie et al (2018) assessed, none were low enough to stay within the recommended GHG limit proposed by Willett et al (2019).	Noted.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
30589	93	18	93	21	The policies listed for "shifting away from meat diet and engage in food consumption that falls in line with low carbon futures" are not necessarily listed in order of effectiveness for climate mitigation (nor are all of them necessarily climate mitigation strategies).	Noted.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
44303	93	21	93	23	The statement is not correct, the policies described in the previous section are information policies and not market based policies. I suggest to introduce the concept of taxation, i.e. tax on fossil fuel energy, tax on meat and other food with high GHG emissions. In Chapter 9 the concept of Personal Carbon Allowances is introduced.	Accepted	BERTOLDI PAOLO	European Commission	Italy
31775	93	22	93	23	Governments can also use regulations, taxes/subsidies etc. to influence behaviour - so not sure it's correct to say that they have a limited role to play.	Noted. We have adjusted this in the re-write	Ashok Sreenivas	Prayas (Energy Group)	India
30591	93	26	93	28	Food procurement for food services is another prime upstream action that could lead to structural dietary changes.	Noted.	Raychel Santo	Johns Hopkins Center for a Livable Future, Bloomberg School of Public Health	United States of America
22811	93	29	93	32	I strongly disagree that "the transport sector is one of the key areas where ... measures have been implemented successfully as part of the effort for a behavioural shift", and I don't think the Gehl 2011 reference provided is robust enough for such a strong statement. Transport is "the fastest growing emitting sector in the world" (quote from the Transport Chapter) and its emissions have stagnated or increased even in Europe - I don't see how this can be reconciled with the sentence here.	Noted. We have looked further than Gehl, but the point the text is making is that emissions reduction benefits have been registered from transport policies, in several cities.	Giulio Mattioli	TU Dortmund University	Germany
44305	93	34	93	34	add Milan in the list of cities with congestion charges.	Accepted	BERTOLDI PAOLO	European Commission	Italy
22813	93	34	93	38	Congestion charging has had a positive effect, but a decline in car ownership and use has been observed in many large cities in the Global North, regardless of whether they implemented such measures or not (see e.g. Paris), even though these are typically offset by increases in car ownership and use in periurban and rural areas. More broadly, in countries and places where this decrease has been observed, it is generally due to trends (e.g. socio-demographic) that have little to do with deliberate policies - on this see Marsden, G. R., Dales, J., Jones, P., Seagriff, E., & Spurling, N. (2018). All Change? The future of travel demand and the implications for policy and planning.	Noted. Still we cannot deny that the introduction of congestion charges has helped cities where those policies were introduced to lower their emissions.	Giulio Mattioli	TU Dortmund University	Germany
26529	93	34	93	41	This is a rather overarching comment, but it must be said that much of the discussion (apart from that relating to cooking stoves and mobile phones) emanates from, and probably only has relevance for, the Global North and the economic powerhouses of the Global South (China etc). In part, this is likely to be because so much of the literature and debates (around sustainability transitions, for instance) is coming from the 'usual suspects' in western European universities. To take an example: the context where financial incentives can be used to push people towards use of alternative means of mobility only really holds in cities of the global north, and much less so in the congested cities of the global south where a) people can't afford to be penalised for driving dirty vehicles, b) there is no public transport and no short-term possibility of public transport to fall back on, and c) there is little government will or capacity to implement such measures, amidst corruption and general poor governance. Exceptions, in a few major Capital cities, are mentioned (Bogota, Buenos Aires and Santiago) but this almost proves the point, because those are the rare economic power-houses, amidst innumerable small- to medium-sized cities which will neither make headlines, nor be able to implement such measures.	Noted. The comment is fair and correct. The decarbonisation pathways of different countries will be different.	Thomas Smith	Masaryk University	Czech Republic
3875	93	6			(see Table 5.7)	Noted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3877	93	14			meaning of NRDs	Noted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
