

IPCC AR6 WGIII Second Order Draft Government and Expert Review Comments Responses (Annex III - Scenarios and modelling methods)									
If any fields are not readable, please ensure to expand relevant cells. If reading this in PDF format, please refer to the Excel format version of this document available on: https://www.ipcc.ch/report/ar6/wg3/downloads/drafts-and-reviews Please note, "Annex III - Scenarios and modelling methods" was previously titled "Annex C - Scenarios and modelling methods", and comments and responses below may refer to Annex C.									
Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response	
83171	0	0	0	0	Since space constraints seems not to be the issue here could you please add a paragraph or two explaining what scenario probabilities (like 50% or >67%) actually mean, in the sense of what get counted to arrive at such a classification. Given that it is such a central element in scenario communication and given many popular misperceptions (prevalent even among researchers) like "you wouldn't board a plane that goes down with a probability of 50%" it would be helpful to able to a refer to a description what these likelihood/probability numbers mean and how they are being calculated/computed	Geden Oliver	Germany	Thank you for your remark. Annex C has page limited imposed by the TSU, similarly to other chapters. Scenario probability are described in chapter 3 and in the WG I AR6.	
14979	0				Apparently very important information required to understand the WGIII AR6 pathway classification, e.g. on historical warming baseline, is somewhat hidden in ANNEX C. This kind of information has to be shared and highlighted better in Chapter 1, also to ensure that this information could be referenced more easily in the SPM. Please strengthen cross-chapter coordination and elevate this crucial information.	Government of Saint Kitts and Nevis	Saint Kitts and Nevis	Thank you for your comment. The typology of illustrative pathways is detailed in chapter 3 and part II of this annex. Revised version will reinforce x-sections and x-chapter links.	
17003	0				Part I seems to have structural issues	Government of France	France	Part I structure has been revised.	
17005	0				Section 1.9 on IAMs is probably the one most informative about the capabilities and shortcomings of its class of models, and can serve as example for the other sections. It could add the sort of review of models that sections on energy, buildings and transport provide, with references to the report. It could also relate more to other sections by highlighting how IAMs treat all the sectoral details available in other models, possibly at higher granularity or through model combination.	Government of France	France	Thank you for your comment. Sections on sectorial models have been revised to include a critical analysis of model methods limitations. Links between sections have been strengthen.	
17007	0				Section 1.2 on economic models, as it stands, is really more about how different types of models, including IAMs and sectoral models, handle economics. It could be amended to focus on the abilities and limitations of economy-wide models--which it should distinguish from IAMs explicitly. It could notably explain that economy-wide models, by definition, encompass all sectoral emissions and energy consumptions, and explain how they do that, the concept of input trade-offs, the possibility and ways of hybridisation with BU models. More generally, the annex could give clearer understanding of how different model paradigms produce the same information (eg energy consumption and emissions of steel production, or of buildings) at different levels of granularity.	Government of France	France	Thank you for your suggestion. Section 1.2 has been revised to provide the key elements about how economic concepts and modelling frameworks are mobilized in the models underlying the assessment chapters, including sectoral models and IAMs.	
17009	0				Section 1.3 on energy system models is manifestly patched up from separate contributions with little harmonisation. Sections 1.3.2 and 1.3.3 are only the presentations of some of models, probably quite far from exhausting the many energy system modelling tools referred to in the report. Something more methodological, allowing interpretation of the modelling results discussed in the report, is expected. The paragraph about GEM-E3 is particularly ill-adapted (energy modelling barely stressed). Section 1.3.1 has methodological issues of more interest, but it could probably not be the first in 1.3. Important points to discuss concerning energy system models are discounting, modeling command and control versus pricing policies, the limited information on market prices and the focus on costs hence the question of how to represent regulated markets, hence the tension between normative and descriptive uses; the core data of technology databases and their dynamics; the possibility of modelling early retirement and stranded assets; to name a few. In introduction to the section, coverage must be stressed: 'energy systems' are not just energy supply and cover in fact all dimensions of energy supply including buildings, transport and industrial demands i.e. links must be made with sections 1.4, 1.5, 1.6.	Government of France	France	Thank you for your remark. The structure of sectorial sections has been revised and links between x-sections have been improved.	

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
76281	0				Page 44 section II.2.4.2: This is an useful section about an important interface and the WGII-WGIII links. A reference is given to the cross WG box on impacts avoided, but it would be useful if you could give more references to how the WGII-WGIII links are adressed.	Jan Fuglestedt	Norway	This comment was been addressed and references were added.
76285	0				This Annex is an essentail part of the WGIII report and will be an important resource in the use of WGIII after publication and also for the SyR.	Jan Fuglestedt	Norway	Thank you for your encouraging comment.
80077	1	1			Overall comments: 1. I wonder why the book Tulkens 2019 (reference below) is not quoted in this Annex, although it is recent, and deals for its major part with modeling and scenarios. Ms Bosetti, a lead author of this Annex, knows this book very well. Please do quote it, as it constitutes a substantial pedagogic effort addressed to both economists who seek an introduction to the climate problem as well as to climate scientists who wonder about the basics of economic modeling in their field. 2. Comparing with FOD, and remembering my advocacy of a clearer distinction between Modeling and Scenarios, I notice that there is in this SOD substantial progress, more on the former than on the latter, though. 3. The absence of the "comparative tables" announced in sections 1.10 and 1.11 is regrettable, as it would help understanding better the scenario part of this Annex.	Henry Tulkens	Belgium	Thank you for your comment and suggested reference.
17629	1	1	1	1	Just to say: thank you very much and congratulations on such a great draft. I enjoyed reading it and I hope my comments are useful.	Alaa Al Khourdajie	United Kingdom (of Great Britain and Northern Ireland)	Thank you. Noted.
86301	1	1	301	27	Consider inclusion of a model using hydrogen as a source of electricity if not already included.	RABIZ FODA	Canada	Rejected. Annex C scope focused on methods and scenarios. It does not refer specific to a single energy source. This should be included in chapter 6 and other sectoral chapters.
86303	1	1	301	27	Consider modelling with combined heat and power sources for electricity generation and district heating in cities.	RABIZ FODA	Canada	Rejected. Annex C scope focused on methods and scenarios. It does not refer specific to a single energy source. This should be included in chapter 6 and other sectoral chapters.
61481	1	1	301	30	As to the researches (publications) listed in this annex, I suggest that the statement should clarify the research area and spatial and temporal scale to avoid any confusion.	Graham von Maltitz	South Africa	Thank you for reviewing Annex C SOD. The annex structure has been improved to present in a structured way key information about modelling methods and scenarios that underlie the chapters of the assessment, including IAMs but also other types of models such as sectoral models. Tables are provided to give a structured visualisation of key models characteristics, strengths and weaknesses.
48355	1		301		As I commence this review on Annex C and its myopic focus on IAMs, there comes to my mind the most apposite quote from the eminent American novelist Ernest Hemingway which could well describe the present state of IAM reporting in AR6 - "Show the readers everything, tell them nothing".	Simon Robertson	Australia	Thank you for revising Annex C SOD. Annex C has been explicitly requested by the IPCC panel. Its scope goes beyond IAMs, and provide key information about the various types of models that are underlying the assessment chapters. In the limited space of the Annex, a synthesis is given on key models characteristics, strengths and weakness, and on processes for scenarios collection and assessment.

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
48357	1		301		Given the scope of this annex, one can only surmise that the rationale for Annex C is to provide supplementary information to the policymaker in order to aid their understanding of the selected IAMs and the pathways advanced by the same and how it will affect policy formulation. Unfortunately, Annex C fails completely in this regard due to its exhaustive qualitative obfuscation. This is most problematic given the quantitative obfuscation that has occurred with respect to IAM scenarios presented in the AR6 has now been compounded and thus exacerbated by the qualitative obfuscation contained in Annex C. What has been presented in Annex C is an updated and bloated version of Annex II from the AR5 that is ultimately of little if any use for the end user, that is to say the policymaker, as it does not remotely assist in the comprehension of the model output (i.e., the pathway) as there is absolutely no documentation as to model input (i.e., data).	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Annex C page limits have been defined by the IPCC secretariat and WG III TSU, in accordance to the WG III bureau views. The Annex C structure and content has been revised to improve transparency of models and methods.
48359	1		301		For comparative purposes, the corresponding annex to the AR5, Annex II, attempted to provide supplementary information for the 31 models employed and the accompanying 1,184 scenarios contained in approximately 10 pages (p.1308-1318), might I add, all of which appear to be of limited assistance from a policymaker's perspective. Alarming, we now have Annex C of the AR6 running out to a concerning 78 pages, excluding the supplementary material of 223 pages that is nothing more than a magician's misdirect! If the 10 pages of AR5 Annex II failed to provide policy relevant insights for the policymaker, does an additional 68 pages for AR6 Annex C assist the policymaker's understanding of the pathways and thus the required policies which are to be enacted over the course of this century? Of course not, as the fundamental input data and accompanying documentation for each and every scenario contained in the AR6 scenario ensemble is entirely absent and as such the deciphering of the scenario pathways (i.e., model output) in terms of the suite of mitigation policies mobilised within the scenario remains an impossible task. The consequence of this is that the information required for such knowledge to be formed eludes the policymaker thereby resulting in a lack of situational awareness of policy specificity, both in terms of the spatial and temporal aspects at the global, regional and national level.	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Annex C page limits have been defined by the IPCC secretariat and WG III TSU, in accordance to the WG III bureau views. The Annex C structure and content has been revised to improve transparency of models and methods.
48361	1		301		One must ask why, when compared to AR5 Annex II, does Annex C provide an additional 67 pages of qualitative obfuscation? Is it a demonstration of the IAM research community's disciplinary protectionism in response to the growing criticisms of IAMs in the peer-reviewed scientific literature? This could perhaps provide a probable explanation particularly with the subsequent publication of the public relations 'puff piece' of Keppo et al. (2021) https://doi.org/10.1088/1748-9326/abe5d8 . As a number of authors and advisors of that article are also authors of both this annex and of Chapter 3, allow me to respectfully suggest they be extremely cautious and considered about relying upon Keppo et al. in the revision of this annex as a means of bolstering their defensive position as the aforementioned article is plagued by loose logic and sophistic argument. For example, on the matter of IAM scenario transparency, Keppo et al. (p.13) state that (underlined for emphasis) - "What is more, documentation is not always as helpful for non- experts as one would hope, since the implications of specific assumptions only become clear when one understands the model well. Similarly, making code and data publicly available is valuable, and people are increasingly doing this, but few people know how to run and critique a model of this kind. With that said, open sourcing can enable extended user groups and with more expert users, there is a greater potential for scrutiny and challenge." Such an intellectually feeble defence is nothing more than rhetoric refuse especially given the twenty five years of peer-reviewed scientific literature, including when the then editors of the prestigious journal Nature Climate Change in 2015, called for open publishing of IAM scenario inputs (i.e., data) in addition to model code.	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Annex C scope goes beyond IAMs. As explicitly requested by the IPCC panel, it include major model methods and scenarios reviewed in IPCC WG III AR6.

