

APCC AAR2 Second Order Draft Review Comments and Responses Chapter 4

Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
8	0	0	0	0	Throughout the report biodiversity is mentioned many times, mostly as either co-benefit or conflicting objective related to mitigation. However a clear definition of biodiversity is never given. Indeed it seems different authors implicitly use different - and sometime conflicting - definitions. The unfortunate consequence is a complete lack of metrics for biodiversity in the report. (Despite such metrics being readily available in the literature and international policy documents.) While we have clear metrics for mitigation or GHG emissions, where the only notable complication concerns consumption based accounting, no method for comparing scenarios in the biodiversity dimension is used or provided. This is a serious weakness: Discussions and tradeoffs between conflicting objectives cannot be based on facts and come across as personal opinions.	We communicated this to the LAs of chapter 4. If applicable, we tried to implement this.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
9	0	0	0	0	Please apply the concept of uncertainty in a larger context and apply the safety principle and the precautionary principle drawing on worst case scenarios The important concept of uncertainty was quite prominently covered in AAR14, according assertions were clear such as: The safety principle, the precautionary principle and the polluter pays principle. The safety principle requires that, in case of doubt, THE UPPER LIMIT (the „WORST CASE SCENARIO“) of possible negative environmental impacts should be assumed. Scientific evidence of negative consequences of climate change beyond all doubt is therefore not required to implement climate protection measures; a plausible suspicion is sufficient. Doubts about the anthropogenic influence on the climate should therefore not be accepted as a justification for „business as usual“. For climate science, this means that it must in any case present the full range of possible impacts, including rather unlikely but possible „best case“ and „worst case“ scenarios, in order to enable society to make informed decisions. This, assuming always an 1) upper limit and 2) a worst case scenario, does not seem to be adequately taken into account in many places in AAR2 which are to numerous to list them here. However, the most prominent according fields are: 1. surface temperature rise (Austria, globally) and according directly temperature related consequences such as the length and height of heat waves 2. significantly endangered food safety (regarding Austria's self- sufficiency) in particular the worst case of massively reduced yields up to local or even nationwide total crop failures 3. overcrowded emergency facilities during heat waves reaching capacity limits of different kinds, in particular in hospitals 4. wood fires of larger size Most of the above risks were discussed among doctors and scientists in November 2023 in Vienna during an event hosted by the Viennese medical chamber called „Medizin in der Klimakrise“, most relevant video: Wiener Ärztekammer (Nov. 2023). /Medizin in der Klimakrise, Teil 9/. url: https://www.youtube.com/watch?v=T56gS7s26mA&t	We communicated this to the LAs of chapter 4. If applicable, we tried to implement this.

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11	0	0	0	0	Please mitigate/leave out euphemistic descriptions of future/present positive effects of global warming Even though these statements are true they have the potential to create an attitude of underestimating the total risk of the mid- to longterm climate change impact. Examples are: 1. Positive effects of CO₂ -fertilization on plant growth 2. Citation: In limited situations, climate change will improve ecosystem productivity by increasing temperatures, extending cropping seasons. 3. Citation: Warmer temperatures, however, improve conditions for e.g., bathing activities or summer tourism	We communicated this to the LAs of chapter 4. While we do not necessarily agree that example 3 is a good example for an euphemistic description, we tried to implement this throughout the report, if applicable.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
12	0	0	0	0	Please include a risk assessment of the possibility of a /systemic collapse/ The topic of a systemic collapse is currently avoided/missing although the according mechanisms have been made clear at least by 1972 (Donella Meadows, Jörgen Randers und Dennis Meadows (2016). /Grenzen Des Wachstums — Das 30-Jahre-Update/. 5. Aufl. Hirzel). What had been seen even by the authors as lying far way in the distance at that time has now become a more imminent and even obvious risk. Before making the risk assessment the notion of 'systemic collapse' should be defined as adequately as possible for the analysis. The topic is that important that it merits an according subsection/box or the like. One example underpinning that the importance of the analysis of a collapse has found large attention within the scientific sector is the following declaration about the threat of societal collapse (mainly triggered by climate change), signed by six hundred and seventy-four scholars, all with a doctoral degree, from 53 countries, including many professors and also a former minister (Dr Yves Cochet) among others from 2020. Since then, this initiative of scholars produced four open letters to either the general public or participants in key international summits, the last dating from 2023. these scientists believe that "Only if policymakers begin to discuss this threat of societal collapse might communities and nations begin to prepare and so reduce its likelihood, speed, severity, harm to the most vulnerable, and to nature." Each signatory, with doctoral degree, endorsed a public warning on societal disruption and collapse due to environmental change. They cover more than 20 major academic disciplines, including ecology and climatology, thereby conclusively demonstrating that preparations for societal collapse are being taken seriously by experts from around the world. The announcement of the final list of signatories concludes a 3-year initiative to promote awareness of the scientific basis for exploring how to reduce the damage from societal disruption, breakdown, and collapse, due to environmental change. The range of signatories demonstrates clearly that any scientists or commentators who claim that warnings and preparations for societal collapse are unscientifically fringe beliefs are either grossly misinformed or deliberately misleading. Editors, journalists, 'factcheckers' and 'online safety groups' who ignore or disparage such views when covering the topics of climate change, biodiversity loss, and energy futures, can now be challenged by readers, colleagues, funders and advertisers. Therefore, digital platforms should desist from any further 'visibility filtering' or 'de-amplifying' of analyses of collapse risk, as they have done in the past. (Source: https://jembendell.com/2024/07/03/no-more-warnings-needed-an-intransigent-managerial-class-must-be-sidestepped/, accessed on 2024-07-26) If nothing can be said about the collapse risk include the issue in a prominent place in the list of „Research Gaps“.	Thank you. We provide a risk assessment where possible.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
13	0	0	0	0	Target years 2040, 2050 and 2070: These years are psychologically too far off. The target years 2040, 2050 and 2070 are far off in the future. Even though projections have to be made it should be prominently added that the uncertainties are very high with regard to projections along such long periods. This increases confidence into science rather than compromising it. In particular in 2023 the broad public has seen and felt that most of the climate models and scientists were not capable to predict the sharp rise in global surface and sea surface temperature. Citations in the report: 1. Strong climate change has a high potential to negatively affect carbon stocks and halt sequestration, in particular after 2070 (medium evidence, high agreement). [2.3.3, 2.3.4, 2.4] page: , rows: 2. The long-term nature of spatial planning creates particular urgency, given Austria's climate neutrality goal for 2040. page: , rows: 3. The overall final energy demand for heating will decrease in the different scenarios by 10-50 % until 2040/2050, despite the population growth and therefor increasing heated area	We communicated this to the LAs of chapter 4. If applicable, we tried to implement this.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
14	0	0	0	0	Please take into account that quite some scientists spread the word that the „Paris goal“ of 1.5 °C has already been missed and very likely also 2 °C will be surpassed! There seems to be a lot of uncertainty regarding how the most recent dramatic development of the global surface temperature (inkl. at least the entire year of 2023) relates to the Paris/Glasgow goal (and other thresholds) of 1.5 °C . While the majority of scientists (=consensus) seems to be of the opinion and many declare it publicly that neither the 1.5 °C target will be met and most likely nor will the 2 °C be met, some scientists up to the end of 2023 publicly still clinged to the possibility that the 1.5 °C target may still be met. It should be clarified that this opinion can only be maintained when looking at the mean temperature based on a calculation period (averaging interval) which is large enough to level out the most recent rapid rise in temperature. Since the current calculation period is a concept that was developed decades ago during a rather stable climate the according limits of applicability and risks of applying it in case of an accelerating temperature rise should be made transparent. This is in particular true for the case of decisions makers who seek all possibilities to downplay the dramatic development of the temperature rise. Citations from the report: 1. fundamental aims of the assessment report with the goal of keeping global warming well below 2 degrees page: , rows: 2. Regardless of the political commitment, the achievability of the goals by current measures is doubted page: , rows: 3. Rapid reductions restrict warming to well-below 2 degreeC So this passage should be adapted as well: For all emission scenarios considered by the IPCC, global surface temperature will continue to rise until at least mid-century (high confidence) (IPCC, 2021a). Global warming of 1.5 °C and 2 °C will be exceeded during the 21st century unless deep reductions in CO2 and other greenhouse gas emissions occur in the coming decades (IPCC, 2021a).	When mentioning the 1.5°C or 2°C target, we kept in mind how the statement may be perceived by the reader.

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15	0	0	0	0	Please allow for a widened the spectrum of admitted sources and references In line with the practice of the IPCC reports only peer-reviewed scientific papers are admitted as references. This ensures a highly sound scientific basis but on the other hand strongly limits how reality can be grasped, Other types of references should be admitted given the current exceptional circumstances that 1. the climate catastrophe is advancing at an extremely fast pace 2. it often takes too long until a paper is published 3. some sensitive topics are not well accepted or bluntly avoided in scientific papers. The most important example is the sensitive issue of systemic collapse, because it still is rather a taboo in the scientific ambience (proof lacking due to self-reference, see the according comment) Suggestion how to include non peer-reviewed references without compromising the scientific standard: As with the IPCC classification of certainty (high agreement, robust evidence etc.) additional sources may be tagged with according remarks or even explicit warnings on potential biases, e. g.: „paper not peer-reviewed“, „newspaper article“, etc.. rather than too precautiously excluding them from eligible references. This is even more justified as the entire AAR2 is subject to an external review process safeguarding against biases. During this review additional cautious remarks might be added by the reviewers. Examples of such additional references that can bring along important added value are 1. books, including popular science books of scientists or similar quality, e.g. from investigative journalists as long as a minimum standard is met (foremost spedification of references) 2. conference proceedings (even if not peer-reviewed) 3. articles in newspapers authored by scientists 4. video/audio recordings/transcripts of public talks of scientists 5. at a national level papers issued by research institutions, a concrete example are the „discussion papers“ from the Austrian University of Life Sciences (Boku): https://boku.ac.at/wiso/infer/publikationen/diskussionspapiere 6. publications of scientists on blogs, websites etc., for instance of former prof. Jem Bendell (prof. at the University of Cumbria up to the end of 2023). 7. statistics issued by large corporations such as insurances, banks etc.	If applicable, we also included non-peer reviewed literature in the assessment. However, we are restricted to literature that is or can be made publicly available.