22815	94	13	94	23	This report of the International Council for Cleaner Transportation has looked into financial policies for EV diffusion, comparing Norway with other countries: <a href="https://theicct.org/publications/using-vehicle-taxation-policy-lower-transport-emissions">https://theicct.org/publications/using-vehicle-taxation-policy-lower-transport-emissions</a>	Noted. Thank you.	Giulio Mattioli	TU Dortmund University	Germany
26527	94	21	94	23	Linking precisely to my previous point - Norway is a rich, European economy which is soaked in oil. Fossil fuels are the entire basis for its wealth, so looking towards these policies is really to lose all perspective.	Noted. Still Norway's example in EV is what we are assessing here.	Thomas Smith	Masaryk University	Czech Republic
44307	94	24	94	31	Provided that electricity is decarbonised.	Noted.	BERTOLDI PAOLO	European Commission	Italy
45901	94	31	94	31	please consider adding after: "(Cherry et al. 2016)" the sentence:  "the shift to electric vehicles might not bring substantial benefits if the mass of individual cars continues to grow, since high mass is source of energy waste due to the disproportion between the transported mass of 1 to 2 people and the vehicle mass (IEA Energy Outlook 2019, Growing preference for SUVs challenges emissions reductions in passenger car market Laura Cozzi Apostolos Petropoulos; <a href="https://www.iea.org/commentaries/growing-preference-for-suvs-challenges-emissions-reductions-in-passenger-car-market">https://www.iea.org/commentaries/growing-preference-for-suvs-challenges-emissions-reductions-in-passenger-car-market</a> ), of danger for pedestrian and cyclists, of large non-exhaust emissions of PM10 and PM <sub>2.5</sub> . In fact a review of studies on PM emissions concludes for an almost equality of emissions when comparing cars with an electric engine with cars with a modern internal combustion engine, due to the prevalence of particulate emissions generated by tire and brake wear, and dust resuspension from the ground, all proportional to the vehicle's mass (Timmers et al. 2016).  Timmers, Victor R.J.H., and Peter A.J. Achten. "Non-Exhaust PM Emissions from Electric Vehicles." Atmospheric Environment 134 (June 2016): 10–17. <a href="https://doi.org/10.1016/j.atmosenv.2016.03.017">https://doi.org/10.1016/j.atmosenv.2016.03.017</a> .	Noted. The text has been re-written; text and the reference in the re-write.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
3881	94	44	95	2	This sentence has no verb	Accepted	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3879	94	35		39	Please to cut the sentence	Rejected. No reason provided for the request.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
31777	95	28	95	30	But there is a risk that going the DESCO route would trap many households into a low level equilibrium where they cannot move up to services such as, say, washing machines and refrigerators, that are important for DLS. This should also be mentioned.	Noted. Good suggestion.	Ashok Sreenivas	Prayas (Energy Group)	India

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6677	95	29	95	32	Please clarify that PAYG in this context refers to solar installations. PAYG is also used heavily in Africa as an electricity service provision plan. In general, prepaid plans in developing countries (and most of the world) are not connected to smart devices, but use a keypad system instead. If the author does wish to discuss prepaid electricity as a potential option for reducing electricity consumption, he or she should explain both the pros and cons of this service, including the potential of energy deprivation among extremely budget-constrained customers alongside the potential for savings among others. However, more research is needed on prepaid electricity plans to understand why they reduce consumption: <a href="http://mn.gov/commerce-stat/pdfs/card-examining-potential-for-prepay.pdf">http://mn.gov/commerce-stat/pdfs/card-examining-potential-for-prepay.pdf</a>	Noted. Good point raised. We have reflected this in the rewrite	Reuven Sussman	American Council for an Energy-Efficient Economy	United States of America
13683	95	42	95	42	Degrees C figure needs editing	Noted.	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
3883	95	20			US or USA?	Rejected. US and USA are used interchangeably.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3885	95	27			a dot is missing at the end of the line	Noted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3887	95	35			erase were	Accepted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
3889	95	36			meaning of SH5	Accepted.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
15033	96	9	96	37	This box mentions progressiveness in terms of revenue use, but not in terms of payment of the tax - this is a major fairness issue	Accepted. Revised box content.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