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48363	1		301		This type of sustained behaviour is not a good look when coming from such a small yet highly visible research community and it reflects poorly on the scientific credibility of the IPCC due to its continued engagement with opaque IAMs. Might I remind the authors that this weak line of defence has all the hallmarks of the defence offered by the 'creative' bankers on Wall St. prior to the Global Financial Crisis. When concerned economists/academics inquired of the so-called 'bankers/economists' - "Could you please explain the inner-workings of these fancy new derivatives?"; they were only to be told by the self-declared 'experts' responsible for such unethical financial conduct, "Well, even if we told you, you wouldn't understand - it's far too complex." Alas we all know how that ended. For the IAM research community to offer up such intellectual folly as an adopted defence is disingenuous, dishonest and smacks of outright arrogance. The reaffirmation of a falsehood does not make it any less false.	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. The Annex C scope is far beyond IAM methods. Your comment is noted and the revised version aims to improve transparency of climate mitigation models and scenarios.	
48365	1		301		Similarly this low-brow sophism is evident in Annex C with this not at all being surprising given that this annex has more or less arisen from the identical groupthink that spawned the Keppo et al. article. Taken from the opening of the Annex C preamble (p.557) - "This annex on Scenarios and modelling methods aims to address some of these gaps by detailing the modelling frameworks applied in the WG III AR6 chapters and disclose scenario assumptions and its key parameters. It was been explicitly included in the Scoping Meeting Report of the WG III contribution to the AR6 and approved by the IPCC Panel in the 46th Session of the Panel."	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Noted.	
48367	1		301		I am surmising that this opening statement with its choice of words, specifically those of "aims to address", has been carefully crafted given that the substance of Annex C fails to reach its declared worthy ambition of "detailing the modelling frameworks applied in the WG III AR6 chapters and disclose scenario assumptions and its key parameters." Does this stated disclosure of scenario assumptions and key parameters relate to the AR6 scenario ensemble of ~1,600 scenarios? For example, according to the annex (p.3877) concerning technology assumptions, some models contain "hundreds or thousands of technologies". If so, are there further annexes to Annex C that I have missed that contain such detail given the Annex's noble opening declaration of "...and disclose scenario assumptions and its key parameters"?	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Annex C refers to climate mitigation methods and scenarios. The parameterisation and detailed results of mitigation scenarios is included in the WGIII AR6 scenario database and repository.	
48369	1		301		In the same paragraph there is the following oxymoronic assertion of (p.3877) - "Technology assumptions are a key component of IAMs, with some models representing hundreds or thousands of technologies. Despite the importance of technology costs (Creutzig et al. 2017), there has been limited comparison of technology assumptions across models (Krey et al. 2019; Kriegler et al. 2015a). There is, however, a substantial literature on the sensitivity of mitigation scenarios to technology assumptions, including model comparisons (Kriegler et al. 2014a; Riahi et al. 2015), single model sensitivity studies (McJeon et al. 2011b; Krey and Riahi 2013; Giannousakis et al. 2021) and multi-model sensitivity studies (Bosetti et al. 2015). Not only are the initial technology costs important, but also how these costs evolve over time either exogenously or endogenously. Since IAMs have so many interacting technologies, assumptions on one technology can affect the deployment of another. For example, limits on solar energy expansion rates, or integration, may lead to higher levels of deployment for alternative technologies. Because of these interactions, it can be difficult to determine what factors affect deployment across a range of models."	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Noted.	

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48371	1		301		Does not the concluding sentence to this paragraph contradict the preceding assertion? How are policymakers to interpret this patent doublespeak? The intention for the development of a mathematical model is to shed light on the complexities and interconnectivity of relationships within the system under consideration. However if the model is unable to convey the nuances of these relationships, then such a model is the embodiment of absolute disutility from the policymaker's perspective.	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Sentence has been revised.
48373	1		301		Then there is the statement of (p.3877) - "Not only are the initial technology costs important, but also how these costs evolve over time either exogenously or endogenously". Indeed, many a researcher in the broader scientific community has highlighted the lack of transparency in some IAM scenario cost assumptions only to then discover, via correspondence, that the modellers' have used outdated and thus exorbitant costs, such as PV and BEV technology costs, and that these costing errors have been sustained throughout the longitudinal period of the study, thereby compounding the error. This distortion created by such opaque and erroneous technology costings can gravely mislead policymakers in terms of their understanding of 'what' of is required and 'when' this is to be performed in order to remain below a specified temperature threshold.	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Sentence has been revised.
48375	1		301		Therefore, it is essential for all input data and assumptions to be enumerated for each scenario as this enables criticisms to be made of the scenario by external experts who have no intellectual and/or institutional ties to the modelling project. In terms of the consequences of both disclosure and non- disclosure of input data/assumptions is evident in the numerous AR6 WGIII FOD review comments (e.g., 1. IAM technology cost assumptions and learning rate inputs, 2. opaque input data and its effect on devising pertinent low-carbon transition policy).	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Noted.

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48377	1		301		<p>In addition, such disclosure enables external experts to assist with the discovery of oversights and/or errors within IAM presented scenarios. For example, when attempting to determine the particulars for an outlier pathway, I encountered the troubling consequences of IAM scenario opacity with the published IPCC SR1.5 scenario "database". When examining the annual CO2 emissions for the transport sector in year 2100, I noticed that for scenario 'EMF33_1.5C_cost100' there was a 10 Gt difference in CO2 emissions for year 2100 between the model output of MESSAGE-GLOBIOM 1.0 and REMIND MAgPIE 1.7-3.0 with the latter indicating considerable net negative emissions. A similar issue was also apparent in the remaining REMIND MAgPIE 1.7-3.0 runs of the EMF33 scenario family. As the devil is in the detail and with the details being unavailable (i.e., no input data and inadequate documentation) for the aforementioned scenarios, I contacted the modelling team responsible for the outlier scenario runs requesting that they shed light as to why such a difference between these two models running the same scenario would result in a 10 Gt variance in year 2100? After some obfuscation from the modelling team, I was subsequently informed that this was in fact a "reporting error" and that the offending "false data" would have to be "replaced and corrected" in the IPCC/IIASA SR1.5 scenario database. This experience of mine underscores the importance of data transparency accompanied by an adequate and appropriate level of documentation being made available. Evidently, and most disturbingly, is that this "reporting error" had seemingly slipped through unnoticed by the modelling team's post-production analysis, the peer-review process in which this modelling endeavour had been subjected to and subsequently published in the scientific literature, and finally through its appearance in the published IPCC SR1.5. This does not instil a great level of confidence in what is being presented in IAM scenarios. Being charitable, the labelling of this 10 Gt variance as a "reporting error" appears to rather euphemistic to say the least!</p> <p>As Risbey et al. (1996. Assessing Integrated Assessments, Climatic Change 34: 369-395) state regarding IAMs (p.389), 'It is necessary to not only document assumptions and make them explicit; it is equally important to examine their implications for model results, and the implications of alternative sets of model assumptions. While this imposes a significant burden on the analyst, in the absence of such an effort it is hard to interpret the results meaningfully. It is also important not to make assumptions when we do not have to. We need to identify when and where we are making assumptions out of analytical convenience or ignorance of alternatives, and develop the contacts with other disciplines that expose us to better tools or</p>	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Noted.