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16	0	0	0	0	Please include the rather new notion of /ecocide/ and its potential driving potential in policies/transformation paths The notion of „ecocide“ and according legal sanctions are currently not mentioned in the report although there are relevant according discussions at a national but foremost at a European level. On the issue it says the following in Ernest Aigner u. a. (2023). /APCC Special Report: Strukturen für ein klimafreundliches Leben/. Hrsg. von Christoph Görg, Verena Madner, Andreas Muhar Andreas Novy, Alfred Posch und Karl W. Steininger Ernest Aigner. Springer Spektrum. isbn: 978-3-662-66496-4: For some time now, the legal policy debate has been discussing under the keyword „ecocide“ whether behavior that is harmful to the environment or the climate can be understood and sanctioned as an (international) crime, depending on its severity (Greene, 2019; Gray, 1996). A draft to introduce ecocide as a criminal offense at the international level was already presented in 2010 (Gauger et al., 2013; Higgins et al., 2013). This draft defines „ecocide“ as actions or omissions that, among other things, cause climate damage or the loss of entire ecosystems. In 2021, international law experts presented a new draft in which ecocide is defined more generally. It describes ecocide as unlawful and willful actions or omissions that were carried out in the knowledge that serious, large-scale or long-lasting environmental damage could occur. Damage that affects entire animal or plant species or ecosystems, or even a large number of people, is by definition considered large-scale“(Stop Ecocide Foundation & Independent Expert Panel for the Legal Definition of Ecocide, 2021). Even then, the act or omission causing it must be unlawful or willful, so that, for example, not all species or biodiversity loss would be covered by the (future) crime of ecocide. The European Parliament has repeatedly called on the EU and MS to support the recognition of ecocide as an international crime in the Rome Statute (P9(2021)0014, 2021; European Parliament, 2022). At the national level, for example, the criminal offence of ecocide was recently added to French environmental law (LOI no 20211104 du 22 août 2021 portant lutte contre le dérèglement climatique et renforcement de la résilience face à ses effets, 2021). In 2021, the Commission proposed revising the Environmental Criminal Law Directive, under which certain acts would now constitute a criminal offence. These acts include, among others, the discharge of substances into the air, soil and water if it causes significant damage to animals and plants, or harmful behaviour that leads to significant damage in a Natura 2000 protected area (COM(2021) 851 final, 2021).	This comment does seem to be relevant for chapter 6 and 8, but not for chapter 4.

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17	0	0	0	0	If possible: Please try to establish a critical review of potential biases among the authors/steering committee. Several of the IPCC reports – at least up to AR4 – have been strongly criticized in the scientific community suffering from a bias regarding a too weak risk assessment. One of the papers that summarizes the relevant critical points bears the title 'Climate change prediction: Erring on the side of least drama?' (Keynyn Brysse, Naomi Oreskes, Jessica O'Reilly und Michael Oppenheimer (2012). /Climate change prediction: Erring on the side of least drama?/. In: /Global Environ. Change/, coauthored by Prof. Naomi Oreskes. Also Stefan Rahmstorf himself, being one of the authors, publicly declared (key note in Vienna in 2024) that he did not agree with the picture given in the final version of the related report.) A key assertion from the abstract of the paper reads as: We suggest, therefore, that scientists are biased not toward alarmism but rather the reverse: toward cautious estimates, where we define caution as erring on the side of less rather than more alarming predictions. In an older paper from 2007 (J. E. Hansen (2007). /Scientific reticence and sea level rise/. In: /Environ. Res. Lett./) one of the world's leading climatologists describes: Another relevant discussion is that of 'behavioral discounting' (Hariri et al 2006), also called 'delay discounting' (Axtell and McRae 2006). Concern about the danger of 'crying wolf' is more immediate than concern about the danger of 'fiddling while Rome burns'. It is argued in the referenced discussions that there is a preference for immediate over delayed rewards, which may contribute to irrational reticence even among rational scientists. Furthermore he stresses: I suggest that 'scientific reticence', in some cases, hinders communication with the public about dangers of global warming. If I am right, it is important that policy-makers recognize the potential influence of this phenomenon. Such a critical review of authors is definitely difficult to be done in a self-evaluation and probably ultimately can be done efficiently only by external reviewers. The main focus of the critical review should be with regard to the above citation, i. e., if the AAR2 report has a bias 'toward cautious estimates' thereby 'erring on the side of less rather than (providing) more alarming predictions'. This relates strongly to the comment on the risk of a systemic collapse which I added in a separate comment.	We communicated this to the LAs of chapter 4. If applicable, we tried to implement this.

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18	0	0	0	0	Please include a risk assessment of the possibility of a / ystemic collapse/ The topic of a systemic collapse is currently avoided/missing although the according mechanisms have been made clear at least by 1972 (Donella Meadows, Jörgen Randers und Dennis Meadows (2016). /Grenzen Des Wachstums — Das 30-Jahre-Update/. 5. Aufl. Hirzel). What had been seen at that time by the authors as lying far way in the distance today has become a more imminent and even obvious risk. Before approaching the according risk assessment the notion of 'systemic collapse' should be defined as adequately as possible for the analysis. The topic is that important that it merits an according subsection, box or the like. One example underpinning that the importance of the analysis of a collapse has found large attention within the scientific sector is the following declaration about the threat of societal collapse (mainly triggered by climate change), signed by six hundred and seventy-four scholars, all with a doctoral degree, from 53 countries, including many professors and also a former minister (Dr Yves Cochet) among others from 2020. Since then, this initiative of scholars produced four open letters to either the general public or participants in key international summits, the last dating from 2023. These scientists believe that: „Only if policymakers begin to discuss this threat of societal collapse might communities and nations begin to prepare and so reduce its likelihood, speed, severity, harm to the most vulnerable, and to nature.“ Each signatory, with doctoral degree, endorsed a public warning on societal disruption and collapse due to environmental change. They cover more than 20 major academic disciplines, including ecology and climatology, thereby conclusively demonstrating that preparations for societal collapse are being taken seriously by experts from around the world. The announcement of the final list of signatories concludes a 3- year initiative to promote awareness of the scientific basis for exploring how to reduce the damage from societal disruption, breakdown, and collapse, due to environmental change. The range of signatories demonstrates clearly that any scientists or commentators who claim that warnings and preparations for societal collapse are unscientifically fringe beliefs are either grossly misinformed or deliberately misleading. Editors, journalists, ‘factcheckers’ and ‘online safety groups’ who ignore or disparage such views when covering the topics of climate change, biodiversity loss, and energy futures, can now be challenged by readers, colleagues, funders and advertisers. Therefore, digital platforms should desist from any further ‘visibility filtering’ or ‘de-amplifying’ of analyses of collapse risk, as they have done in the past. (Source: https://jembendell.com/2024/07/03/no-more-warnings-needed-an-intransigent-managerial-class-must-be-sidestepped/, accessed on 2024-07-26) If nothing can be said about the collapse risk please include the issue in a prominent place in the list of „Research Gaps“. See also the following most recent papers (more older ones do exist): 1. Lisa Scordato und Magnus Gulbrandsen (2024). /Resilience perspectives in sustainability transitions research: A systematic literature review/. In: /Environmental Innovation and Societal Transitions/ 52. url: https://doi.org/10.1016/j.eist.2024.100887 j.eist.2024.100887%E2%80%9C> 2. Daniel Steel, Giulia Belotti a Ross Mittiga und Kian Mintz-Woo (2024). /A Dynamic Collapse Concept for Climate Change/. In: /Environmental Values/. url: DOI:%2010.1177/09632719241255857 3. Daniel Steel, C. Tyler DesRoches und Kian Mintz-Woo (Okt. 2022). / Climate change and the threat to civilization/. In: /Proceedings of the National Academy of Sciences (PNAS)/ 119.42, S. 907–909. url pnas.2210525119%E2%80%9C> 4. Danilo Brozović (2023). /Societal collapse: A literature review/ In: /Futures/ 145 5. Joe P. L. Davidson (2023). /Two cheers for collapse? On the uses and abuses of the societal collapse thesis for imagining Anthropocene futures/. In: /Environmental Politics/ 32.6, S. 969–987 6. C.E. Richards, H.L. Gauch und J.M. Allwood (2023). /International risk of food insecurity and mass mortality in a runaway global warming scenario/. In: /Futures/ 150	Thank you. We provide a risk assessment where possible.