22819	96	9	96	37	The Box is titled "Carbon pricing and fairness" but it discusses mostly *acceptability* and related *perceptions* of fairness among the population. The question of how many /who would be disadvantaged by such measures is rather underdiscussed. In the transport sector, recent studies have developed indicators of vulnerability to fuel price increases - see e.g.: Mattioli, G., Wadud, Z., & Lucas, K. (2018). Vulnerability to fuel price increases in the UK: A household level analysis. Transportation Research Part A: Policy and Practice, 113, 227-242; Mattioli, G., Philips, J., Anable, J., & Chatterton, T. (2019). Vulnerability to motor fuel price increases: Socio-spatial patterns in England. Journal of Transport Geography, 78, 98-114. The first study shows that roughly half of low income households would be badly affected, while the other half not at all (as they do not own/use cars). This questions traditional analysis of the progressivity/regressivity of carbon taxes, as these tend to mask variation "within income groups" - in other words, a fuel price increase could still have important (and possibly unfair) effects even if, in the aggregate, it was considered as "progressive". It also means that, if revenue was redistributed to households below a certain income, this would still be problematic, as it would result in an income transfer from low-income households with cars to low-income households without it	Accepted. Revised box content.	Giulio Mattioli	TU Dortmund University	Germany
44309	96	9	96	37	Carbon pricing is substantially discussed also in Ch.9 in particular the recycling of the revenues.	Accepted. Revised box content.	BERTOLDI PAOLO	European Commission	Italy
13685	96	13	96	14	The statement here sounds like stating the blindingly obvious - so not sure it's worth flagging up in a box in an IPCC assessment.	Accepted. Revised box content.	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
15031	96	15	96	15	Carbon pricing is the most "efficient" way to reduce emissions only if various assumptions are made and definitions are given - for example about what efficient means.	Accepted. Revised box content.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
25041	96	15	96	18	Revise "While carbon pricing ... Klenert et al. 2018)." as this statement is not aligned with sustainable development and equity related issues	Accepted. Revised box content.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
22821	96	21	96	22	An interesting studies on carbon pricing, its impact on energy poverty, and how it can be made progressive is: Berry, A. (2019). The distributional effects of a carbon tax and its impact on fuel poverty: A microsimulation study in the French context. Energy policy, 124, 81-94.	Accepted. Revised box content.	Giulio Mattioli	TU Dortmund University	Germany
2635	96	28	96	37	The "gilets jaunes" crisis in France in fall 2019 illustrates well a case where the Gouvernement, having neglected to act as suggested on lines 31-32 and 34-35, was faced with an opposition so strong that the projected tax increase on gas had to be abandoned.	Accepted. Revised box content.	Philippe Waldteufel	CNRS/IPSL/LATMOS	France
13687	96	30	96	37	The comment here might be further extended to include some comment on 'allowable solutions' as restricted geographically, e.g. within local administrative boundaries, so public support can be reinforced through being able to see funding generated through carbon 'taxes' is being recycled locally.	Accepted. Revised box content.	Keith Baker	Built Environment Asset Management (BEAM) Centre, Glasgow Caledonian University	United Kingdom (of Great Britain and Northern Ireland)
1001	96	15			Carbon pricing is the most efficient way to reduce emissions'. Very disputable...	Accepted. Revised box content.	Ian Gough	London School of Economics	United Kingdom (of Great Britain and Northern Ireland)
22817	96	15			"carbon pricing is the most efficient way to reduce carbon emissions" - this is in contradiction with much of the rest of the chapter, where it's been repeatedly said that carbon pricing is a highly limited and difficult to implement measure.	Accepted. Revised box content.	Giulio Mattioli	TU Dortmund University	Germany
3891	96	16			meaning of LCA : life cycle analysis?	Yes.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
11983	97	1	97	39	This is a useful and succinct summary of the knowledge gaps - please retain	Accepted.	Maria Malene Kvalevåg	Norwegian Environment Agency	Norway
25667	97	3	97	9	This paragraph could be clarified. You say that 'Climate solutions remain supply-side...' but what I think the authors mean that the models have all been supply-side whilst the actual solutions looks likely to be demand-side.	Accepted. Modified accordingly.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