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response	
48379	1		301		<p>Furthermore on the matter of scenario input data disclosure, the IAM research community continues to tout that the mitigation scenarios advanced are exploratory "what if" scenarios and are not and should not be interpreted as being predications. However, any reference to a pathway derived from an exploratory "what if" scenario is in fact essentially an expression of the processed scenario input data. As such, without knowing the input data for the scenario, then the question must be - What "what ifs"? If the research question posed by an exploratory "what if" scenario produced pathway begins with - "what if...this happens?" or "what if... that happens?", in addition to the follow-up question - "how has the 'this' or 'that' been reflected in the pathway in terms of shaping the trajectory?" but without knowing the "this/that" aspect, then the research question will defy an answer - thus what is before the policymaker is nothing more than a prediction. The consequence of this opacity of the "what if" aspects, that is to say where the input data has not been disclosed, is that the specifics behind why a pathway takes a particular trajectory will remain elusive with the pathway then appearing to be seemingly conjured up as if it was a fantastical vision of a soothsayer. The repercussion of this upon informing policy? Policymakers will be none the wiser for having read Chapter 3 with its ~1,600 scenarios and the accompanying Annex C!</p> <p>Therefore, by reason of the foregoing, and in the case of the AR6's scenario ensemble, all scenarios must be considered to be scientifically unvalidated and nothing more than mere predictions. IAM researchers asserting that IAM pathways are explorations of plausible "what ifs" can only make such weighty claims when the input to and output of the scenarios are declared simultaneously. Regardless of whether a model is open-source, external examiners and policymakers can ascertain the plausibility of the pathway (i.e., output) by simply assessing the plausibility of the input (see example of the FOD review comments of Hoekstra and Rosen as to the implication of such). As the modelling axiom states - garbage in, garbage out. In this instance, the "black-box" IAM can remain as inky as the night sky. Publishing models as open-source but keeping the scenario input data under lock-and-key and/or drip-feeding input data to enquirers are activities that must be viewed, externally, as being underhanded and manipulative.</p>	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Noted.	
48381	1		301		<p>Only when all inputs to a scenario are made available and documented, can the IAM research community make claim to be undertaking explorations of 'what ifs'. Until this happens, scenarios must logically be considered to be predictions of the future. No longer is the crystal ball the tool-of-the-trade, it is now a box of switches driven on and off by lines of code. If those who have exited the fortune teller's tent are without knowledge as to how their envisaged fortune has been obtained, then what has been presented is a prediction of the future. If the recipient is able to deduce the elements as to how the fortune has been constructed, then it would cease to be a prediction and enter the realm of being a "what if". The plausibility as to the rationale of the "what if" can then be examined. Plausible or bullshit?</p> <p>Put simply, you can't have a "what if" scenario if the policymaker does not know WHAT the "what if" statements actually are! By not disclosing the input data for the scenario, then the "what if..." statement remains incomplete! In other words, for a "what if..." statement to function as intended, the information contained in place of the ellipsis needs to be known! The policymaker needs to know the information denoted by the ellipsis as this is key to understanding the enacted policies within the scenario as coded by the modeller. Only a sophist would attempt to suggest otherwise.</p>	Simon Robertson	Australia	Thank you for reviewing Annex C SOD. Section I.1.9 has been improved on the limitations of IAMs.	

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
48383	1		301		<p>Moreover, the word count for the entire annex is 37,377 words with only 641 attributed to the so-called limitations of IAMs. The nominated main four reasons for criticism of IAMs appear to have been most carefully selected and then further subjected to a heavy sanitisation treatment with this being consistent with the deafening overtones of disciplinary protectionism and self-preservation that is present throughout Annex C. There is a substantive collection of critical literature on IAMs that appears to have been overlooked by those responsible for authoring this subsection as to the limitations of IAMs! A scholarly oversight or intended act of presenting only the "clean linen"? Once again let us return to Riseby and colleagues' subsection titled - A PLACE FOR DIRTY LAUNDRY - (1996, p. 391) "Since such dirty laundry issues are also likely to loom large in the IA modeling context, it is important that the IA community find ways to facilitate communication about these issues. By openly discussing problems, solutions may emerge earlier, and the community will have not have the feeling that the IA modelers are presenting only the fresh linen."</p> <p>In conclusion, and while on the matter of information usefulness to policymakers, the AR6 scenario ensemble at present contains ~1,600 scenarios, an increase of ~500 over the AR5, with this being a prime example of the psychological phenomenon of information bias. Similarly, the 'cognitive car crash' that is Annex C is more paralysis by analysis. If the policymaker isn't mentally incapacitated by the end of Chapter 3, they certainly will be after the first few pages of Annex C as such a tome promises so much but delivers absolutely nothing. Remember the audience you have been tasked to address!</p> <p>If the IPCC were to conform to its declared desire and meet its own obligation as stated in its opening preamble to this annex as to the disclosure of '...scenario assumptions and its key parameters', with this being "...explicitly included in the Scoping Meeting Report of the WG III contribution to the AR6 and approved by the IPCC Panel in the 46th Session of the Panel.", then the verbose 78 pages that constitute Annex C would be replaced in its entirety by the provision of transparent and meaningful scenario input data accompanied by documentation for each and every scenario within the AR6 scenario ensemble. To do otherwise will result in a complete and dismal failure to that which has been explicitly stated in the Scoping Meeting Report of the WG III contribution to the AR6 and its approval by the IPCC Panel in the 46th Session of the Panel with this being recounted in the preamble to this annex.</p> <p>This is not just an exemplar of bad science; it is also an exemplar of dishonest science! I trust that the IPCC will not merely "take this into account" but genuinely act on the above</p>	Simon Robertson	Australia	Thank you for your comment. Annex C is part of WG III AR6. Although authors promoted actively interactions with WG I-WG II authors, climate models and its uncertainty are integrately part of WG I report.
75059	3	3	3	3	<p>I think it's important to provide metrics on prediction errors of simulation models that were used in the previous report, once sufficient amount of new data are cumulated over time. I would also recommend adding a section on sensitivity analysis of key simulation models that were used for prediction, and adding a section to summarize all changes made in model selection or any optimization methods between the current report and reports generated in the past.</p>	Rong Lu	United States of America	Thank you for your comment. The sentence has been revisited.
66185	4	1	193	35	<p>Annex C (Scenarios and modelling methods) would be a suitable part of the report to address uncertainties in predictions from climate models, by verifying the ability of a model calibrated at a point in time, entirely on earlier data, to predict global warming, say 30 or 80 years later. This would need to be addressed in this report.</p>	Donal OCallaghan	Ireland	Thank you for your suggestion about more updated references.
16983	4	13	4	13	<p>" whole system". We suggest to specify to what system it is referring to. Socio-ecocsystem? or only "energy system"?</p>	Government of France	France	Thank you for your comment. References have been revised and now presented chronologically.

IPCC AR6 WGIII Second Order Draft Government and Expert Review Comments Responses (Annex III - Scenarios and modelling methods)									
If any fields are not readable, please ensure to expand relevant cells. If reading this in PDF format, please refer to the Excel format version of this document available on: https://www.ipcc.ch/report/ar6/wg3/downloads/drafts-and-reviews Please note, "Annex III - Scenarios and modelling methods" was previously titled "Annex C - Scenarios and modelling methods", and comments and responses below may refer to Annex C.									
Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response	
20449	5	4	5	4	Reference of Capellán-Pérez et al. 2020 is outdated, there is a more recent reference, which includes all the partners of the MEDEAS project, a review of all the existing previous literature (including Capellán-Pérez et al. 2020 one) and the open source pymedeas model (EU project final outcome): J. Solé, R. Samsó, E. García-Ladona, A. García-Olivares, J. Ballabrera-Poy, T. Madurell, A. Turiel, O. Osyuchenko, D. Álvarez, U. Bardi, M. Baumann, K. Buchmann, I. Capellán-Pérez, M. Černý, Ó. Carpintero, I. De Blas, C. De Castro, J.-D. De Lathouwer, C. Duce, L. Egler, J.M. Enríquez, S. Falsini, K. Feng, N. Ferreras, F. Frechoso, K. Hubacek, A. Jones, R. Kacilková, C. Kerschner, C. Kimmich, L.F. Lobejón, P.L. Lomas, G. Martelloni, M. Mediavilla, L.J. Miguel, D. Natalini, J. Nieto, A. Nikolaev, G. Parrado, S. Papagianni, I. Perissi, C. Plainer, L. Radulov, P. Rodrigo, L. Sun, M. Theofilidi, Modelling the renewable transition: Scenarios and pathways for a decarbonized future using pymedeas, a new open-source energy systems model. Renewable and Sustainable Energy Reviews, Volume 132, 2020, 110105, ISSN 1364-0321, https://doi.org/10.1016/j.rser.2020.110105	Jordi Solé	Spain	Thank you for your comment. Noted. Your remark has been incorporated.	
61459	5	4	5	5	When multiple references are cited in one sentence, it is suggested to arrange them in chronological order.	Graham von Maltitz	South Africa	Thank you for your comment. Noted. Your remark has been incorporated.	
16985	5	11	5	11	Here and elsewhere, references should be consistently cited chronologically (e.g. from the oldest to the most recent).	Government of France	France	Thank you for your comment. Noted. Your remark and suggested reference has been incorporated.	
80071	5	28			C5-28 To the critique of perfect foresight models given in these lines, the following should be added, starting on line 32: "There is another and stronger argument, namely that these models (using optimal control) are inappropriate for describing processes characterized by negotiations. Indeed, these forecasts are fixed which imply fixed values of the state of the system, whereas the temporal modeling should take into account the possibility that ongoing negotiations modify the state of the system. This is as a major reason for developing recursive dynamic models, using dynamic programming instead of optimal control, as argued in Tulkens 2019 (Lecture 7)".	Henry Tulkens	Belgium	Noted.	
80073	5	33	5	37	C-5 33 drop the words "also known as myopic or limited insight models" and, after the words "is achieved" insert the following: "... by either dynamic programming, using the technique of value functions to anticipate the future (Germain, Toint, Tulkens and De Zeeuw 2003, Tulkens 2019), or without information..." as well as in line 36-37 replace the words "are very unlikely" by : "may or may not, depending upon the value function used,..." Comment: the author(s) seem to ignore the "value function" technique of dynamic programming. Details in Tulkens 2019, Lecture 7.	Henry Tulkens	Belgium	Thank you for your comment. The sentence has been revisited.	
4889	6	34	6	35	"There are two approaches: exogenous and endogenous technological change. They primarily differ on how policy and investment decisions affect technological development and diffusion." Wang et al. (ref below) should be cited here. They show how technological change can be endogenized by observing historical relative factor cost shares – the higher the cost share, the more firms apply new technologies aimed at driving costs down. They find a good match between technological change and technology development and diffusion. Reference: Wang R, Saunders H, Moreno-Cruz J, Caldeira K. 2019. Induced energy-saving efficiency improvements amplify effectiveness of climate change mitigation. Joule 3: 2103–2119.	Harry Saunders	United States of America	Thank you for your comment. The sentence has been revisited.	
16987	6	38	6	39	do IAMs exist which consider the ocean aspects? If yes, please mention them and detail their specificities.	Government of France	France	Thank you for your comment. The section has been revised.	
45671	6	45			Which two categories? Please explain.	Government of Germany	Germany	Thank you for your comment. The sentence has been revisited.	