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19	0	0	0	0	Please apply the concept of uncertainty in a larger context and apply the safety principle and the precautionary principle drawing on worst case scenarios A very recent and comprehensive (42 pages) overview on the important concept of uncertainty including a review of the frameworks of the past applied to the assessment of environmental change is: Luke D. Bevan (2022). /The ambiguities of uncertainty: A review of uncertainty frameworks relevant to the assessment of environmental change/. In: / Futures/ 137. The important concept of uncertainty was also quite prominently covered in AAR14, according assertions were clearly formulated such as (own translation of the german original): -- The safety principle, the precautionary principle and the polluter pays principle. The safety principle requires that, in case of doubt, THE UPPER LIMIT (the „WORST CASE SCENARIO“) of possible negative environmental impacts should be assumed. -- Scientific evidence of negative consequences of climate change beyond all doubt is therefore not required to implement climate protection measures; a plausible suspicion is sufficient. -- Doubts about the anthropogenic influence on the climate should therefore not be accepted as a justification for „business as usual“. For climate science, this means that it must in any case present the full range of possible impacts, including rather unlikely but possible „best case“ and „worst case“ scenarios, in order to enable society to make informed decisions. Assuming always an 1) upper limit and 2) a worst case scenario for safety reasons, as mentioned in AAR1, does not seem to be adequately taken into account in many places in AAR2 which are too numerous to list them here. However, the most important affected fields are: 1. surface temperature rise (Austria, globally) and according directly temperature related consequences such as the length and height of heat waves 2. significantly endangered FOOD SAFETY (focussing here on Austria's self-sufficiency) in particular of massively reduced yields up to local or even nationwide total crop failure. In less scientifically embellished words: The risk of a FAMINE should 1) be a least mentioned, 2) according boundary conditions should be sketched and the likelihood of such boundary conditions coming true should be estimated (qualitatively). 3. overcrowded emergency facilities during heat waves reaching capacity limits of different kinds, in particular in hospitals 4. wood fires of larger size The key issue in this is not an intellectual exercise on how the concept of uncertainty, known unknowns and unknown unknowns may be applied to climate or other models as it the impression might result from the above citation (Bevan, 2022). They key issue is to show to the public and to the decision makers the extension of the worst case scenario and the implications it has on the life of the population. The above risks with the exception of food safety were discussed among doctors and scientists in November 2023 in Vienna during an event hosted by the Viennese medical chamber called „Medizin in der Klimakrise“, the most relevant among the according video recording series of that day is: Wiener Ärztekammer (Nov. 2023). /Medizin in der Klimakrise, Teil 9/.%E2%80%9Chttps://www.youtube.com/watch?v=T56gS7s26mA&t%E2%80%9C	We communicated this to the LAs of chapter 4. If applicable, we tried to implement this.

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20	0	0	0	0	Please increase and emphasize the importance of „banning“ (a highly important element of all „transformation pathways“) Currently banning/forbidding is hardly used as a valid action or only implicitly. Examples are: 1. Recommendations in Steining et al. (2024) for policy are to supply the needed push (laws see Section 3.3.3) and pull measures, which means a mix of stricter building codes, laws for forbidding new HVAC systems and the exchange of HVAC systems to fossil-free systems, accompanied by well-balanced subsidies for needed technologies that are currently not sufficiently available or have too little experts on production, planning and building. page: , rows: 2. There is strong scientific consensus that decarbonization of the transport sector requires a comprehensive set of measures, which can be categorized into awareness-raising, regulatory, infrastructural or fiscal nature (high agreement, robust evidence). Assoc.-Prof. Reinhard Steurer comments on the issue of banning as a means in a talk in 2023 with a taste of irony (Youtube, minute 20:41: https://youtu.be/I9C8fxMO7UI?si=kmZ3qY610Uy3VUcQ&t=1245): By the way, there is hostility towards science. We don't need scientists, we can do this by ourselves. And what does 'common sense' tell us? It says: We do this on a voluntary basis – without forbidding. Social science keeps telling us since 20-30 years: This does not work! We will need bans. We need hard regulations - setting the boundaries for all. But with 'common sense' you may ignore this – if you as well ignore emission curves.	This comment does seem to be relevant for chapter 6 and 8, but not for chapter 4.

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21	0	0	0	0	Please improve the structure of the partly overloaded „key messages“: Dividing them into 1) alarming messages 2) further explanatory key messages E. g. there are more than 20 (!) „key messages“ in chapter 2. This is not „communication-efficient“ in particular with regard to the special target group of decision makers. The notion of „key“ is usually associated with „a few but really relevant“. The overall message would be clearer to grasp if there would be some sort of prioritization/ranking of the key messages already here not only in the summary for decision makers. The easiest prioritization would be to divide the messages in two groups: 1) alarming messages 2) further explanatory messages	We introduced key messages for the entire chapter. These introductory key messages set the context for the following key messages. The key message have been adapted accordingly.

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22	0	0	0	0	Der Entwicklung der Städte, im Besonderen der "Suburbias" mit den in sich verwobenen Gebäude- und Infrastrukturen, wird in ihrem Sachstandsbericht eine zu geringe Bedeutung beigemessen. Da der Klimawandel durch die hypertrophen Ausdehnungen der suburbanen und peri- urbanen Stadtregionen massiv beeinflusst wird, sind übergeordnet zum "Kapitel 3: Siedlungen und Städte, Wohnen, Mobilität, Raumplanung, Naturrisiken" auch die anderen sieben Kapitel des Sachstandsberichts grundlegend betroffen. Sowohl dem öffentlichen Diskurs wie auch dem Sachstandsbericht gehen dadurch wertvolle Möglichkeiten einer Transformation verloren. Meine Publikation "upgrade Suburbia" untersucht diese "Querschnittsmaterie" und bestimmt eine neue Bedeutung der Stadtregionen für den Klimawandel. Es würde mich freuen, wenn sie den Blick in diese umfassenden Zusammenhängeweiter öffnen. Sie sind für den Klimawandel von größter Bedeutung es würde mich freuen, wenn sie das dem "steering-committee" bzw. der "arbeitsgruppe" zur Kenntnis bringen. Die links zu "upgrade Suburbia" sind am Ende angeführt: https://www.buchschmiede.at/app/book/70202-Wolfgang-Steinegger-Upgrade-Suburbia beste Grüße	This comment does seem to be relevant for chapter 3, but not for chapter 4.

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23	0	0	0	0	thank you for your review request. As previous APCC reports, I find the report to be an innovative and inspiring take on this matter.	No action required.
24	0		0		Up-date references and bring reference list to a level suitable for publication (add missing information, provide all information for each reference, apply the guidelines)	Done.
25	0		0		Up-date figures and table according to the guidelines for submission	Done.
26	0		0		please standardize capitalizing in titles	Done.
27	0	0	0	0	Please use consistent wording for "climate change" vs "anthropogenic climate change"	We use the terms consistent with the definitions in the AAR2 glossary.
28	0	0	0	0	consistent structure for CS in KM - e.g. after bold statement	Done.
29	0	0	0	0	Please use the term "federal province(s)" throughout the report when referring to Austria's <i>Bundesländer</i>	Done.
30	1		637		Please note that the ÖKS15 temperature data for all RCP scenarios have a cold bias that cannot be ignored. This bias is inherent in the EURO-CORDEX runs. Based on observations (SPARTACUS), the Austrian annual mean temperature anomaly is already 2°C above 1971-2000, but this temperature increase is not reached until 2068 for RCP4.5 and 2052 for RCP8.5. (RCP2.6 never reaches a 2°C anomaly). Please mention this cold bias explicitly in Chapter 1, 1.2.2. For impact studies relying on ÖKS15, please ensure that GWLs are used and consider the temporal offset with respect to population or infrastructure projections tied to a timescale.	Done.
31	2	11	2	11	Second Paragraph of Introduction: "Alpine mountains" is a very narrow / too narrow expression for the content of Chapter 7. "Mountain regions" or "Alpine regions" would fit much better to the content of the chapter.	Comment does not relate to Chapter 4.

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32	3	0	10	0	Different styles of title case writing are used throughout the document, for capitals, (sub)sections and appendices, as can be perfectly observed in the Table of Contents; should imho be uniform for the whole report; which title case style to be used should be decided, as there is no clear one and only international standard as far as I know (https://en.wikipedia.org/wiki/Title_case).	Headings have been adapted.
780	214	0	283	0	Austria: I was expecting to see more material with focus on Austria, in particular more graphs, tables, decomposition of emission drivers, etc. I am sure transport and statistic authorities possess data about travel demand, passenger kilometers by mode, energy consumption by mode etc. This allows to decompose emissions and provide numerical estimates about the relevance importance of each factor driving them in Austria. To what extent CO2 emissions are driven by changes in GDP, energy efficiency of the fleet, modal split and car ownership? In buildings, to what extent are they driven by housing demand per capita, energy efficiency of buildings or the evolution of the heating system choice? And has that relevant contribution changed in Austria since 1990? Such an analysis will add a lot of insights and will help policy discussions. Also, the chapter will benefit extremely from some scenario-based analyses dedicated to Austria; there is some sporadic reference to some simulations conducted by some authors for Austria. For instance, there is a simulation about the 2040 share of EVs in the fleet In my view, these scenarios could be spotlighted and their assumptions could be made clearer.	We included more Austria-specific data where possible. However, most topics mentioned are part of chapter 3.
1197	284		378		Please add impact numbers (damage/loss) past/present or for the future? E.g. 4.4.3	We provided impact numbers where possible.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1198	286	31	286	31	Be more explicit in the modal shift requirements in urban/suburban areas	We added a sentence to be more explicit.
1199	286	2	286	3	You may add at domestic and import levels	Domestic and upstream' was added prior to GHG emissions.
1200	286	47	286	47	It is questionable and highly speculative to describe CCS as a key instrument of transformation. There is still no large-scale commercial CCS plant in the world. It is therefore not appropriate to base a strategy on CCS.	CCS is mentioned in the literature on Austria's decarbonization.
1201	286	7	286	8	"through optimized space and building use" should be widened to "optimized spatial planning and space and building/infrastructure use"	Text modified according to the suggestion and the argument was added in section 4.2.2 including a reference
1206	286	22	286	22	GHG emissions? or CO2 equivalents?	We mean GHG emissions.
1213	286	22	286	22	22,6% when including emissions generated by tourists visiting Austria from abroad (compare Neger, et al.2021). Mind balancing methods (eg Scope 1 to Scope 3) and allocation to origin or destination. I agree that it is important to show the total effect and highlight the role of tourist travel, but it has to be coherent and transparent.	We tried to explain that the increase in the share of emissions is due to including origin-destination transport emissions.
1204	286	9	286	10	It is unclear, what this means in practical terms. Which services would be good drop-ins for construction? Having a matching example for a service that optimizes "space and building use" would make this sentence much easier to comprehend.	Text has been slightly expanded to make it more clear: "Shifting from material-intensive processes of production and construction sectors such as construction to services (e.g., rental, sharing) can avoid rebound effects and increase value-added and employment (medium confidence)."
1205	286	16	286	16	"put pressures on demand for electricity " => Why?	Text has been improved to make it clear how electricity demand increases.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1202	286	1	290	24	- the tourism sector is highlighted in the chapter, it is not clear why - it is not the only sector of high importance in Austria. Especially agriculture/forestry is of special interest because of the future central role regarding GHG emissions and the function als natural carbon sink. - transport as main GHG souce is mentioned "only" in the tourism context. The importance of the development of the sector and the necessary development should be adressed for all economic sectors - public transport as backbone of the future transport system, high efficiency for local transport (e.g. e-mobility and active mobility) and the importance of virtual mobility/digitalization to avoid physical mobility.	Agriculture and forestry is covered in chapter 2, while transport is covered in chapter 3. In chapter 4, we only relate to topics covered elsewhere in the report.
1207	286	23	286	23	emissions => add "of guests/visitors"	We specified the sentence accordingly.
1203	286	26	286	30	This statement is valid for most economic sectors, not only for tourism. A low carbon footprint will be crucial for all services and products (including standardisation of the methodologies and communication aspects).	I replace the last sentence in this statement to name tourism specific adaptation measures.
1209	286	42	286	42	"[will be checked again based on TRL" => unclear. Please explain better, thanks.	TRL are "technological readiness levels", which need to be checked to better support this statement.
1210	286	48	286	48	"Investments volumes" => investment	The section has been revised and the comment is no longer relevant.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1211	286	8	286	8	"shifting road transport to public and active modes": Wording: Road transport is not synonymous with private car and truck/lorry traffic. Active modes of transport are also road transport, public transport can also be road transport. Rather: Shifting motorised private transport to public transport and active modes, shifting road to rail transport	The text has been changed according to the suggestion.
1212	286	8	286	8	addition to previous comment: note avoid, shift and improve approach in chapter 3 on mobility	ASI and CE are similar, but different. Therefore here the material and CE perspective is emphasised. The cross-chapter box on CE discusses this in more detail.
1208	286	29	286	29	"touristic" => tourism	Changed to "tourism".
1214	286	32	286	32	share of 75% is global: "...tourism induced GHG emissions worldwide is generated by...". In Austria, it is important to distinguish between different types of tourism. City tourism with a higher proportion of air travel is very differently to the dominant Alpine tourism, (see chapter 7) where arrival by car with lower specific values clearly dominates. This results ultimately in different strategies.	We made adjustments accordingly.
1215	286	41	286	41	The technical possibilities are undeniably important, but what about behavioural changes (eg in transport).	Behavioral change is now taken up in the next key message under "sufficiency"
1216	286	19	286	19	I would not speak here of rare earth elements but of critical raw materials, since not all rare earths are rare.	We agree and changed the wording to 'critical raw materials'