25669	97	3	97	9	Similar to p.9 lines 9-16, you say that the problem is that the models don't acknowledge the GDP loss to climate, but then in the next sentence criticise the use of GDP as an inadequate measure of wellbeing. To be consistent with your critique of GDP as a metric it might be better to say something like: "the current models don't acknowledge the reduction in wellbeing due to climate impacts".	Accepted. Modified accordingly.	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
25671	97	3	97	9	Since a reduction in demand is broadly advocated in this chapter it seems to me that a major 'knowledge gap' is how to manage an economy with declining or constant demand. The classic literature to cite in this regard would be Jackson 'Prosperity without growth', Victor 'Managing without growth' and Kallis, Kerschner, Martinez-Alier 'The economics of degrowth' Ecological Economics.	Accepted. The chapter not necessarily embraces Jackson and Victor (who also focus a lot on growth, albeit negatively). The focus is on improving wellbeing. Text added: "The working of economic systems under a wellbeing paradigm requires better understanding. "	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
15035	97	5	97	5	I guess "GPD" should be "GDP"	Accepted, text has been revised	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
45587	97	6	97	6	The claim that GDP should not be used as a measure of wellbeing and the implication that climate policy should be based on living standards etc is somewhat seismic in the mitigation modelling community. This should be given greater prominence and also its novelty/implications discussed.	Accepted. However, there are stringent space constraints. Section 5.2 includes a short discussion on this.	Daniel Crow	International Energy Agency	France



Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
46617	97	10	97	17	The digitalization footprint is really the main uncertainty to achieve a sustainable transition. It addresses considerations on: (i) theoretical considerations on the link between entropy and information; (ii) state of the art for IT technology; and (iii) technological breakthrough, particularly spintronic.	Agreed but rejected. The statement is true but the specifics are beyond the scope of this chapter.	Vincent MAZAURIC	Schneider Electric / International Chamber of Commerce (ICC)	France
24449	97	19	97	26	Is this related to structure being more 'inert' than agency (from the lock-in section).	Rejected. Discussion on structure vs agency and respective time scales is beyond the word limits of this KG.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
15037	97	28	97	28	"required in" should be "required on"	Accepted.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
24451	97	28	97	39	This knowledge gap comes close to saying "we don't know how agency-structure-meaning help us understanding services-based mitigation". Which is another good reason to delete the whole agency-structure-meaning section!	Accepted. That section had been deleted/strongly modified.	Charlie Wilson	Tyndall Centre for Climate Change Research	United Kingdom (of Great Britain and Northern Ireland)
48127	97	28	97	39	knowledge gap 4 should include the real challenges in policy making and achieving a positive response to policies from society, and industry. Policies don't stop when they are launched. They require a good deal of public cooperation, and the more you ask from people, the more you need to understand about how to bring them along. Don't assume cooperation with occur.	Accepted. Spirit of the comment is reflected now in knowledge gap 3 and 4 in the revised second order draft	Rachel Freeman	University College London, Energy Institute	United Kingdom (of Great Britain and Northern Ireland)
46763	97	39	99	1	please consider adding after "... enables flexibility in behavior" the sentence: "and provides large individual and societal health benefits (Pucher j et al. 2010).  John Pucher, Ralph Buehler, David R. Bassett, Andrew L. Dannenberg, John Pucher is with the Bloustein School of Planning and Public Policy, Rutgers University, New Brunswick, NJ. Ralph Buehler is with the School of Public and International Affairs, Virginia Tech, Alexandria, VA. David R. Bassett is with the Obesity Research Center, University of Tennessee, Knoxville. Andrew L. Dannenberg is with the National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, GA. "Walking and Cycling to Health: A Comparative Analysis of City, State, and International Data", American Journal of Public Health 100, no. 10 (October 1, 2010): pp. 1986-1992.	Reject. The FAQs have changed substantially in the Second order draft and the sentence deleted in revised draft.	Lorenzo Pagliano	Politecnico di Milano, Energy Department, end-use Efficiency Research Group	Italy