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
17615	6	45	6	45	"both categories", but only CBAs are mentioned so far, please mention CEAs/process-based/detailed process IAMs.	Alaa Al Khourdajie	United Kingdom (of Great Britain and Northern Ireland)	Thank you for your comment. Due to space constraints, it will not be possible to go into that level of detail in the Annex.
83359	7	14	7	18	It would be great if you could write one sentence in which you emphasize that there are different kinds of partial equilibrium models; models that model one (energy) market versus models that model capture several (energy) markets. (There also exist partial equilibrium models capturing both energy and material markets). This would help us who have comprehensive energy system models (such as e.g. many TIMES based models) in the review-process. I have more than once experienced reviewers who claim that my model can't capture that and that because it is a partial equilibrium model (when it is obvious that they are thinking of a single market model). Thank you in advance. And thanks for a great chapter, it was a pleasure reading.	Anna Krook-Riekkola	Sweden	Thank you for your comment. This point has been developed in the text.
17617	7	27	7	27	clear and markets adjust with lags?	Alaa Al Khourdajie	United Kingdom (of Great Britain and Northern Ireland)	Thank you for your comment. The sentence has been edited to clarify the meaning.
4891	7	37	7	37	Traditional Input-Output frameworks rely on a Leontief (fixed factors) depiction of production. This lack of flexibility leads to overstatement of factor use reductions due to efficiency gains.	Harry Saunders	United States of America	Thank you for your comment. The reference to I-O framework has been removed to avoid confusion and replaced by the simpler mention of "interindustry intermediary consumption".
9551	7				I would include reference to food consumption at micro level with micro (local-regional-national) growth models	Blanca Casares Guillén	Spain	Thank you for your comment. Section I.3 refers to sectorial energy models. Its sub-sections have been revised and some of suggested references have been incorporated in FGD.
80075	8	31	8	36	C-8 31-36 The (sub)title Strategic interaction promises more than it delivers. The paragraph should be expanded as follows: In line 32, replace "two" by "several" and then, in line 35, drop "or", and on line 36, after "...2017b)", insert " iii) partially cooperative solutions (Eyckmans and Tulkens 2003, Yaafter "...2017b)", insert " iii) partially cooperative solutions (Eyckmans and Tulkens 2003, Yang 2008, Bréchet, Gerard and Tulkens 2011, Tulkens 2019), akin to climate clubs (Nordhaus 2014).	Henry Tulkens	Belgium	Thank you for your comment. The suggested edits and references have been incorporated.
17621	9	4	9	16	I suggest covering hurdle rates too at this point.	Alaa Al Khourdajie	United Kingdom (of Great Britain and Northern Ireland)	Thank you for your comment. The text has been edited to mention hurdle rates.
17623	9	4	9	16	Please check and refer to section A.B.6 from Annex B on SDRs	Alaa Al Khourdajie	United Kingdom (of Great Britain and Northern Ireland)	Thank you for your comment. Noted.
4893	9	12	9	12	"...which usually leads to the lowest discount rates." I believe this is true, but is there a reference for this?	Harry Saunders	United States of America	Thank you for your comment. We have added a reference (Stern, 2006).
17619	9	14	9	14	"tempo"?	Alaa Al Khourdajie	United Kingdom (of Great Britain and Northern Ireland)	Thank you for your comment. The text has been edited to clarify the meaning.

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
75673	9	18	12	39	<p>The "1.3 Energy system modelling" section is missing an entire layer of energy system models - the capacity expansion framework for power systems with a high spatial and temporal resolution. Those models originate from "traditional" capacity planning models (such as TIMES, OSeMOSYS, MESSAGE), inherit the same linear framework, but have hourly resolution and multiple nodes to more appropriately represent intermittent renewables and optimize storage, grid, and firm back-up capacity.</p> <p>They differ from the "1.3.1 Modelling electricity system operation with large scale penetration of renewables" that focus on grid stability and power dynamics, mainly within an hour. Instead, the capacity expansion is a resource matching framework, and high temporal and spatial granularity is essential for evaluating VER's potential and decarbonization of electric power systems.</p> <p>The example models from the rapidly growing group: PyPSA (https://pypsa.org/publications/index.html), SWITCH (https://doi.org/10.1016/j.softx.2019.100251), GenX (http://energy.mit.edu/wp-content/uploads/2017/10/Enhanced-Decision-Support-for-a-Changing-Electricity-Landscape.pdf), and many evolving others (https://doi.org/10.1016/j.eneco.2021.105176). The known Reference Energy System models (such as TIMES) also might be adopted for higher granularity. Though this group of models, often referred to as the "new renewables era" capacity expansion models, do not fit the suggested by the report structure of Energy System Models 1.3.1-1.3.3. Without the group, the potential of VERS in cost-efficient decarbonization is rather an assumption than modeling output, leading to a potential underestimation of VERS' role in the energy transition (as also stated in the "Summary for Policymakers", p37, lines 19-24).</p>	Oleg Lugovoy	United States of America	The whole section is revised and updated, and the energy system models are classified into top-down, bottom-up, and hybrid models and new references are added to the section. Other models that you mentioned is also included: "A number of advanced grid modelling approaches have been developed (Jenkins, J.D et al., 2018), such as robust optimization (Jiang et al. 2012), interval optimization (Dvorkin et al. 2015), and stochastic optimization (Meibom et al. 2011; Monforti et al. 2014) to optimally schedule the operation of the future low carbon systems with high penetration of VRE. Advanced stochastic models demonstrated that this would not only lead to significantly higher cost of system management but may eventually limit the ability of the system to accommodate renewable generation (Badesa et al. 2020; Hansen et al. 2019; Perez et al. 2019; Bistline and Young 2019). Modelling tools such as European Model for Power system Investment with Renewable Energy (EMPIRE) (Skar et al. 2016), Renewable Energy Mix for Sustainable Electricity Supply (REMIX) (Scholz et al. 2017), European Unit Commitment And Dispatch model (EUCAD) (Després 2015), SWITCH (Frapp, M., 2012), GenX (TLO, 2021), and Python for Power System Analysis (PyPSA) (Brown, T et al., 2018) investigated these issues. SWITCH is a stochastic model, in which investments in renewable and conventional power plants is optimized over a multi-year period (Frapp, M., 2012). In GenX the operational flexibility as well as capacity planning is optimized from a system-wide perspective (TLO, 2021). PyPSA is an optimization model for modern electricity systems, including unit commitment of generation plants, renewable sources, storage, and interaction with other energy vectors (Brown, T et al., 2018). " Due to space limit we
4895	9	33	9	33	<p>Need to cite Jenkins at all (ref below).</p> <p>Reference Jenkins, J.D., Luke, M., Thernstrom, S. (2018), "Getting to zero carbon emissions in the electric power sector," Joule 2(12) doi:10.1016/j.joule.2018.11.013</p>	Harry Saunders	United States of America	The reference is added

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
50211	9				<p>I suggest to add and discuss the possibility to use more sophisticated investment models such as real option modeling to handle more complex investment decisions under uncertainty next to WACC and CBA (Engelen and Cassimon, 2018). Such models allow to incorporate multiple sources of uncertainty in the decision-making process (Cassimon, De Backer, Engelen, Van Wouwe and Yordanov, 2011a; Cassimon, Engelen and Yordanov, 2011b) and are therefore better suited to analyze climate transition scenarios (Sanders, Fuss, and Engelen, 2013). For instance, Li, Kool, and Engelen (2020) use real option modeling to analyze the investments in a hydrogen economy, while Engelen, Kool, & Li (2016) find that more governmental support for a hydrogen economy is necessary.</p> <p>Li, Y.; Kool, C.; Engelen, P.J. (2020), "Analyzing the Business Case for Hydrogen-Fuel Infrastructure Investments with Endogenous Demand in The Netherlands: A Real Options Approach". Sustainability 2020, 12, 5424.</p> <p>Engelen P.J., Cassimon D. (2018) Real Options. In: Marciano A., Ramello G. (eds) Encyclopedia of Law and Economics. Springer, New York, NY, ISBN 978-1-4614-7883-6, DOI: https://doi.org/10.1007/978-1-4614-7883-6.</p> <p>Engelen, P. J., C. Kool, & Y. Li (2016). A Barrier Options Approach to Modeling Project Failure: The Case of Hydrogen Fuel Infrastructure. Resource and Energy Economics, vol.43, 33-56.</p> <p>Sanders, M., Fuss, S. and Engelen, P.J. (2013), "Mobilizing Private Funds for Carbon Capture and Storage: An exploratory field study in the Netherlands", International Journal of Greenhouse Gas Control, vol.19, 595-605.</p> <p>Cassimon, D., M. De Backer, P.J. Engelen, M. Van Wouwe and V. Yordanov (2011a), "Incorporating Technical Risk into a Compound Option Model to Value a Pharma R&D Licensing Opportunity", Research Policy, vol.40, 1200-1216.</p> <p>Cassimon, D., P.J. Engelen and V. Yordanov (2011b), "Compound Real Option Valuation with Phase-Specific Volatility: a Multi-phase Mobile Payments Case Study", Technovation, vol.31, 240-255.</p>	Peter-Jan Engelen	Belgium	Thank you for your comment. Noted.
16989	10	33	10	33	there are no mention of marine renewable energy which is coherent with the whole report that focus on land uses, however marine renewable energy is important to take into consideration, especillay when one look at the interactions between different energy sectors.	Government of France	France	Thank you for your comment. Noted.
75773	10	35	11	47	<p>The criteria for mentioning those particular ESMs is not clear. Since there are many more ESMs, perhaps using reviews of ESMs is better than trying to name particular ESMs (as it is the case now). For instance, there are multiple TIMES models (e.g. a sample here [1], but only the UK TIMES from UCL is referenced and explained, while even within the UK, there are other MARKAL/TIMES models). Some suggestions for recent reviews of ESMs that could give a broader perspective than the couple of models mentioned so far are [2-4] and [5] even performs a review of reviews, collecting all the review (of both scenarios and energy models) studies in Table A.3</p> <p>[1] https://www.iea-etsap.org/finreport/ETSAP_Annex-XIII_Report.pdf [2] https://doi.org/10.1016/j.rser.2020.109917 [3] https://doi.org/10.1016/j.rser.2020.110195 [4] https://doi.org/10.1016/j.rser.2018.07.045 [5] https://doi.org/10.1016/j.enpol.2020.111984</p>	Herib Blanco	Germany	The whole section is revised and updated, and the energy system models are classified into top-down, bottom-up, and hybrid models and new references are added to the section. However, due to space limit we are unable to demonstrate other models as well.