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1217	286	46	287	2	Why do the "four key levers for the necessary transformation" only contain efficiency and consistency strategies, i.e. technological solutions, but no sufficiency measures, i.e. absolute reductions in production and consumption? This statement is part of the key messages and thus signals that eco-modernist, technological solutions are sufficient to achieve the necessary transformation. This does not only contradict existing research, but also conveys a misleading, dangerous message to policy makers and the broader public.	"Sufficiency" was taken up explicitly in the key messages. Key message was also re-written.
1218	286	22	286	23	I am surprised that this statement is made with "high confidence", as the data on tourism travel and corresponding emissions in Austria is quite limited. Does this number cited here (the 22.6%) include emissions from international flights (which are not included in the official CO2 inventory by UBA)?	Changed to medium confidence.
1219	286	1	286	1	Would it make sense to add a key message stating something along the lines of Austria being wealthy enough to be able to manage the transition to a carbon-neutral economy?	This is not covered in chapter 4.
1220	286		288		Key Messages: Some opening key messages formatted in bold still miss confidence statements (e.g. those on tourism).	Confidence Statements have been added.
1221	287	11	287	11	At least some examples of "different technological pathways" should be already mentioned here.	We added two options.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1222	287	24	287	35	Yes, CCS technologies are mature. However, these expectations and promises in the report are not appropriate. Where are the commercially working industrial CCS installations? CCS massively increases energy consumption. CCS massively reduces energy efficiency.	The comment reflects a personal opinion. About the individual comments: About the promises, the subchapter and the key messages refer to hard-to-abate emissions. We discussed the respective voluminal versus domestic storage capacity and CO2 export. The commercially working CCS projects are outlined in the text. The energy and water intensity of CCUS is known and discussed in the text. We expand the third key message on CCUS to include the sentence: "CCUS is energy and water intensive and puts pressure on the supply systems."
1223	287	21	287	23	This sentence is quite tautological and energy efficiency is the bigger lever anyway. Alternative suggestion: In all scenarios, import dependency on energy carriers is reduced, but reductions vary and depend on the energy efficiency on the chosen pathway and the assumptions about the use of synthetic fuels in particular. Also this sentence would be very policy relevant but I'm unsure, whether the yet unpublished scenarios are detailed enough to support this: In a well managed transition (ie.the mix of supply technologies closely matches demand profiles) there is little excess energy as cheap input for domestic synthetic fuel production.	We have made a more detailed specification of factors that affect synthetic fuel imports. The second sentence is too detailed for a key message, though, in our opinion.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1224	287	12	287	12	What level of evidence? high, medium?	Confidence level has been lost in the formatting of the SOD and has been retrieved.
1225	287	44	287	44	" Ill-fated" => ill-fated	The sentence has been removed as a response to other comments.
1226	287	24	287	42	Without wishing to fundamentally question CCUS, is it not clearly presented too prominently in the key messages in comparison to other statements or measures?	The CCUS key messages address hard-to-abate emissions in the order of 10 to 20% of Austria's total current emissions.
1227	287	47	287	47	Work.mode of living poses a structural barrier for climate friendly mobility? Only around 25 to 30 % of daily journeys are work-related (see eg Österreich Unterwegs). And even for these, climate-friendly mobility options are available that have relevant potential.	Yes, work mode of living poses a structure barrier, this does not mean that 100% of daily journeys are work related (in the text we point out that this is not the case) and it also does not mean that there are no climate friendly alternatives. it simply points out that work makes climate friendly living in the respective areas more challenging, as it poses a 'structural barrier' to adoption the respective practices.
1228	287	11	287	11	Is it "many different pathways" or "many different mixes/combinations of pathway/technological options"? I my understanding a pathway is a coherent strategy relying on a specific mix of technologies. Moreover: "Many different" suggest that there may option to choose from, however, in the end every affordable and feasible option must be taken. Hard to decarbonise areas will remain, consumption must fall sharply.	We have clarified. We however keep the statement, that many technological mixes allow reaching climate neutrality, as this is supported by the literature.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1229	287	16	287	23	I would also write something here about the forecasts/assumptions regarding future energy requirements. These assumptions then influence how much land area (in principle) must be available. Other obstacles that could also be mentioned: Need for long term storage, flexibility, sector integration.	We have added flexibility options and sector coupling, but we cannot go into detail on the different future energy requirements, which can be extracted from the section.
1230	287	24	287	28	The German Federal Environment Agency writes: The main problem (with CCS) is the enormous additional energy required for capture, transport and storage. The use of CCS technology increases the consumption of limited fossil fuels by up to 40 per cent. The storage of CO2 can only make an effective contribution to combating climate change if the stored CO2 remains permanently and completely in the reservoirs. This requirement is also set by the Carbon Dioxide Storage Act. https://www.umweltbundesamt.de/themen/wasser/gewaesser/grundwasser/nutzung-belastungen/carbon-capture-storage#ccs-im-emissionshandel	The topics of the commentary are already covered in the corresponding subchapter. We expand the second key message on CCUS to include the sentence: "CCUS is energy and water intensive and puts pressure on the supply systems." See answer to comment 1222.
1231	287	36	287	36	I would prefer to call these challenges "societal" (instead of social). As it is about how society will deal with CCUS.	Indeed, and accepted – we replace social by societal
1232	287	38	287	38	also here: societal consensus	Indeed, and accepted – we replace social by societal
1233	287	29	287	35	Just out of curiosity: Are there numbers on the potential of CCUS technologies for Austria? I'm a bit puzzled, as (as far as I know) holistic mitigation models do not include CCUS/NETs.	The knowledge about the Austrian CCUS potential is presented in the corresponding subchapter.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1234	287	24	287	42	Thanks for the interesting key messages. I feel that there is a overemphasis on CCUS, especially as it is previously outlined as only but one out of four levers for the necessary transformation. The other three levers receive substantially less scrutiny in the key messages. CCUS = 3x key messages. Instead, a key message on the co-benefits of avoid (primarily CE) measures could be incorporated (CH4 outlines this multiple times).	The CCUS key messages address hard-to-abate emissions in the order of 10 to 20% of Austria's total current emissions.
1235	287	43	287	43	There are other types of unpaid work than care work (cleaning...)	We reformulated the sentence
1236	287	49	287	50	To what extent is a statement based on a single survey expression of "high agreement"?	Since their is only one survey which has a clear conclusion, this evidence is of high agreement, however, there is low evidence, as their is only one study.
1237	287	3	287	5	This statement is a forecast, is there enough agreement and evidence to support a (medium) confidence assessment?	We specified the statement better.
1238	287	44	287	47	In which perspective is this ill-fated i.e. unfortunate? Should be mentioned otherwise omitted.	The sentence has been removed as a response to other comments.
1239	287	44	287	47	In which perspective is this "ill-fated" i.e. unfortunate? Should be mentioned otherwise omitted. Or is "unequal" meant?	The sentence has been removed as a response to other comments.
1240	287	44	287	47	The phrase "ill-fated but not coincidental" is not clear; it is not explained what is not coincidental about the following "link". It is also not clear what that link should be, other than these are two extremes of work.	Thank you, we reformulated the phrase to make it clearer.
1241	288	4	288	8	This statement is only valuable if real wages will increase. Many households depend on more than two jobs. Work time can only be reduced if wages are sufficient to have decent living and housing conditions.	This refers to the future, and the correct differentiation is now spelled out in chapter itself.
1242	288	5	288	8	Sentence structure; a verb is missing	we added a comma, we don't think a verb is missing.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1243	288	5	288	8	Sentence structure; a verb is missing	we added a comma, we don't think a verb is missing.
1244	288	13	288	14	Italics missing	Confidence statements changed to italics.
1245	288	17	288	19	Sentence structure not good => two shorter sentences?	We reformulated the sentence
1251	288	17	288	18	Probably better to replace "as well as" with "and".	Done.
1247	288	29	288	29	doubling of "provisioning" is not good style	Doubling has been removed.
1248	288	14	288	14	Is mobility a basic good like food and housing? Basic is the (easy) access to amenities rather than travelling to make up for poor access. See new report of the International Transport Forum (OECD) "sustainable accessibility for all"	Thank you, we reformulated the sentence accordingly
1249	288	25	288	25	I would appreciate here some definitions of CDR; CCS, CCU. See this report. https://www.stateofcdr.org/	Thank you. We added a sentence to the introduction referring to these terms. Specific discussion and definitions are provided in the respective section of the chapter.
1250	288	6	288	6	BAU scenario is meant here, or what does "BAU work" means? Maybe a comma after BAU could improve readability...	Thanks, agreed
1246	288	27	288	29	sentence structure; incomplete sentence link to the first sentence with a comma?	Sentences have been combined.
1252	288	1	288	8	The term "future work systems" is not intuitive, possibly jargon. You can probably make this key message easier to understand if you replace "integrated efficiency, consistency and sufficiency measures" by "transition to climate-friendly society" (or similar). And it is not obvious which "unpaid care" if required for the reinforcement of GHG emissions - please rewrite for clarity.	We have reformulated the sentence. The second comment (and ...) we do not understand. If it means to tell us that it is unclear, which unpaid care requires GHG emission - for instance fossil fuel engine based commuting requires GHG emissions. We elaborate on that in the text.
1253	289	1	289	2	This is a very good overview of the chapter contents and the energy/climate/human system. Would it be better to be presented already at the start of the whole document?	Unfortunately, this could not be implemented because not all chapter have such graphs.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1255	289	1	289	2	Figure resolution not good. green line should not "cross" the grey box "skew" links do not look very professional, sorry... (on the right, from natural resources)	The figure has been updated for better readability for the final version of the report.
1254	289	2	289	2	Figure 4.1 provides the illusion that an appropriate green house gas reduction strategy can massively rely on CCS / CCU.	This was not our intention, we merely wanted to capture the systemic relation. We tried to avoid this impression with an updated figure.
1258	289	20	289	20	For cross-chapter alignment between CH3 & 4: I feel this section would suit well into Chapter 0, especially since it does not only cover CH4 topics, but includes transport, buldings, etc. that are part of CH3.	There will be a preface to the complete report, but this will only include references to selected frameworks or topics discussed in the chapters. Therefore, it is important to include this information here so that it can be referenced in the Preface, the SPM and the Technical Summary.
1256	289	21	289	21	"3 decades" => three	This change was implemented but rewritten using a longer data source because of a comment received on Figure 4.2.
1257	289	23	289	23	higher => compared to? than?	This sentence was rewritten for clarity.
1259	290	5	290	5	Figure 4.2: Why is the dashed line ending 2015?	The GTAP v9 consumption-based accounting was only computed at selected points in time, with the latest calculation done for 2015. In the final report, we shifted to using CO2-only consumption-vs. production-based comparison, where more recent data is available.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1260	290	22	290	24	Reference?	Reference added.
1261	290	5	290	5	Please add the lines into the legend.	The figure was thoroughly reworked.
1262	290	5	290	5	(Mostly negative) emissions by LULUCF are cross-checked with Chapter 2?	The LULUCF figures are taken from the Umweltbundesamt national accounting statistics and are consistent with Chapter 2.
1263	291	14	291	14	CCBox 4 Figure 1, Panels A and B: y-axis missing as lines; no decimals required	Done.
1264	291	14	291	14	the largest part of CCBox 4 Figure 1 Panel C is missing here?	Has been added.
1265	291	26	291	26	"facilitates" => or: contributes to?	Changed
1266	291	27	291	27	"requires..." => role of human labor/work?	Changed. Human labor added as requirement.
1267	291	29	291	29	"often" => almost always? most often?	Changed to 'commonly'
1268	291	14	291	14	Good image, but too small font size. What do the grey bars represent?	Font size has been increase, grey bars explained.
1269	292	16	292	16	"105 Mt non-metallic minerals, 37 Mt fossil energy carriers" => connect with an "and" please, thanks.	Changed
1270	292	21	292	21	"particularly high" ->at the per-capita level or relative to other countries?	Changed. Per-capita levels
1271	293	1	293	9	Relevant for the climate system is not the Austrian scale but the global scale. If the increasingly service oriented economy in Austria is connected with a relative decarbonization within the country it can also be connected with a shift of emitting industries to other places in the world.	Yes, emissions at the global scale triggered by Austrian consumption matters for the climate system. We agree, discussion can't be restricted the Austrian scale. This is exactly the reason why we talk first about the material and then the carbon footprint. To clarify this, we added "consumption-based CO2 emissions reduction".