3893	97	1			The whole section 5.5 can be seen like the conclusion of the chapter 5	Noted. No further action required.	Catherine MACOMBE	INRAE Institut national de la recherche agronomique et de l'environnement	France
22823	97	1			The section jumps right into a list of knowledge gaps - it needs a paragraph of introduction	Rejected. No space available.	Giulio Mattioli	TU Dortmund University	Germany
46267	97	5			Type: it should be GDP and not GPD: "(... )against GDP, without acknowledging the GPD loss due to climate impacts."	Accepted, text has been revised	Amin Hasanein	Islamic Relief Deutschland	Germany
41981	97	17			In view of the high energy consumption originated because of crypto-currency ("bitcoins") mining, the final sentence should word "implications on materials and energy demand". This covers also energy consumption derived from ICT technologies manufacturing	Accepted, text has been revised	Francisco Javier Hurtado Albir	European Patent Office	Germany
15039	98	1	98	1	FAQ 5.1 should read "What can policy makers do to change behaviour?"	Rejected. This chapter is about people, not about policy makers. There are more roles where people can make a difference.	Robert Oakes	United Nations University Institute for Environment and Human Security	United Kingdom (of Great Britain and Northern Ireland)
18533	98		98		Under FAQ 5.1 it say: "The choice of instruments depends on the effects on wellbeing, and optimal policy mix depends on the context. " No it bloody doesn't, or at least should not. It should depend on how much respect you have for your citizens and their views of the good life (see chapter 1 of this report). It should depend on whether people actually want the kind of transformation and kind of society created thereby. This text, as it now stands, reminds me of the inhuman purely technocratic approach of previous IPCC reports, and is not in line with the promise made in chapter 1 that you will recognize the essential role of ethical and political-philosophical considerations. NB: It is worthwhile to check the entire report for similar traces of technocratic totalitarianism. I do not have the time. (See for example FAQ 5.2 where it is suggested that ethical values that do not conform to the ideology of the authors of this chapter ought to be perceived as obstacles and, apparently, be rejected/eradicated/overruled. Horribly intolerant! Apparently 'inclusive and participatory processes' only have value if they deliver the "right" outcome.)	Partially accepted. Accepted in the sense that the sentence has been deleted (irrespective of this comment, the comment is not right in interpreting this sentence as technocratic totalitarianism; outcome evaluations are part of policy processes, and also part of participatory processes). Accepted also that technocratic policy making is not a winning recipe. Rejected in the sense that the comment shows a lot of emotions but does not specifically proof the allegations. The authors of this chapter spend some time considering what was meant here. Possibly, it amounts to a position that a clear liberal view, accompanied with a restraint principle, is adequate and sufficient to motivate climate policies. There is some validity in this perspective. There is also substantial critique in liberal philosophy, and sound argument for an eudaimonic perspective. This chapter does not want play judge here but simply highlight climate mitigation implications as if wellbeing mattered.	Marcel Wissenburg	Radboud University, Nijmegen, The Netherlands	Netherlands
25043	98		98		In FAQs delete any reference to "green energy"	Accepted.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
25045	98		98		In FAQs replace "subsidies for cheap petrol" with "inefficient subsidies"	Rejected.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
35745	98				FAQ 5.3. This box creates the impression that if we simply tried to forget GDP growth and concentrate on other goals, we would succeed without problems. This is absolutely not the case! Current economies are structurally dependent on growth, so there will be HUGE conflicts if we try to go away from the growth-based paradigm. For instance: without growth, unemployment usually rises, international competitiveness of countries is reduced, debt becomes more expensive, pension systems are more difficult to sustain, elections are more difficult to win, business confidence is low, and a negative spiral starts. Some references: <a href="https://www.sciencedirect.com/science/article/abs/pii/S2210422413000038">https://www.sciencedirect.com/science/article/abs/pii/S2210422413000038</a> , <a href="https://www.sciencedirect.com/science/article/pii/S0016328718300715">https://www.sciencedirect.com/science/article/pii/S0016328718300715</a> <a href="https://www.sciencedirect.com/science/article/abs/pii/S0921800914002699">https://www.sciencedirect.com/science/article/abs/pii/S0921800914002699</a> <a href="https://www.sciencedirect.com/science/article/abs/pii/S0921800917317093">https://www.sciencedirect.com/science/article/abs/pii/S0921800917317093</a>	Rejected. There is not enough space to outline this debate. Aspects now considered in 5.6	Miklós Antal	Eötvös Loránd University	Hungary