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response	
47475	12	1	12	5	The three models explained as representatives to study economic impacts would not be sufficient. For the global models, EPPA, AIM, IMACLIM and Env-LINKAGE are at least actively working if GEM-E3 would be presented here.	Shinichiro Fujimori	Japan	The whole section is revised and updated, and the energy system models are classified into top-down, bottom-up, and hybrid models, which Env-LINKAGE, and EPPA are also explained."The modelling work based on ENV-Linkages (as a successor to the OECD GREEN) provides insights to policy makers in identifying least-cost policies by taking into account environmental issues, such as phasing out fossil fuel subsidies, and climate change mitigation (OECD., 2013)." Due to space limit we are unable to demonstrate other models as well. In the EPPA model different processes (e.g., economic and technological), which have impacts on the environment from regional to global at multiple scales is simulated. The outputs of this modeling (e.g., greenhouse gas emissions, air and water pollutants) are provided to the MIT Earth System (MESM), which investigated the interaction between sub-models of physical, dynamical and chemical processes in different systems (MIT, 2021)."	
4897	12	2	12	5	<p>Will you include detailed documentation (or links thereto) for these models as in previous rounds?</p> <p>It will be interesting to see in more detail the models referenced here. And in more detail see how these models have been changed/upgraded/advanced since the last IPCC go-round.</p> <p>A few limitations that should have been fixed this time, some of which are outlined in Saunders (ref below). (See Sections 4 and 5 in ref below; see also footnote #26 for models evaluated, including many you've used this time around and cited in Annex C). Also, there should be, in your archives, a detailed breakdown and analysis of these models I supplied at that time.</p> <p>Reference Saunders, Harry D., 2015. Recent evidence for large rebound: elucidating the drivers and their implications for climate change models. The Energy Journal 36(1), 23-48</p> <p>Footnote 26 of Saunders. The models reviewed include: ADAGE, CEPE-Swiss, CIMS, CRIEPI, EPPA-MIT, ETSAP-TIAM, E2020-EC, FUND, GCAM, G-CUBED, GTEM, IMACLIM, IMAGE, MERGE, MESSAGE, MiniCam, MITRE-INFORUM, MRNNEEM, NEMS, NEMS-GPRA, POLES, RFF-Haiku, SGM, WEM(IEA), and WITCH.</p>	Harry Saunders	United States of America	The whole section is revised and updated, and the energy system models are classified into top-down, bottom-up, and hybrid models and new references are added. New models are explained as well. Due to space limit we are unable to demonstrate all the models.	

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
16991	12	41	12	41	<p>For the section "1.4 Building sector models", we suggest adding these 2 sub-sections : (please double click to see the entire comment)</p> <p>1.4.3. Qualitative models</p> <p>The polarisation of approaches around quantitative methods underlines the dominance of deductive, statistical or mathematical models in the field of building energy consumption. A study conducted by Benjamin K. Sovacool in 2014 on the basis of 4444 articles on this topic, published between 1999 and 2013 by 9549 authors in three leading journals specialised in energy, shows that only 19.6 % of the authors have a background in the social sciences. In addition, 12.6 % of articles in the whole corpus use qualitative methods, and less than 5 % of the citations refer to journals in the social sciences and humanities.</p> <p>Since multifaceted behaviour processes can not be digitised, quantitative models reduce domestic energy use to a few discrete indicators that do not reflect the overall logic of social practices. This results in a significant difference between the estimation of consumption by energy models and the actual performances of buildings.</p> <p>Qualitative models show the relationships between the technical, political, economic and social factors in the process of household energy consumption. In this framework, the effects of the context as well as the individual and collective dimensions are essential elements of the process. From the point of view of individuals and groups, the consumption mechanism thus mobilises personal factors such as the predispositions inherited from experiences, but also more structural elements such as household size or incomes.</p> <p>On the other hand, while the qualitative studies on household energy behaviours manage to describe processes in their complexity and comprehensiveness, they are difficult to model digitally. When they rely on synthetic quantitative indicators, behavioural models struggle to introduce the effects of the construction components of buildings.</p> <p>Still, many studies on behaviours emphasise the relationship to the domestic comfort of groups and individuals. Sometimes associated with cleanliness (Shove, 2003), when it comes to water consumption, comfort usually relates to room occupancy and housing temperatures, and in this sense households are adapting to the domestic context by developing " energy intelligence "</p> <p>1.4.4. For a transversal approach</p>	Government of France	France	Thank you for your comment. Noted.
17001	12	42	12	43	<p>At a time of energy transition, building consumption modelling constitutes an important mediator of expertise for operational actors. It is an essential element in the implementation of construction and rehabilitation policies that achieve factor 4. At the same time, this consumption falls within the constructive constituents of the buildings and social behaviours of the buildings' occupants. However, the numerical modelling of building consumption and that of energy behaviours do not belong to the same approaches.</p>	Government of France	France	Thank you for your comment. Noted.
52559	13	3	13	8	<p>Recent literature has commented on the inadequacy of Cobb-Douglas forms of production functions to represent, in a top-down manner, energy sectors of an economy (Meran, 2019; Santos et al, 2018). The reasoning is predicated upon their lack of adherence to physical laws, and it is particularly relevant for macroeconomic models. This could be mentioned here. 1.) Meran, Georg. 2019. "Thermodynamic constraints and the use of energy-dependent CES-production functions: A cautionary comment." Energy Economics 81: 63-69. 2.) Santos João, Tiago Domingos, Tânia Sousa, and Miguel St. Aubyn. 2018. "Useful Exergy Is Key in Obtaining Plausible Aggregate Production Functions and Recognizing the Role of Energy in Economic Growth: Portugal 1960–2009." Ecological Economics 148: 103-120.</p>	Government of Saudi Arabia	Saudi Arabia	Thank you for your comment. Noted.

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
47477	13	19	13	26	Model integration approach should be described more appropriately here. Integration of energy system and CGE models can be found in AIM (Fujimori et al., 2019; Nature COmmunications), IMACLIM (Waisman et al., 2012), GEM-E3 (Vandyck et al., 2016) at least.	Shinichiro Fujimori	Japan	Thank you for your comment. Noted.
75775	15	24	17	14	This classification/taxonomy is in general for ESMs rather than transport models only. If the classification is introduced as it stands, perhaps it is better to do it earlier in the text for all sectors. In this transport section, perhaps the taxonomy introduced by [6] (Table 1) is useful. It shows that it is not black and white and there are multiple models in the transition space from energy models to transport models [6] https://doi.org/10.1080/15568318.2018.1466220	Herib Blanco	Germany	Thank you for your comment. Noted. The suggested reference was added.
81539	16	15	16	15	Suggest to explicitly mention name and acronym of the model for "Fulton et al. (2009)", as done in other instances for other models in this chapter. Name and acronym: IEA Mobility Model (MoMo).	Marine Gorner	France	Thank you for your comment. Noted.
19967	16	18	16	19	Relevant studies to cite: (1) van der Voorn, T., Svenfelt, A., Björnberg, K.E. et al. Envisioning carbon-free land use futures for Sweden: a scenario study on conflicts and synergies between environmental policy goals. Reg Environ Change 20, 35 (2020). https://doi.org/10.1007/s10113-020-01618-5 ; (2) Van der Voorn T, Pahl-Wostl C, Quist J (2012) Combining backcasting and adaptive management for climate adaptation in coastal regions: a methodology and a South African case study. J Futures 44:346–364. https://doi.org/10.1016/j.futures.2011.11.003 ; (3) Van der Voorn T, Quist J, Pahl-Wostl C, Haasnoot M (2017) Envisioning robust climate change adaptation futures for coastal regions: a comparative evaluation of cases in three continents Mitigation and Adaptation Strategies for Global Change 22:519–546. https://doi.org/10.1007/s11027-015-9686-4	Tom van der Voorn	Netherlands	Thank you for your comment. Noted.
47483	17	3	17	4	Zhang et al. (2018, and 2020) shows coupling transport and IAMs. https://iopscience.iop.org/article/10.1088/1748-9326/ab6658/meta https://www.sciencedirect.com/science/article/pii/S0306261917315490	Shinichiro Fujimori	Japan	Thank you for your comment. Noted. The literature assessment about IAM and LCA links has been improved.
81541	17	20	17	20	In table I.2, line "MoMo", column "Period": MoMo's capability for projections is 2100 (https://www.iea.org/areas-of-work/programmes-and-partnerships/the-iea-mobility-model). (Projection timeframes differ by exercise/scenario. E.g. Global EV Outlook 2020: 2030; ETP 2020: 2070; ETP 2017: 2060. links: Global EV Outlook 2020: https://www.iea.org/reports/global-ev-outlook-2020 ; ETP 2020: https://www.iea.org/reports/energy-technology-perspectives-2020 ; ETP 2017: https://www.iea.org/reports/energy-technology-perspectives-2017).	Marine Gorner	France	Thank you for your comment. Noted.
9553	19		22		I would include reference to food consumption waste at all level of the food chain (production-industry, distribution, markets, restaurants, houses).	Blanca Casares Guillén	Spain	Thank you for your comment. Noted. The suggested reference was added.
16993	20	2	20	2	We recommend to consider that EPIC is not a dynamic vegetation model, but it is used within GLOBIOM, which dynamically models the use of croplands, pastures/grasslands, managed and unmanaged forests, and other natural vegetation types. GLOBIOM uses globally gridded simulated crop yields and resource requirements from EPIC.	Government of France	France	Thank you for your comment. Noted. The suggested reference was added.
16995	20	24	20	24	Please consider for this section that food and energy are not coming only from land uses, but also from ocean uses.	Government of France	France	Thank you for your comment. Noted. The suggested reference was added.
47485	22	9	22	14	Ohashi et al. (2019) shows biodiversity implications of climate change mitigation policies. https://www.nature.com/articles/s41467-019-13241-y	Shinichiro Fujimori	Japan	Noted.