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1272	293	8	293	8	"slowest rate" => in concrete?	In consumption-based CO2 emissions; rate added
1273	293	10	293	12	Reference(s)?	References added
1274	293	12	293	13	Reference(s)?	References added
1275	293	28	293	29	sentence structure!	Changed accordingly.
1276	293	29	293	29	"the focus has so far been improving procurement" => been on	Changed
1277	293	29	293	31	Reference(s)?	References added
1278	293	35	293	38	Reference(s)?	We have added references.
1279	293	42	293	42	what do you mean by "stock growth" in this context?	Explanation added: expansion of material stocks in buildings, infrastructure and the vehicle fleet
1280	294	15	294	21	Combine/consolidate with the decent living standard framework presented in 5.2. include cross-references. To make it easier to compare the current demands, decent demand and excessive (sufficiency and beyond demands), an illustration would be useful here or at 5.2. The DLS schematic could be adopted.	Cros-reference added.
1281	294	18	294	19	Should be linked to the corresponding section in the chapter on health (from p. 165)	Done.
1282	294	4	294	4	Figure 4.4: Yes, updates to 2023 data would be crucial!	Done.
1283	294	1	294	3	Consider citing Chapter 3 here.	Cross-ref added
1284	295	13	295	15	These strategies have not yet been mentioned in the report.	Added a eference to CC-Box where strategies are discussed in more detail.
1285	295	10	295	11	replace semicolons with commas here, please	Changed
1286	295	14	295	14	capital "C" for "circular"	Changed

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1287	295	30	295	30	"and a weak modal split shift as circular economy strategies till 2040" => sentence structure, grammar	Changed
1288	295	32	295	32	is it reduction of traffic volume or mileage?	We are refering to person-kilometers and tonne-kilometers here. Changed across section.
1289	296	17	296	17	"loop closing" shoud be explained.	Explanation added
1290	296	3	296	3	Why "circular economy" twice and once in brackets?	Redundant 'circular economy' removed. Error due to bulk-replacing 'CE' with 'circular economy'
1291	296	7	296	7	scenario (singular)	Changed
1292	296	18	296	19	Figure 4.6 => Really? On page 306? Not 4.5?	Changed
1293	296	19	297	2	Reference(s)?	Reference added.
1294	297	45	297	46	It would be good to make the connection with the previous chapter clear here, especially the passages on spatial order and planning.	Cross ref to 3.2
1295	297	22	297	22	"Availability of REEs possibly is challenging" => is possibly challenging	Changed
1296	297	24	297	27	Reference(s)?	References added
1297	297	29	297	29	"economy measure in C1" => measures	Changed
1298	297	29	297	29	"impact on living quality" => quality of life?	Changed
1299	297	42	297	42	"29 % of homeowner" => plural, homeowners	Changed
1300	297	35	297	51	check for consistency/overlaps with Chapter 3 (housing)	In general they are consistent, in detail and concerning scenarios it is different as here we focus on material and there they focus on GHG emissions. As far as the past is concerend, both are based on UBA's GHG inventories.
1301	298	6	298	8	I appreciate that this has been included.	Thank you, noted.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1302	298	13	298	27	But how realistic are such scenarios given the political will and support by the population?	What we can provide here is the option space to achieve already set targets like carbon neutrality and the circular economy targets as set out in official documents. The political will and support by the population are not static. A phasing out of fossil-fuel based heating systems would have been not realistic a decade ago. Instead of what is realistic, we far more ask what are the barriers and what are the options for overcoming them in later sections. However, perspectives on political will are covered in chapter 6 and individual acceptance in chapter 5, respectively, overall feasibility is dealt with in chapter 8.
1303	298	28	299	42	Section 4.2.3 mostly very general and very few concrete relation to Austria...	Austrian context added to the end of section.
1304	298	28	298	28	Section 4.2.3. is very generic. Consider making it more specific to Austria.	Austrian context added to the end of section.
1305	298	7	298	8	Add reference to chapter 3	Cross-ref added
1306	299	41	299	42	End Use technologies can also contribute to avoid - esp. digitalisation (e.g. teleconference substituting business trips)	we added the prefix "environmental" to end-use technologies to clarify that this paragraph does not relate to foundational technologies; digitalisation is considered among "infrastructures and buildings for everyday life" in the previous paragraph
1307	299		304		Chapter 4.3: Does not follow the otherwise coherent structure of "Current-Future-Needed Transformation" of other sub-chapters. This deviation might confuse the reader.	Change in structure was made.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1308	300	2	300	3	What is meant with the first "business" in the excerpt "excluding business and business travel"? Should it be "business travel" only?	Text has been edited.
1309	300	11	300	13	Is the time from 2010-2019 meant with "in the last years" or also the time during and after COVID? And with "in the last years" in line 11, do you mean the same time as "in the last decade" in line 12 and 13? Without this clarity, I am not sure whether you mean that summer months have seen stronger increases than winter months or whether you mean they had stronger increases earlier in the last decade than in the last time. What does 1.7 refer to?	The relevant section was removed to shorten text.
1310	300	14	300	16	In the sentence you first write "nominal" and after "in real terms". What is it now? Both?	The relevant section was removed to shorten text.
1311	300	40	300	40	You might also be interested in the paper by Gössling et al. who write "Adding aviation's non-CO2 contribution to climate change on the basis of an effective radiative forcing weighting increases tourism's contribution to global warming to 10% in 2013." Gössling, S./Balas, M./Mayer, M./Sun, Y.-Y. (2023): A review of tourism and climate change mitigation: The scales, scopes, stakeholders and strategies of carbon management. In: Tourism Management 95. doi.org/10.1016/j.tourman.2022.104681.	See comment 1319.
1312	300	45	300	47	Shouldn't this last sentence "About half of..." come directly after the 8% sentence in line 41? Or do you use a different source for it?	This is the same source. We edited it to make it more clear.
1313	300	2	300	2	"excluding business and business travel" => Why is this excluded?	TSA includes leisure and business travel
1314	300	22	300	26	References? Book "Tourismus und Klimawandel", edited by Pröbstl-Haider et al. 2021?	Reference added.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1315	300	27	300	27	"tourism will be compensated" => rather: might be?	The relevant section was removed to shorten text.
1316	300	29	300	29	"in the Mediterranean (Amelung and Moreno, 2012) Although rising" => Full stop missing	The relevant section was removed to shorten text.
1317	300	31	300	31	"will be difficult to compensate (Steiger, 2010)" => Maybe check more recent work by this author, e.g. Steiger & Scott, 2020, Tourism Management?	The relevant section was removed to shorten text.
1318	300	32	300	33	This sentence sounds rather tautological	The relevant section was removed to shorten text.
1319	300	40	300	40	Gössling et al. 2023, Tourism Management, estimate the share to have reached 10% meanwhile... https://doi.org/10.1016/j.tourman.2022.104681	Comment was taken into account.
1320	300	48	300	48	An overview table would be helpful here	The revised text makes such a table void.
1321	300	17	300	19	This is a good opportunity to refer to Chapter 7, in which tourism in the Alpine regions, which dominates in Austria, is dealt with in more detail.	Cros-reference added.
1322	300	31	300	31	"value-added"-> value added	The relevant section was removed to shorten text.
1323	300	13	300	13	Please explain "Ø". This will help readers to better understand.	The relevant section was removed to shorten text.
1324	301	17	301	17	maybe I missed it, but the explanation for RBA is missing...	The explanation was in the previous paragraph. After re-structuring the section, the term is again defined.
1325	301	33	301	34	"no estimations of indirect emissions induced by tourism activities were provided" => This is an important weakness. Please also use the terms Scope 1, 2 and 3 here.	Has been adopted