42135	98				FAQ5.3 - is demand reduction compatible with economic growth - the chapter starts well I think in 5.1.1 and 5.1.2 but really needs to nail this on the head in the chapter - and at the moment it has not done this	Accepted. Considering how to more systematically address this question.	Catherine Mitchell	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
25673	99	1			The chapter ends "The question of economic growth recedes into irrelevance if this twin goal [of wellbeing for all and reducing GHG emissions] is properly conceptualized." In anticipation fo future challenges to this argument it may be worth including a more sustained defence of it, such as to be found in are Kallis and Van Den Bergh, 'Growth, agrowth, or degrowth to stay within planetary boundaries?', Journal of Economic Issues, and also the opening chapters of both Jackson 'Prosperity without growth' and Victor 'Managing without growth'.	Rejected. The FAQs are no space for an in-depth discussion. References noted and considered for 5.2	Tilman Hartley	Institute of Environmental Science and Technology, Autonomous University of Barcelona (ICTA-UAB)	Spain
44397	120	45	120	46	The date should read 1956 rather than 1955. DOI should read: <a href="https://doi.org/10.1093/aristotelian/56.1.167">https://doi.org/10.1093/aristotelian/56.1.167</a>	Noted, revision has been added	Urbano Fra Paleo	University of Extremadura	Spain
46269	131	3			It should be: "Lovelock, James, 2007: [...]"	Noted, revision has been added	Amin Hasanein	Islamic Relief Deutschland	Germany
42387	134	41	134	41	Koutsovitis M. E. and Goyeneche M. 2018: Proposals for adaptation to Climate Change in Territories of High Social, Sanitary and Environmental Vulnerability. Argentina. Proceedings of 3rd Interamerican Congress of Climate Change- Resilience to climate change in Latin America	Rejected. This chapter is on mitigation.	HUMBERTO EDGARDO STEPANIK	Catedra libre ingeniería. UBA voloneer work for villa 31	Argentina
1055					... and a multiplicity of other locations in the Chapter	Unclear.	Harry Saunders	Carnegie Institution for Science	United States of America
5437					The chapter lacks a section on education for sustainability. To what extent is education for sustainability being implemented in different world regions, and for different age groups? To what extent has education for sustainability been shown to facilitate changes individual behaviour and (long-term) professional practices?	Accepted. Due to space constraints, we need to be short. Include a section in 5.2 now.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
5439					I suggest that a separate sub-section is included on "GDP and other measures of wellbeing". The shortcomings of GDP as a measure of wellbeing is discussed in several places, along with discussions of alternative measures of wellbeing. See for eg page 15 line 30- 43 and page 16 line 30-40. This discussion is important and should be drawn together into a substantive sub-section. This section should also include the discussion on the linkages between economic growth and carbon emissions.	Semi-accepted. 5.2 includes a subsection on metrics. It is not titled with GDP as more comprehensive metrics are considered too.	Angela Druckman	University of Surrey	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6015					My top-level concern with this chapter is that the call for demand reduction relies heavily on (a) efficiency improvements, and (b) behavior change. The problem with relying on efficiency improvements is that any gains will be swamped by rebound effects. This is true of both energy as well as material efficiency improvements. Part of this is because of the Jevons Paradox, stated in modern terms as the Khazzoom-Brookes postulate, about which there is now a substantial empirical literature (which should be mentioned in this chapter). Basically, any cost savings from efficiency improvements are reinvested to expand production. But it is also because in a growth-oriented economy, efficiency gains are typically deployed specifically for the sake of more growth, in other words, in order to expand extraction and production, rather than to reduce it. Indeed, economists believe that efficiency improvements are good "because" they facilitate growth, and we know that growth has a tight empirical relationship with energy and material throughput. It is not clear, then, why we would expect that efficiency improvements would on their own suddenly have the opposite effect. This is not a reasonable assumption. This