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response	
20107	23	42	24	41	There exist many classification schemes that are consistent and detailed: -Nikas, A., Doukas, H., & Papandreou, A. (2019). A detailed overview and consistent classification of climate-economy models. Understanding risks and uncertainties in energy and climate policy, 1-54.	Haris Doukas	Greece	Noted.	
47487	25	19	25	39	Fujimori et al. (2019); Nature Sustainability is a MIP paper that explored land and agricultural aspects. https://www.nature.com/articles/s41893-019-0286-2	Shinichiro Fujimori	Japan	Noted.	
47489	26	11	26	44	There would be better to touch upon an extension attempt to social dimensions in terms of income inequality and poverty (Fujimori et al. 2020 and Rao et al. 2019). https://iopscience.iop.org/article/10.1088/1748-9326/abb55d/meta https://www.sciencedirect.com/science/article/pii/S001632871730349X	Shinichiro Fujimori	Japan	Thank you for your comment. Noted.	
70207	26	22	26	22	The first integration of LCA coefficients with an IAM has been achieved for transport sector analysis, which should be added accordingly. For example: "Results from soft-linking an LCA model with the NEMS IAM show that including life cycle emissions in transport carbon pricing schemes influences optimal climate change mitigation pathways of the US national vehicle fleet (DOI: 10.13140/RG.2.2.18061.87528, chapter 5, pp. 70-84). Further improvements regarding the integration of life cycle assessment with IAMs are needed in order to systematically assess yet unknown optimal mitigation pathways (see https://www.nature.com/articles/nclimate3148 ; https://www.sciencedirect.com/science/article/pii/S1361920919300513)."	Paul Wolfram	United States of America	Thank you for your comment. Noted.	
61461	27	1	27	1	The picture is not clear enough.	Graham von Maltitz	South Africa	Thank you for your comment. Noted.	
16997	27		27		Figure 1.7 : It is difficult to read the text on the figure	Government of France	France	Thank you for your comment. Noted.	
17627	29	1	29	46	Please elaborate more on input assumptions: discounting and technology assumptions; edogenous vs. exogenous, etc..	Alaa Al Khourdajie	United Kingdom (of Great Britain and Northern Ireland)	Thank you for your comment. Noted.	
17625	29	18	29	18	On ABMs, please consider the following review paper: https://onlinelibrary.wiley.com/doi/abs/10.1002/wcc.647	Alaa Al Khourdajie	United Kingdom (of Great Britain and Northern Ireland)	Thank you for your comment. Noted. The Annex C structure has been reviewed.	
20451	29	20	29	24	The problems of the IAMs, energy models and equally important data, for being totally open and so transparent are analysed in : Stefan Pfenninger, Lion Hirth, Ingmar Schlecht, Eva Schmid, Frauke Wiese, Tom Brown, Chris Davis, Matthew Gidden, Heidi Heinrichs, Clara Heuberger, Simon Hilpert, Uwe Krien, Carsten Matke, Arjuna Nebel, Robbie Morrison, Berit Müller, Guido Pleßmann, Matthias Reeg, Jörn C. Riehstein, Abhishek Shivakumar, Iain Staffell, Tim Tröndle, Clemens Wingenbach, Opening the black box of energy modelling: Strategies and lessons learned, Energy Strategy Reviews, Volume 19, 2018, Pages 63-71, ISSN 2211-467X, https://doi.org/10.1016/j.esr.2017.12.002 .	Jordi Solé	Spain	Thank you for your comment. Noted.	
20453	29	20	29	24	Closed models or "black box" models are really an issue to assure a good science behind it. Openness is not the case of the energy models used in the current main international and national institutions. Alternatively, there are initiatives to open up the energy and data used in the models and the IAMs associated to them, please see https://openmod-initiative.org for open models and https://open-power-system-data.org/background/ for open data (please see: Frauke Wiese, Ingmar Schlecht, Wolf-Dieter Bunke, Clemens Gerbaulet, Lion Hirth, Martin Jahn, Friedrich Kunz, Casimir Lorenz, Jonathan Mühlenpfordt, Juliane Reimann, Wolf-Peter Schill, Open Power System Data – Frictionless data for electricity system modelling, Applied Energy, Volume 236, 2019, Pages 401-409, ISSN 0306-2619, https://doi.org/10.1016/j.apenergy.2018.11.097)	Jordi Solé	Spain	Thank you for your comment. Noted.	

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
76283	32	10	33	36	It would be useful if you could mention the core set of scenarios used in WGI; with references to Ch4 and the scenario description section in WGI Ch1. It would also be natural if you could say which scenarios are used in WGII.	Jan Fuglestedt	Norway	Thank you for your comment. Noted.
83983	34				Models abbreviations should be explained in the legend	Tomáš Halenka	Czech Republic	Thank you for your comment. Noted.
47481	39	1	39	27	Illustrative pathways would be better located former part because they are referred I.4.2 (p14) but not yet explained.	Shinichiro Fujimori	Japan	Thank you for your comment. The sentence has been revised.
76279	39	1	39	27	It would be useful with a few sentences about how the IPs align with the core set of scenarios used in WGI; i.e. in terms of the temperature outcomes. Also how they relate to what is used in WGII.	Jan Fuglestedt	Norway	Thank you for your comment. The sentence has been revised.
16999	40		40		Table II.1 : Be aware that the addition in models of marine uses could change the results. For example, uses of marine energy and resources do not have the same impacts in terms of CO2 emissions, nutrition, etc. And it is important to take into account the possible substitutions between terrestrial and marine resources and energy.	Government of France	France	Thank you for your comment. Noted.
14981	42				It is unfortunate that this topic is "only" covered in the ANNEX of the WGIII assessment. Policymakers would have already desperately looked for this cross-WGI information in the SPM as well as in chapter 1. The whole set of IPs references Paris Agreement temperature targets (which have been informed by AR5), so it is fundamentally important to, for example, provide information on historical warming estimate choice at the highest level, i.e. the SPM. It has to be possible at all times to relate back to warming estimates used for pathway classification under SR1.5 and AR5 WGIII (Table SPM.1 footnote 7) and compare those with the latest assessment, there has to be full transparency in this regard. Hence, please add a table that compares warming estimates used for the classification for AR6 WGIII, SR1.5 and AR5 WGIII. This table should also be included in chapter 1 and at least condensed into a Table SPM.1 footnote in the SPM. Also, please reflect on the use of temperature metrics linked to the Paris Agreement as e.g. highlighted in Tokarska et al. (2019)	Government of Saint Kitts and Nevis	Saint Kitts and Nevis	Thank you for your comment. Noted.
45673	45	1	45	9	Synthesising WG II and WG III will be very helpful. We hope that such analysis will be provided at least in the SYR.	Government of Germany	Germany	Thank you for your comment. Noted.
14871	47				The vetting process has not been vetted. Major concerns are: vetting for CCS: some scenarios are overly confident on CCS in 2020 and should be vetted out. Vetting for PV/wind: it's wrong to lump them together, because they have highly different learning curves. Vetting for PV/wind: why allow here for a 50% margin, which is much higher than for the others? Suggest to reduce to 30%.Vetting for bioenergy: should be there too.	Felix Creutzig	Germany	Thank you for your comment. Noted. Links with other SDGs and developmental dimensions have been included in Part I sectorial sections.