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1326	301	49	301	51	Sentence structure not good; very hard to follow your argument here	Section has been re-written.
1327	301	1	302	6	This section seems far too detailed for such a high-level report. The main takeaways from the available data should be summarized here; further discussions on data availability can go into the Research Gaps Section at the end of the chapter. Finally, I am not sure how the numbers presented here relate to the key message on the contributions of the tourism sector (incl/excl mobility) to the overall emissions.	The text was completely revised and is not considerably shorter than before.
1328	301	40	301	48	"99% of all emissions directly caused by visitors of Austrian destinations are linked to transport." This pattern is different from studies published in Japan, New Zealand, Australia, Taiwan, and Norway on tourism carbon emissions. Even for these island countries, transport-related emissions account for a smaller percentage. The differences may be due to the scope of emissions being included (direct and indirect emissions; whether food or shopping are comprehensively considered; whether emissions are differentiated by national vs foreign carriers). It may be worthwhile to mention other literature on the range of emissions contributed by transport. This will help to highlight other hotspots in tourism emissions, other than the transport component.	The high share of transport may definitely be related to the method applied here but also to the share of international visitors traveling to the destinations mostly by car or air. A study of Norway by Sun et.al., however, indicates a share of 90%, so not much lower. than the one we cite. Another study for Norway found the share to be 88% (Sun et.al. 2022), for Japan Kitamura et.al report 56% (2020).
1329	301	4	301	4	Are the 0.3% for the year 2013 as well?	It has been clarified that all emissions are based on 2013.
1330	301	30	301	37	What year are Neger et al. (2021) calculating the emissions for? If it is not the same year as Lenzen et al. (2018) that should be accounted for in the text.	It is the year 2016; information has been added.
1331	302	40	302	41	Here and for the other types of destinations concerned, a link to the corresponding passages in Chapter 1 would be useful.	Cros-references added.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1332	302	37	302	41	See the section on snow cover in chapter 1.	Cros-reference added.
1333	302	2	302	6	see Gössling et al. 2023, Tour Manag as further back-up of this argument! https://doi.org/10.1016/j.tourman.2022.104681 https://www.sciencedirect.com/science/article/pii/S0261517722001947	Has been adopted
1334	302	19	302	19	"popular touristic destinations" => omit "touristic" here; not necessary.	The relevant section was removed to shorten text.
1335	302	38	302	38	"Austria's skiing industry Studies on the effects of climate change on ski tourism" => Full stop missing. References?	References added.
1336	302	40	302	40	"glaciers in Austria" => for glacier skiing see Abegg/Mayer 2023, https://doi.org/10.3389/fhumd.2023.1154245 and Mayer/Abegg 2024, https://doi.org/10.1007/s00484-022-02371-6 for glacier tourism in summer see Salim et al. 2023, https://doi.org/10.1080/09669582.2022.2044833 , https://www.tandfonline.com/doi/abs/10.1080/09669582.2022.2044833 Mayer et al. 2024, https://www.degruyter.com/document/doi/10.1515/tw-2024-0006/html	References added

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1337	302	43	302	45	Reference(s)? Maybe Scott and Gössling, 2022, Annals of Tourism Research, https://doi.org/10.1016/j.annals.2022.103409	Reference added.
1338	302	47	302	47	"as it may no longer be technically possible" => Not alone! Economically viable, and accepted by guests and local people alike Water availability?	Done. We outline this in more detail now.
1339	302	48	302	49	see Mayer/Abegg 2024, International Journal of Biometeorology 68, 547–564	Reference added.
1340	302	46	302	46	I would rather say "many" and not "some".	Done.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1341	302	3	302	6	I agree that a national-level tourism carbon emissions inventory is urgently needed. The United Nations World Tourism Organization (UN Tourism) has recently passed the “Measuring the Sustainability of Tourism (MST)” framework. This framework, endorsed by the United Nations Statistical Commission, is designed to measure tourism carbon emissions and is supported with data from TSA and SEEA. It is compatible with the System of National Accounts, and its emissions results are directly comparable with tourism GDP and employment. Leveraging the MST framework will help Austria establish a valid and reliable national tourism emissions inventory. This database will provide several benefits: (1) monitoring changes in tourism emissions over time, (2) understanding different drivers in increasing or mitigating tourism emissions, (3) advising tourism carbon management for Austria, and (4) assessing the trade-off between tourism GDP and emissions.	Noted, but no adaptation of the text needed

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1342	302	6	302	6	A new subsection on tourism emissions mitigation and policies should be added here. It is important to provide information on the current status of governmental mitigation strategies that are being implemented or proposed to reduce tourism emissions in Austria. A review of national and regional tourism policies on emissions mitigation pathway would be helpful. If no such policies exist, this is also important information, as it highlights the policy vacuum in addressing tourism emissions increases. One useful reference: Gössling, S., & Lund-Durlacher, D. (2021). Tourist accommodation, climate change and mitigation: An assessment for Austria. Journal of outdoor recreation and tourism, 34, 100367.	Noted, but not adopted.
1343	302	7	302	7	It may be worthwhile to introduce some information regarding how tourism employment will be affected by climate change. Will they benefit or be disadvantaged by the even out of seasonality in Austria (shorter winters but longer summers)? Who will be affected more – women, youth, or low-income staff? There is not much literature and few empirical figures on this aspect yet, but it is a critical issue as destinations are impacted by changing climate patterns and tourism operation adjustments. Reference: Scott, D., Hall, C. M., & Gössling, S. (2019). Global tourism vulnerability to climate change. Annals of Tourism Research, 77, 49-61.	Unfortunately, there is little literature on employment changes from a demographic perspective, as the employment opportunities will depend on the manifestation of climate change as well as changes in product offerings. We have added a statement concerning this in the text.
1344	302	39	302	39	increased need AND difficulty for artificial snow-making	Done.
1345	302	28	302	28	What about off-seasons such as autumn and spring?	This is mentioned in the second paragraph of the section "Future Systems"