problem is reviewed in this 2019 article: <a href="https://www.tandfonline.com/doi/abs/10.1080/13563467.2019.1598964">https://www.tandfonline.com/doi/abs/10.1080/13563467.2019.1598964</a> . The reliance on behavior change poses two problems. One is that this approach is also vulnerable to rebound effects. If people switch from private transportation to public, or from beef to legumes, to the extent that this entails a cost savings it is likely that the savings will be redeployed for additional consumption elsewhere. But the bigger issue with this approach is that it misidentifies consumers as the driver of overproduction, rather than industry. In the interests of speeding up turnover, industry deploys tactics such as aggressive advertising and planned obsolescence, or attempting to sabotage public consumption options in order to induce people to purchase private alternatives (i.e., privatizing healthcare, education, transportation, parks, etc.). All of this places consumers under heavy pressure. In other words, consumers become the victims, as it were, of industries geared toward overproduction. A much more robust approach to demand reduction is to call for active policy decisions to scale down unnecessary industrial output. So, bans on planned obsolescence, rights to repair, long-term mandatory warranties in order to extend product lifespans, regulations on total ad expenditure, removal of ads from public spaces where people don't have a choice about what they see, etc. Plus taxes to curtail the use of particularly destructive products like beef and SUVs. In other words, the call for demand reduction needs to get at the root of overproduction rather than just the symptoms of it. Ultimately, any policy needs to be backed up with caps on energy and material throughput. Capping will ensure that any improvements in efficiency result in aggregate reduction of energy and material use, rather than getting wiped out by rebound effects. There are a number of published scientific articles on capping fossil fuels and emissions ( <a href="https://link.springer.com/article/10.1007/s10584-018-2162-x">https://link.springer.com/article/10.1007/s10584-018-2162-x</a> ; <a href="https://www.tandfonline.com/doi/abs/10.1080/17583004.2015.1021563">https://www.tandfonline.com/doi/abs/10.1080/17583004.2015.1021563</a> ; <a href="https://www.tandfonline.com/doi/abs/10.1080/15487733.2008.11908010">https://www.tandfonline.com/doi/abs/10.1080/15487733.2008.11908010</a> ; <a href="http://www.teqs.net/Tyndall2005.pdf">http://www.teqs.net/Tyndall2005.pdf</a> ); this principle can be extended to energy and materials. Crucially, all of this should come along with policy on working-time reduction, so as to avoid any unemployment that might result from a reduction of throughput. This policy has its own intrinsic benefits in terms of reducing demand. Indeed, a shorter working week has been found to be one of the single most impactful policies in terms of reducing energy demand. Researchers have found that if the United States were to reduce its working hours to the levels of Western Europe, its energy consumption would decline by 20%. <a href="https://journals.sagepub.com/doi/abs/10.2190/D842-1505-1K86-9882">https://journals.sagepub.com/doi/abs/10.2190/D842-1505-1K86-9882</a>	Rejected. The chapter takes up most of these concerns, and not all specificities are justified. Specifically, rebound is discussed in 5.5. However, direct rebound effects are relatively low, and efficiency gains are real. The chapter is also clear that absolute reductions are necessary, and efficiency alone is not sufficient. Most visible this is in the discussion on digitalization. Behavior: This chapter agrees with this, and frames consumers as only one of several agents, and making clear that responsibility is at least to some degree with other agents, such as industry.	Jason Hickle	Goldsmiths, University of London	United Kingdom (of Great Britain and Northern Ireland)
9391					fig 5.3 is not referenced in the text while it should be better explained and argued	Accepted. Changed.	ANNA LAURA PISELLO	DEPARTMENT OF ENGINEERING - UNIVERSITY OF PERUGIA, ITALY	Italy
9393					fig 5.14 is poor quality	Accepted. Changed.	ANNA LAURA PISELLO	DEPARTMENT OF ENGINEERING - UNIVERSITY OF PERUGIA, ITALY	Italy
25521					Please take care not to use value-judgement terms such as 'important', 'significant' and also prescriptive terms such as 'need' and 'must'. Some readers will interpret these statements as policy prescriptive.	Accepted. Text revised.	Sarah Connors	IPCC WGI TSU	France
25555					As a reader who isn't familiar with all the topics being discussed in your chapter, it might help many Executive Summaries to include subheadings to cluster the statements by topic or overarching chapter themes.	Accepted. We have now included a Social Science Primer	Sarah Connors	IPCC WGI TSU	France