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response	
20127	48	0	48	0	<p>More ongoing inter-comparison projects, like ENGAGE, with submitted datasets (e.g. PARIS REINFORCE, NAVIGATE). E.g. PARIS REINFORCE Exploring stakeholder-driven scenarios for climate change policy to deliver on the Paris Agreement ongoing (Sognaes et al.) https://paris-reinforce.eu/ http://paris-reinforce.epu.ntua.gr/main Number of scenarios still increasing (e.g. 100)</p> <p>- Sognaes, I., Gambhir, A., Van de Ven, D.-J., Nikas, A., Anger-Kraavi, A., Bui, H., Campagnolo, L., Delpiazzo, E., Doukas, H., Giarola, S., Grant, N., Hawkes, A., Koberle, A., Kolpakov, A., Mittal, S., Moreno, J., Perdana, S., Rogelj, J., Vielle, M., & Peters, G.P. (under review). A multi-model analysis of long-term emissions and warming implications of current mitigation efforts. Nature Climate Change.</p> <p>Similarly: NAVIGATE Developing the new generation of IAMs ongoing (Gernaat et al., 2021) https://navigate-h2020.eu/ Nuber of scenarios still going</p> <p>Gernaat, D. E., de Boer, H. S., Daioglou, V., Yalew, S. G., Müller, C., & van Vuuren, D. P. (2021). Climate change impacts on renewable energy supply. Nature Climate Change, 11(2), 119-125.</p>	Nikas Alexandros	Greece	Thank you for your comment. Noted. Links with other SDGs and developmental dimensions have been included in Part I sectorial sections.	
47479	48	3	48	3	Fujimori et al. (2019); Nature Sustainability should be a key reference for CDLINKS intermodel comparison. https://www.nature.com/articles/s41893-019-0286-2	Shinichiro Fujimori	Japan	Thank you for your comment. Noted.	
61463	49		49		The table is not intuitive enough. It is suggested to modify it.	Graham von Maltitz	South Africa	Thank you for your comment. Noted.	
48421	52	1	52	1	Although a large number of national scenarios are classified into Other category, there were more detailed subcategories in the meta-scenario sheet of scenario submission template, such as Mi-Century strategy and Enhanced mitigation. I suggest adding columns to present more detailed subcategories for national scenarios.	Ken Oshiro	Japan	Thank you for your comment. Noted.	
75057	53	13	53	26	I think it might be better to further break down the total number of models based on whether each model was used to estimate simulation input parameters, or the model is actually a simulation model for sector-level predictions using the key perspectives.	Rong Lu	United States of America	Thank you for your comment. Noted.	
80079	54	1			<p>References to be added to Annex C :</p> <p>Bréchet, T., Gerard, F. and Tulkens, H. 2011, "Efficiency vs. stability in climate coalitions: A conceptual and computational appraisal", The Energy Journal, 32, 49–75.</p> <p>Eyckmans, J. and Tulkens, H. 2003, "Simulating coalitionally stable burden sharing agreements for the climate change problem", Resource and Energy Economics 25 299-327.</p> <p>Germain, M., Toint, P., Tulkens, H. and de Zeeuw, A. 2003, "Transfers to sustain dynamic core-theoretic cooperation in international stock pollutant control", Journal of Economic Dynamics and Control 28: 79–99.</p> <p>Tulkens, H. 2019, Economics, Game Theory and International Environmental Agreements: The Ca' Foscari Lectures, World Scientific Publishing Co., Singapore, London.</p> <p>Yang, Z. 2008, Strategic bargaining and cooperation in greenhouse gas mitigations: an integrated assessment modeling approach, The MIT Press, Cambridge, MA.</p>	Henry Tulkens	Belgium	Thank you for your comment. The sentence has been revised.	

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response	
11947	64	10	64	19	Baselines for thermal comfort to be framed as a range rather than absolute value as based on the DNA the local population has inherent thresholds and that may be negotiated to reduce energy demand i.e. threshold for UK summer deaths may be acceptable for people in Africa, India and others. The intent is not to differentiate the people for their origin but acknowledge their thresholds as drastic variation often leads to diluting their immunities and health hazards; with increased energy demand and related issues too.	Anjali Sharma	India	Thank you for your comment. The sentence has been revised.	
45675	89	0			Please add the names of the model in the index of "Part 2: Model reference cards"	Government of Germany	Germany	Thank you for your comment. Noted. This has been corrected.	
61465	101	47	101	47	The character "2" should be superscript.	Graham von Maltitz	South Africa	Thank you for your comment. Revised.	
61467	102	4	102	5	I suggest to add specific notation to these narratives, such as "sustainable development (SSP1)" etc., to make it clearer.	Graham von Maltitz	South Africa	Thank you for your comment. The sentence has been revised.	
61469	104	10	104	10	As to the abbreviation "NDC", the full name should be given when it firstly appears.	Graham von Maltitz	South Africa	Thank you for your comment. The sentence has been revised.	
61471	104	14	104	14	Suggest to unify the terms, such as "long-term targets of 2 and 1.5°C?" in line 11 and "long-term targets of well-below 2°C and 1.5°C?" in line 14.	Graham von Maltitz	South Africa	Thank you for your comment. Noted.	
30491	106	3	106	3	Two cross-cutting EMF-30 papers should be added here: Smith S.J., J. Chateau, K.R. Dorheim, L. Drouet, O. Durand-Lasserve, O. Fricko, and S. Fujimori, et al. 2020. "Impact of Methane and Black Carbon Mitigation on Forcing and Temperature: A Multi-Model Scenario Analysis." Climatic Change, 163, 1427–1442. https://doi.org/10.1007/s10584-020-02794-3 , and Harmsen M, Fricko O, Hilaire J, Van Vuuren D, Drouet L, Durand-Lasserve O, Fujimori S, Keramidas K, Klimont Z, Luderer G, Reis L, Riahi K, Sano F, Smith S J. 2019. "Taking some heat off the INDCs? The limited potential of short-lived climate forcers' mitigation" Climatic Change, 163, 1443–1461. https://doi.org/10.1007/s10584-019-02436-3	Steven Smith	United States of America	Thank you for your comment. The sentence has been revised.	
30493	106	15	106	15	text is confusing. Suggest: What is the impact of policies aiming at reducing emissions of short-lived climate forcers on forcing, temperature, and health.	Steven Smith	United States of America	Thank you for your comment. The sentence has been revised.	
30495	106	19	106	25	This text is incorrect. Appears to be copy/pasted from another section. Please either take text from the EMF-30 overview paper or contact the authors of that paper for some accurate text.	Steven Smith	United States of America	Thank you for your comment. The sentence has been revised and additional reference sources were provided.	
20129	120	1	122	45	In line with the above, for example, PARIS REINFORCE includes seven global models (GCAM, TIAM, MUSE, E3ME, 42, GEMINI-E3, ICES), four European (FORECAST, ALADIN, EU-TIMES, NEMESIS), and a series of regional, like MUSE-Brazil, GCAM-China, GCAM-SOUSEI, GCAM-USA, AIM-Japan, TIMES-India, NATEM-TIMES, MAPLE-China, TIMES-CAC, etc.), and currently under review publications producing emissions scenarios include, among others: - Sognaes, I., Gambhir, A., Van de Ven, D.-J., Nikas, A., Anger-Kraavi, A., Bui, H., Campagnolo, L., Delpiazzo, E., Doukas, H., Giarola, S., Grant, N., Hawkes, A., Koberle, A., Kolpakov, A., Mittal, S., Moreno, J., Perdana, S., Rogelj, J., Vielle, M., & Peters, G.P. (under review). A multi-model analysis of long-term emissions and warming implications of current mitigation efforts. Nature Climate Change. - Giarola, S., Mittal, S., Vielle, M., Perdana, S., Campagnolo, L., Delpiazzo, E., Bui, H., Anger-Kraavi, A., Kolpakov, A., Sognaes, I., Peters, G.P., Hawkes, A., Koberle, A., Grant, N., Gambhir, A., Nikas, A., Doukas, H., Moreno, J., & Van de Ven, D.J. (under review). Challenges in the harmonisation of global integrated assessment models: a comprehensive methodology to reduce model response heterogeneity. Science of the Total Environment. See more here: http://paris-reinforce.epu.ntua.gr/pr_wwh/scientific_module	Nikas Alexandros	Greece	Thank you for your comment. The sentence has been revised.	
61473	129	14	129	14	Is "belinket" used correctly here?	Graham von Maltitz	South Africa	Thank you for your comment. The sentence has been revised.	

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
61475	133	3	133	5	Should the information of this publication be updated?	Graham von Maltitz	South Africa	Thank you for your comment. Noted.
84963	138	17	138	32	Greater emphasis of these points and the urgent need for international standards and implementation strategies is warranted and urgently needed as carbon-pricing schemes are being implemented regionally and across member-states.	Eli Rabani	United States of America	Thank you for your comment. Noted. The detailed technological portfolios of pathways will be presented and made available in the IPCC WG III AR6 database.
84967	138	17	138	32	Because this will depend heavily on each technology, their implementation and enterprise characteristics, frameworks for evaluation and optimization will need to be developed and procedures for their implementation and conduct must be established.	Eli Rabani	United States of America	Thank you for your comment. Noted.
84969	138	17	138	32	Alignment with and contribution to progress towards SDGs should be made a qualifying principle for award of carbon credits in the event that measurable CDR capacity becomes adequate to meet or exceed SP15 net emission targets, such that competition favors verifiable carbon capture which contributes to earliest accomplishment of SDGs.	Eli Rabani	United States of America	Thank you for your comment. Noted.
84965	138	24	138	28	Additionally, concerning 2.(ii) various mitigation/CDR strategies or technologies can create co-benefits that can serve SDGs and be distributed or redistributed as in-kind investments. in SDGs, and should be valued appropriately & considered equivalent to revenues in a manner that simultaneously optimizes economic viability of these climate interventions toward timely climate restoration and progress towards SDGs. Additionally, rewinding effecting ecological restoration and associated ecosystem services should be considered in the foregoing valuations.	Eli Rabani	United States of America	Thank you for your comment. Noted.
61477	156	14	156	14	Should "by" be added before "30-70%"?	Graham von Maltitz	South Africa	Thank you for your comment. Noted.
85411	158	10	158	10	Addressing residual emissions in 'challenging-to-decarbonise' sectors such as the industrial and aviation sectors relies on the development and commercialization of innovative advanced technologies, currently still in lower readiness levels.	Neil Dickson	Canada	Thank you for your comment. Noted.
61479	161	16	161	16	Is the sentence finished? What does it mean "in reach"?	Graham von Maltitz	South Africa	Thank you for your comment. Noted.
74299	177	27	177	34	The model assumption is that nuclear "might have to play a role" and seems to suggest that an effort would be made to accommodate the demand through renewables. Given the current and anticipated volume of nuclear production through this period, and investments that are being made to produce green hydrogen by nuclear power, the role of nuclear seems to be understated. https://www.hydrogen.energy.gov/nuclear.html	Jeffrey Merrifield	United States of America	Thank you for your comment. Noted.
74301	185	36	185	41	The language should be modified to note that steam from nuclear units has been extensively used in eastern Europe and Russia. https://www.world-nuclear.org/information-library/non-power-nuclear-applications/industry/nuclear-process-heat-for-industry.aspx	Jeffrey Merrifield	United States of America	Thank you for your remark. Limitations of IAMs and other model methods have been strengthen in FGD.
74303	194	21	194	33	This section fails to address the efforts of African countries currently underway to potentially deploy nuclear power as one of the elements to meet their future carbon free generation needs. Currently, South Africa has two operating nuclear units and Egypt has several currently under construction. https://www.iaea.org/newscenter/news/is-africa-ready-for-nuclear-energy	Jeffrey Merrifield	United States of America	Thank you for your comment. Noted. The sentence has been revised.
61483	201	16	201	17	The sentence is not clear, please rephrase.	Graham von Maltitz	South Africa	Thank you for your comment. Noted. The sentence has been revised.
61485	201	36	201	36	"100% Renewable 1.0", why did use "1.0"	Graham von Maltitz	South Africa	Thank you for your comment. Noted. The sentence has been revised.
61487	203	9	203	9	"1.5C" should be "1.5 °C"	Graham von Maltitz	South Africa	Thank you for your comment. Noted.
61489	203	10	203	10	It is better to give a specific year (e.g. by 2050 or by 2100) instead of "next decades"	Graham von Maltitz	South Africa	Thank you for your comment. Noted.