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1346	303	43	303	44	Is this sentence balanced enough? I guess certain regional tipping points will be surpassed, but if the impossibility of any skiing is mentioned, it should have more context, under which circumstances this might or probably be the case.	Context has been provided.
1347	303	37	303	39	The ecological consequences and problems of such measures must be mentioned.	Thank you. Will add and also references to chapter 2 for ecosystem services.
1348	303	13	303	13	Steiger 2011 maybe even better, dealing with the effects of the snow-scarce season 2006/07... https://www.emerald.com/insight/content/doi/10.1108/16605371111175285/full/html	Reference added.
1349	303	14	303	16	Sure, but snowmaking possibilities are also at risk from global warming... And the public discourse regarding skiing and climate change vulnerability is rather negatively biased against skiing. References missing here	Sentence has been removed and the snowmaking difficulties are discussed.
1350	303	21	303	21	overtourism	The relevant section was removed to shorten text.
1351	303	17	303	22	References?	The relevant section was removed to shorten text.
1352	303	34	303	43	too few references here	The relevant section was removed to shorten text.
1353	303	42	303	43	see Falk 2013, Tourism Management, https://doi.org/10.1016/j.tourman.2012.10.005	Reference added.
1354	304	24	304	24	The example is not precise as long as the origin of the tourist is not known... may change to: Global net emission benefits, however, are achieved only by substituting long distance (Austrian) destinations by short distance destinations.	Thank you, we adopted it.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1355	304	32	304	36	For the travel to the destination also electrified Bus Systems can be an alternative, esp. for the mobility at the destination active mobility (e-bike...) is an attractive alternative and should be mentioned.	Thank you. We have added a direct reference to this in the paragraph concerning public transportation networks.
1356	304	7	304	25	This passage, like some of the previous ones, is rather feuilletonistic (few reliable facts) and seems to downplay the need for change.	Thank you. This is not our intention. The section has been strongly adapted, references added, and increased urgency conveyed.
1357	304	29	304	30	A link to the chapter on spatial planning and mobility makes sense here.	Cros-reference added.
1358	304	37	304	39	The fundamental problem with such a statement can be that the drivers of emissions are not addressed here directly (as something to be abolished as soon as possible), but that they only appear as negative potential for reductions. It is therefore necessary to link them to the information on emissions, if possible with a quantification of the necessary and achievable reduction.	We have tried to quantify the reduction potential from switching to alternative means of transportation. Finding alternatives for fossile fuels is subject to the improve part of the ASI framework.
1359	304	7	304	7	"number of touristic trips" => omit "touristic" here	"Touristic" was omitted.
1360	304	7	304	13	References completely missing	References added.
1361	304	14	304	18	References completely missing	The relevant section was removed to shorten text.
1362	304	20	304	25	References missing	References added
1363	304	19	304	25	in general: Gössling/Higham 2021, Tripartite destination challenge, https://doi.org/10.1177/0047287520933679	Reference added.
1364	304	31	304	31	"Touristic service providers" => Tourism	Not quite the same thing.
1365	304	31	304	36	References?	References added
1366	304	37	304	43	References missing	Section has been shortened and reference added.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1367	304	26	304	26	According to the IPCC a shift towards renewables is classified as improve strategy (see AR6 WGIII CH5 Table 5.1). This can be explained by no change in end-service provision taking place. There has been an effort to align the classificaiton of mitigation options according to ASI. This process (as far as I know), however, has not been finalized.	This has been revised and we now follow the ASI framework.
1368	304	26	304	26	Consider citing this paper: Free public transport to the destination: A causal analysis of tourists' travel mode choice https://arxiv.org/abs/2401.14945 (close to be published)	Reference added.
1369	304	46	304	47	In the context of Switzerland, the share of renewables also increased, however, the total amount of renewables and non-renewables did not decrease in tourism. Thus, in the end, still more resources of both categories are used. If the same holds for Austria, that could be mentioned in the text. Source: Federal Statistical Office. (2023). Nutzung erneuerbarer Energien im Tourismus und der Gesamtwirtschaft. URL: https://www.bfs.admin.ch/bfs/en/home/statistics/tourism/monetary-aspects/sustainability-indicators.assetdetail.26625787.html	This has been incorporated into the text.
1370	305	13	305	14	This statement could be more specific. One would expect concrete plans or a mention of the absence of such plans.	We made this more concrete.
1371	305	4	305	4	"touristic activities" => tourism	Thank you. This is noted and adapted in the text.
1372	305	5	305	5	"touristic" => tourism	Thank you. This is noted and adapted in the text.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1373	305	4	305	7	see suggestions in Gössling et al. 2023, see above https://doi.org/10.1016/j.tourman.2022.104681	Reference added.
1374	305	8	305	21	Important research gaps: e.g. snowmaking is publicly debated as unsustainable and maladaptation, however, there are very few reliable data about GHG footprint of it.	Thank you. We discuss this now in more detail and provide references.
1375	305	31	305	31	In the context of the aim to decrease car dependence (or at least switch to a less manufacturing-intensive fleet of electric vehicles), it would be interesting to add here a few sentences on the current and future role of the automotive industry in Austria (how many employees potentially affected, etc.).	Not possible to implement, due to space restrictions.
1376	307	25	307	25	See the sections on biomass in chapter 2.	A cross-reference to chapter 2 was introduced.
1377	307	25	307	27	Substituting biomass with biomethane or hydrogen is not plausible as both energy carriers are much more expensive than the former. I suggest removing this sentence completely. The same goes for the sentence at line 32.	This was apparently a misunderstanding. It is not about replacing biomass, but replacing alternative waste fuels. Text was modified to be clear.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1378	307	15	307	40	The section on cement might also mention works on newer processes aside from CCS: Electrochemical decomposition of limestone might be cheaper: https://pubs.acs.org/doi/10.1021/acsenergylett.3c00242 Using non-carbonate calcium sources to make CO2-free cement: https://arpa-e.energy.gov/technologies/projects/electrochemical-synthesis-low-carbon-cement I suggest replacing the sentences about hydrogen with: "Research into process level innovations to reduce CCS costs or produce entirely CO2-free cement are ongoing, but mostly happen in the united states." and referencing the literature above.	Part 1: Approved Peer revied reference is taken up and paragraph has been re-written. Focus should remain on Austria, though.
1379	307	29	307	29	see also work by Daniel Jansen et al? https://scholar.google.com/citations?user=IWrocflAAAAJ&hl=de&oi=sra	References were checked, but no clear connection has been detected to the marked sentence.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1380	307	23	307	24	Isn't material efficiency (= changes in the input/output ratio, thus lowering mat. input requirements per unit output) clearly an improve measure? I feel the classification following ASI across the report is still a bit off. There has been an effort to align the classificaiton of mitigation options according to ASI. This process (as far as I know), however, has not been finalized.	Yes, material efficiency is rather "improve".
1381	308	1	308	1	Here, too, the sections on biomass in the first chapters should be mentioned.	Cross-reference to chapter 2 has been added.
1382	308	5	308	8	References?	Reference is given in the first part of the sentence already.
1383	311	25	311	26	material efficiency and energy efficiency are typically very cost efficient. Therefore they should be mephsizised regardless if domestic REs supply is sufficient.	Paragraph was restructured to place more emphasis on efficiency. Moreover, the ASI perspective and sufficiency was brought in.
1384	311	28	311	28	Uncertainties regarding timely grid expansion, costs of electricity + grid stability and flexibility have been identified as key concerns.	Reference states only grid stability and flexibility of energy system.
1385	311	36	311	37	You may add a reference to the vast literature on carbon contracts for difference here. I think many of thos studies demonstarte the high risk for indiszrial companies. (e.g. Agora, Future Camp, Wuppertal Institut)	Not relevant any more, as paragraph was shortened
1386	311	30	311	32	References?	References were added.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1387	311	27	311	27	Not sure why material efficiency (= changes in the input/output ratio, thus lowering mat. input requirements per unit output) is classified as demand side measure. Energy/Resource efficiency measures in the industry sector (e.g. steel, cement) are rather supply-side measures.	What is meant is that material demand is being reduced by higher material efficiency. Bracket was rephrased.
1388	311	20	311	20	Just wanted to highlight that the subsection follow the same logic (Status Qup, Characteristics of future state, Necessary transformation). This, however, does not seem to be the case in this subsection.	Structure of section 4.4.4 was changed and parts were moved to section 4.4.2.
1389	311	1	311	19	Sub-Chapter 4.4.3.: This chapter is missing a reference to the Risk Cross-Cut	Reference added.
1390	312	41	312	41	Why is the period from 2004 to 2008 chosen as the starting point? 2003 - 2007 would be more suitable, as 2005 would be the average value, 2005 is also the base year for most climate targets.	Changed to 2003-2007 and to 2019-2023 to incorporate latest data.
1391	312	2	312	3	I propose to rephrase as follows: Most importantly, for some emission intensive industries next to the combustion of fuels a significant share of emissions does arise from other chemical reactions within production processes, so called "process emissions".	The whole section has been restructured and condensed.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1392	312	7	312	7	Incentives are low because of the often disruptive nature of the technologies, which in some cases make parts of the existing assets obsolete. (Wesseling et al. 2017; Bataille et al 2018) Wesseling, J.H., Lechtenböhmer, S., Åhman, M., Nilsson, L.J., Worrell, E., Coenen, L. (2017): The transition of energy intensive processing industries towards deep decarbonization: Characteristics and implications for future research, Renewable and Sustainable Energy Reviews 79 (2017) 1303–1313, http://dx.doi.org/10.1016/j.rser.2017.05.156 Bataille, C., Åhman, C., Neuhoﬀ, K., Nilsson, L.J., Fischedick, M., Lechtenböhmer, S., Solano- 4/5/15 © European Union, 2002-2015 http://europass.cedefop.europa.eu Page 6 / 6 Rodriquez, B., Denis-Ryan, A., Stiebert, S., Waisman, H. Sartor, O., Rahbar, S. (2018): A review of technology and policy deep decarbonization pathway options for making energy-intensive industry production consistent with the Paris Agreement, Journal of Cleaner Production 187 (2018) 960-973 DOI: 10.1016/j.jclepro.2018.03.107	References were checked and some incorporated into the text.
1393	312	18	312	21	Typically not leading on costs but rather on quality Austrian industries may feel the need to be at the forefront of these developments in order to be able to compete in the future,.	Speculative statement without reference.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1394	312	28	312	31	These macroeconomic impacts seem to be rather large, given the overall small size of the steel industry. I recomend to at least mention the positive effects on the GDP that a decarbonisation of steel wozuld have, which might have the opotential to outweigh the negative effects claimed by one study. further, if a significant share of the cost differential of green steel would be covered by the government (e.g. via conteacts for difference and direct investment support) the overal balance would look much more positive.	On the macroeconomic level the question is not who pays for the transition (government or private sector) but rather of there are free capacities for investments. This uncertainty is now addressed.
1395	312	34	312	34	such potwntial industrial relocation is termed as "renewables pull" by Samadi et al (2023), who explain the effect and also its limitatiions. Samadi, S., Fischer, A. & Lechtenböhmer, S., (2023): The renewables pull effect: How regional differences in renewable energy costs could influence where industrial production is located in the future, Energy Research and Social Science. 104, 103257.	The references is included in the text.
1396	312	21	312	21	"[mention non-market effects: reference to other sections/chapters on quality of life, health etc.]." => and image/place identity?	The relevent section was removed to shorten the sub-chapter.
1397	312	34	312	38	Yes, references very much needed	Sentence was deleted to shorten the section, as it was too general.
1398	312	45	312	45	"Gas has remained ..." should be "Gas consumption has remained ..."	Sentence has been re-written to "Gas consumption has declined slightly throughout the period (-6 %)."