29141					The chapter provides an excellent framing and overview of demand side and social aspects of mitigation. The approved outline includes a bullet on 'Policies facilitating behavioural and lifestyle change' which is perhaps not adequately addressed in FOD. Please consider for SOD	Accepted. Included in revised section 5.6 and also discussed th 5.5 and 5.4	Minal Pathak	Ahmedabad University	India
29143					The ASI framing works for the chapter and helps tie different demand sectors. But this isn't really taken up very well in the sectoral chapters. Consideration for SOD	Accepted. In SOD two x-chapter tables have been included to address the issue.	Minal Pathak	Ahmedabad University	India
33843					This is a critical chapter with important messages but it is written in a text book fashion and is very theoretical. It is also difficult to understand because of the complex language and figures used. It is important that the chapter works on making links between the theoretical concepts discussed and practical examples of how these would work in the real world.	Accepted. Restructuring and revision of contents have been done carefully in SOD.	Debra Roberts	EThekwin Municipality	South Africa
44099					Health care (health services) as important determinant for health and thus as constituent for wellbeing (i.e. health related wellbeing) should be mentioned: In the whole discussion on human needs/wellbeing the importance of health services/health care and access to it (in poor countries and poor population groups in rich countries as well) as basic human needs is missing. See for example Alas, R.N., Jha, A.K., 2019. Climate change threatens the achievement of effective universal healthcare. <i>BMJ</i> 366, I5302. <a href="https://doi.org/10.1136/bmj.I5302">https://doi.org/10.1136/bmj.I5302</a>	Accepted. Reference has been added in section 5.2	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
44129					To improve readability abbreviations in headings should be avoided	Accepted. text revised	Ulli Weisz	University of Natural Resources and Life Sciences Vienna, Institute of Social Ecology	Austria
48011					Outline : does this chapter address inequities outside access to energy? How is gender accounted for (for instance related to energy poverty)? Where are just transitions explored? Is intersectionality explored (eg multiple vulnerabilities and inequalities related to mitigation, adaptation, loss and damage in a changing climate)?	Accepted. text revised	Valérie Masson-Delmotte	CEA, IPSL/LSCE	France
48013					How do the "decent living standards" account for consequences of a changing climate? (eg adaptation needs, capacities)?	Accepted. text revised	Valérie Masson-Delmotte	CEA, IPSL/LSCE	France
48015					An assessment of the implication of digital economy for emission trends is needed (across chapters and quantitatively).	Accepted. text revised	Valérie Masson-Delmotte	CEA, IPSL/LSCE	France
48017					Could this chapter also provide an assessment of potentials and limits not just at the global scale but also specific to regions of the world or types of countries / income categories? When I read the ES, I have the impression that it is focused on developed countries.	Accepted. ES is revised thoroughly with line of cite. So sections added examples from regions and local contexts within the chapter.	Valérie Masson-Delmotte	CEA, IPSL/LSCE	France
48019					There is a need for a coordinated approach, across WG and chapters, on the issues of education (including training teachers) and (initial + lifelong professional) training, climate change literacy (within enabling conditions).	Accepted. Role of Education now included in multiple sections 5.2, 5.4, 5.5	Valérie Masson-Delmotte	CEA, IPSL/LSCE	France
48021					Question : are there examples or case studies of "turning points" or "abrupt shift" in behavior related to climate action or other issues from which we could learn on the potential for accelerating on the demand side?	Accepted. text revised based on literature. Not many examples available except under Panedemic but will depend on what literature becomes available.	Valérie Masson-Delmotte	CEA, IPSL/LSCE	France
48023					I have the impression that the psychological dimension (including emotional and moral aspects) are not addressed in the chapter, at least from the ES and from the table of contents. There is a growing amount of literature related to this aspect in the mitigation context (e.g. work from Tobias Brosch, University of Geneva, Psychology of Sustainable Development)	Noted. It is in Section .54. ES statements revised substantially	Valérie Masson-Delmotte	CEA, IPSL/LSCE	France
48031					Where is the "GHG emission information provided to consumers" assessed in this chapter?	Accepted. Text has been revised.	Valérie Masson-Delmotte	CEA, IPSL/LSCE	France