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61491	203	21	203	21	Why should deforestation make room for grasslands? For pastures may for livestock ranching, but what are grasslands used to?	Graham von Maltitz	South Africa	Thank you for your comment. Noted.
61493	203	22	203	22	Do you mean "biomass would become a key energy fuel"? It is better to see them discussed as hypotheticals to remind the reader that these are potential outcomes of their choice.	Graham von Maltitz	South Africa	Thank you for your comment. Details about biomass resources availability and potential conflicts with land use are detailed in chapters 7 and 12.
61495	208	15	208	15	It is a surprising result "NDC has not many impacts on the economy in Thailand". Could you give some specific numbers (e.g. NDC would reduce economic growth by X%) and explain some reasons why it happens?	Graham von Maltitz	South Africa	Noted.
61497	210	22	210	22	What do you mean "rapid and huge" here?	Graham von Maltitz	South Africa	Noted.
61499	212	25	212	25	"The macroeconomic impact (GDP loss) was the largest when CCS is unavailable" why did you use "was" here? Is it a historical trend analysis?	Graham von Maltitz	South Africa	Noted.
15331	214	29	214	29	The statement in the sentence "China's Nationally Determined Contributions do not comply with the Paris Agreement" is too subjective, and the facts and China's positive contribution should be respected. It is suggested to revise the expression or delete the sentence by the author.	Government of China	China	Noted.
61501	214	31	214	31	What do you mean "local actors" here?	Graham von Maltitz	South Africa	Noted. Sentence has been revised and definition of local actors has been included.
61503	215	21	215	21	What do you mean "points" here?	Graham von Maltitz	South Africa	Noted. Sentence has been revised.
15333	231	30	231	30	The expression of Taiwan (ROC) is wrong. It is suggested to change "Taiwan (ROC)" to Taiwan, Province of China.	Government of China	China	Thank you for your comment. The regional classification has been finalised and agreed as part of the approval process.
74305	232	23	232	35	I would be interested to understand what mix of nuclear technologies was assumed for this analysis. Was it solely 1 GWE Generation III designs, or did it incorporate Generation IV advanced nuclear including high-temperature gas, molten salt and fast reactors that are currently under development? The latter group is generally of a much smaller size (50-300 MWE) and includes a significantly larger share of factory manufactured components, which has the potential to reduce risk and allow for construction methodologies more akin to a combined cycle gas unit. This will allow for a higher rate of potential deployment and lower risk of the units not being completed.	Jeffrey Merrifield	United States of America	Noted.
74307	264	26	264	36	This model is incomplete as it does not include hydrogen produced by nuclear power.	Jeffrey Merrifield	United States of America	Noted.
74309	265	4	265	10	This model is incomplete as it does not include heat generation provided by nuclear power. https://www.world-nuclear.org/information-library/non-power-nuclear-applications/industry/nuclear-process-heat-for-industry.aspx	Jeffrey Merrifield	United States of America	Noted.
74311	272	16	272	31	This model is incomplete as it does not include hydrogen produced by nuclear power.	Jeffrey Merrifield	United States of America	Noted.
74313	272	37	272	44	This model is incomplete as it does not include heat generation provided by nuclear power. https://www.world-nuclear.org/information-library/non-power-nuclear-applications/industry/nuclear-process-heat-for-industry.aspx	Jeffrey Merrifield	United States of America	Noted.
74315	278	39	278	45	This model is incomplete as it does not include heat generation provided by nuclear power. https://www.world-nuclear.org/information-library/non-power-nuclear-applications/industry/nuclear-process-heat-for-industry.aspx	Jeffrey Merrifield	United States of America	Noted.
74317	285	3	285	10	This model is incomplete as it does not include hydrogen produced by nuclear power.	Jeffrey Merrifield	United States of America	Noted.
74319	285	21	285	26	This model is incomplete as it does not include heat generation provided by nuclear power. https://www.world-nuclear.org/information-library/non-power-nuclear-applications/industry/nuclear-process-heat-for-industry.aspx	Jeffrey Merrifield	United States of America	Noted.
2327	301	22	301	24	Please change this sentence to the following: "Under current plans and policies (PES), energy-related CO2 emissions remain flat to 2050, despite increasing energy demand - a result of a combination of greater use of renewables, energy efficiency improvement and fuel-switching."	Nicholas Wagner	Germany	Noted.

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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response	
10907	Anne x C-27	1	Anne x C-27	1	Could you please expand the size of the figure to improve its readability?	Alix Frank Rodrigue Idohou	Benin	Thank you for your comment. The figure has been enlarged.	
10909	Anne x C-29	1	Anne x C-29	47	Based on the limitations and the number of criticisms raised on the application of IAMs, can we still rely on them now for modelling exercises?	Alix Frank Rodrigue Idohou	Benin	Thank you for your comments. The section about IAM limitations has been revised.	
10903	Anne x C-5	1	Anne x C-5	5	How can one use both general equilibrium models and partial equilibrium models at the same time?	Alix Frank Rodrigue Idohou	Benin	Thank you for your comments. Sentences has been revised.	
10901	Anne x C-5	13	Anne x C-5	13	One major aspect of optimisation models is that the solution is achieved.... Rather write....is achieved.....	Alix Frank Rodrigue Idohou	Benin	Thank you for your comments. Sentences has been revised.	
10905	Anne x C-5	15	Anne x C-5	15	Change considerable by considerably	Alix Frank Rodrigue Idohou	Benin	Thank you for your comments. Sentences has been revised.	
4055		13			change the Word in by is in: One major aspect of optimisation models is that the solution is achieved by simultaneously...	Hugo Mantilla-Meluk	Colombia	Thank you for your comments. Sentences has been revised.	
4057					I consider important to include a short note, highlighting the increasing need on integrating: Earth system models (ESMs) aspects (climate, global carbon cycle, terrestrial vegetation, and ocean ecosystem), and IAMs socio-economic aspects (energy, economic systems, and associated greenhouse gas emissions), to address issues driven by integrative biogeophysical, socioeconomic and human decision-making perspectives. Collaboration between these two communities is expected to play an important role and to help better understand the role of both natural and human systems and their interaction (Bond-Lamberty et al., 2014, Hibbard et al., 2010). B. Bond-Lamberty, K. Calvin, A.D. Jones, J. Mao, P. Patel, X.Y. Shi, et al. 2014. On linking an Earth system model to the equilibrium carbon representation of an economically optimizing land use model. Geosci. Model Dev., 7:2545-2555. K. Hibbard, A. Janetos, D.P. van Vuuren, J. Pongratz, S.K. Rose, R. Betts, et al. 2010. Research priorities in land use and land-cover change for the Earth system and integrated assessment modelling. Int. J. Climatol., 30:2118-2128.	Hugo Mantilla-Meluk	Colombia	Noted.	
60143					I was looking to a definite quantification for 'high confidence', 'medium confidence' 'low confidence' etc.. Is it >95% for 'high confidence'. The report may substantiate this if it not already there.	Umasankari Kannan	India	Noted.	

IPCC AR6 WGIII Second Order Draft Government and Expert Review Comments Responses (Annex III - Scenarios and modelling methods)								
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Comment ID	From Page	From Line	To Page	To Line	Comment	Reviewer	Country	Response
69957					It remains unclear which IEA scenario has been considered - some references are for WEO 2017, others for WEO 2019 and ETP 2020. In any case, I would suggest considering WEO 2020 and its Chapter 4 relative to the first ten years of a Net Zero Emissions by 2050 (NZE2050), the sole that is consistent with 1.5°C target - to be followed by a special IEA NZE 2050 report. Only Chapter 11 Industry currently mentions it. Building on recent evolution of technologies, notably solar and wind power and batteries, IEA2020 underlines some differences between its own findings and the IPCC 1.5°C scenarios. Most of them assume a lower level of population and economic growth than the NZE2050. Nuclear plays a much larger role in many IPCC 1.5°C scenarios than in the NZE2050: half of IPCC 1.5°C scenarios imply an increase in nuclear generation of 60% between 2019-30, compared with a 36% increase in the NZE2050. By contrast, renewables provide 60% of global electricity supply in the NZE2050, a larger share than is the case in around 80% of the IPCC 1.5°C scenarios. Oil use in 2030 in the NZE2050 is less than around three-quarters of the IPCC 1.5°C scenarios, natural gas use is less than around half of the scenarios. The amount of CO2 captured in 2030 in the NZE2050 is less than the level captured in half of the IPCC 1.5°C scenarios, and the 35 Mt CO2 captured through BECCS in 2030 in the NZE2050 is less than the level captured in 60% of the scenarios.	Cédric PHILIBERT	France	Noted.