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1399	313	5	313	5	geopolitical dependency (Russia!)	Geopolitical dependency is covered by the term "energy security".
1400	313	13	314	5	Not a very nice and readable figure...Font size.Choice of colors...	The figure has been thoroughly revised.
1401	313	1	313	1	Just out of curiosity: A-S-I is a demand-side framework, with its logic being ill suited for classifying supply side measure. Shift in energy carriers in end-use sectors (e.g. buildings: heatpumps, etc.) are, according to the IPCC, classified as improve (as it does not require a change in end-service). I'm thus not sure about whether a switch to low-carbon energy sources qualifies as shift measure or if ASI can and should be applied in this context.	We refer to the ASI box where it is explicitly listed as shift measure. We are aware on the discussion about applicability of ASI on the demand side and for energy supply, the classification depends on the unit you are looking. But in the AAR2, we chose as a common approach to consider it as a shift measure.
1402	313	16	313	16	"This was possible" -> can't follow line of argumentation	The sentence was re-written.
1403	314	27	314	27	The following sentence might need some clarification: "Electrification causes a substantial decrease of gross domestic energy consumption" Electrification will increase electricity consumption but might decrease fossil fuel consumption; since combustion engines are extremely inefficient, the sentence makes sense but would need some clarification. I would argue that this generalization is misleading: the reliability of hydro, wind, PV (what happened to bioenergy, e.g. biogas) is highly dependent on local settings.	The scenarios account for intermittency of renewable sources.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1404	314	29	314	29	Synthetic fuel import can be economically competitive with fossil fuel sources if electricity is below current EU market prices (e.g. excess electricity); however, combustion engine powered with power-to-X products cannot compete economically with electric motors. The Carnot cycle is the basis of a combustion engine, and accordingly, over half of the energy is lost. From an economic perspective, synthetic fuels only make sense for industrial processing or special machinery. I recommend to clarify this to avoid misinterpretation.	We have slightly adapted the sentence.
1405	314	16	314	17	Geothermal power should be included.	Geothermal has been added.
1406	314	1	314	1	Image unreadable. I cannot judge the content.	The figure has been thoroughly revised.
1407	314	16	314	17	What is listed here? Technologies? Energy carriers?	The sentence was revised.
1408	314	1	314	1	In case it did not slipped my reading: No in text reference to the figure is made.	A reference to the figure was added.
1409	315	2	315	4	Figure 4.8: Please add a legend explaining the different colored lines, thanks.	We have thoroughly revised the figure.
1410	315	3	315	3	"Netzero scenarios." => net-zero	We changed the spelling.
1411	315	11	315	11	"and heating &" => and	We changed the spelling.
1412	315	24	315	24	"hydrogen, synthetic gases and fuels is mainly used in industry" => are mainly used	Changed to: "hydrogen, synthetic gases and fuels will be mainly used"
1413	315	5	315	33	It seems that only NetZero2040 scenarios are relevant for this section. UBA's Transition scenario should be referenced and included in cross-scenario comparison, as it is key in the Austrian scenario landscape.	Unfortunately, the necessary gross domestic consumption information is not available for the other scenarios (including the UBA scenarios) and can therefore not be included in this figure.
1414	315	17	315	19	Add reference to Ch3?	Reference added.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1415	315	17	315	23	Would be nice to have concrete numbers? Does the "NETZero2040 Paper" provide them?	Adding numbers here would need extensive explanation, and we are space constrained. The detailed numbers can be found in the paper.
1416	315	24	315	24	"is mainly used"->"will be mainly used"?	We changed the spelling.
1417	315	26			The potential application of hydrogen is currently a hot political topic. Why not formulating a Key Message on the sectors in which hydrogen is going to play an important role? This would help to understand the feasibility of ambitions to use green Hyrdogen in the private transport sector.	This is an important topic which is also covered in the SPM and a key message was added in the beginning of the chapter as well as in the SPM.
1418	316	16	316	17	The inclusion of imported energy as source could be misleading - in the end it is irrelevant if the energy is produced domestic or imported - it has to be from renewable sources like wind, solar... I would suggest to switch to: "...can rely on a combination of wind power, solar PV, biomass, hydropower and geothermal power mainly from domestic production but also through imported energy sources, especially in the form of hydrogen or e-fuels". CCS should be adressed separetely as it is not an energy source/carrier.	The comment relates to the start of section 4.5.2. We have updated the sentence slightly, trying to find a balance between the comments of the 2 reviewers.
1419	316	1	316	14	References missing!	A reference to the Netzero2040 paper was added.
1421	316	22	316	22	This section should be cross-checked with the two chapter boxes in Ch3 on flexibility of the energy demand/supply in housing and transport, respectively. Bi-directional charging with electric vehicles should probably also be mentioned here (technologically feasible, legally not (yet))	Section was again cross-checked with the current status of the boxes in Chapter 3. Bi-directional charging is a quite specific topic which is covered in Ch. 3 and will be not elaborated on in this Section.
1420	316	23	316	29	References?	Reference was added.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1422	317	6	317	11	References?	References are in the figure caption, legend and have been added also in the text now.
1426	317	12	317	12	Which points belong to which scenarios? This could maybe made visible with color indices or different symbols?	The shape of the points were changed so taht they can be identified according to the scenarios. The caption of the figure has been adapted accordingly.
1423	317	19	317	19	"due to a seasonal mismatch between" => Unclear! Why does this mismatch lead to reduced demand in the b. sector?	Sentence was adapted to make it clearer.
1424	317	26	317	26	political dependency, e.g. gas imports from Russia?!	Import dependency is also discussed in the beginning of Section 4.5.2 (we extended the elaboration on it and refer to it), and we mention this also here.
1425	317	39	317	40	Reference?	References were added.
1427	318	21	318	30	a bit redundant; see above	Parts of the text were deleted and restructured. Table 4.2 was moved to the Appendix.
1430	319	5	319	5	As I'm not too familiar with the field, I do not understand this figure (esp. the y-axis). A quick clarification of what exactly is being measured and how when talinkg about % change in climate change impact would help non-experts readers.	A more detailed description was added in the figure caption.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1428	319	8	319	8	For alpine hydropower, ice and snow melt can be significant: our projection indicates that increased glacial melt will drastically stop in the coming years when glaciers disappear; precipitation is expected to become more dynamic (more extreme events, but also longer drought periods) and hydropower infrastructure should be adapted to new conditions. https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2011WR010733	Reference was added, and reference to Section 3.4.2 was added where this is discussed in more detail.
1429	319	11	319	13	and vanishing glaciers too?	Glacier melting does not impact the demand side and is already discussed in the context of hydropower above. The section above glacier melt was also extended in the section above and a reference added to Section 3.4.2 where it is explained in more detail.
1432	320	11	320	27	Cross-check with Ch3	Thank you, done.
1431	320	12	320	12	What demand patterns in mobility will be (substantially) affected by climate change? Probably touristic ones (net effect however unclear), but otherwise not sure...	Mobility and manufacturing is strongly affected by decarbonisation but not so much by climate change impacts.
1433	321	26	321	26	It is necessary to mention that the efficiency of PV and wind power increases will vaporize if the capacity of transmission lines and energy storage capacities will not increase in parallel.	There is a whole section on flexibility preceding this section.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1434	321	35	321	38	This is an opinion and not a fact: "there are sufficient technical potentials for wind power and solar PV available (see Table 4.3) compared to biomass from agriculture or forestry, while increasing biomass use for energy purposes is limited, as current production levels for biomass are already at the limits of sustainable forestry practices and would replace significant amounts of food production if produced on agricultural land (see respective sections in Chapter 2)." Neither is biomass production at the limit of sustainable forestry nor would the utilization of agricultural side products replace significant amounts of food production. Overestimation of PV & Wind in the future gross energy consumption of Austria & underestimation of the bioenergypotentials will not be helpful in phazing out fossil fuels.	The second part of the sentence was removed, and I refer here only to potential assessments, which are extensively listed in the cited table. Furthermore, I refer to the respective section in chapter 2.
1435	321	49	321	50	I feel this better represents the possible strategies for reducing the environmental impact of mining, which was missing in the previous draft.	Thank you. This is noted.
1436	321	27	321	28	In this sentence add one part regarding the mineral raw materials needed for the green transition, those also will need to greatly and rapidly increase (critical raw materials, REE, etc). See the comment below. To reference to the importance of raw materials for the green transition see this article: Sovacool, B. K., Ali, S. H., Bazilian, M., Radley, B., Nemery, B., Okatz, J., & Mulvaney, D. (2020). Sustainable minerals and metals for a low-carbon future. Science, 367(6473), 30-33.	This aspect is discussed below in the section.
1437	321	40	321	40	"power has low land-use requirements" => Yes, per se, but considering minimum distances to settlements for instance?	We added "direct" to make clear that direct land-use impacts are addressed here.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1438	321	36	321	39	I largely agree, although land can also be freed through a protein transition, reduced food waste, reduced calory intake, or, although less likely feasible in Austria, increased agricultural yields, hence without affecting food security. Freed land can be used for bioenergy, although it could also be used for restoring ecosystems, or de-intensifying agriculture, with multiple co-benefits for health and biodiversity. The corresponding section is chapter 2.3.4.	We added a reference to 2.3.4 here.
1439	321	42	321	44	How can these negative impacts mitigated, can you give examples?	We added two examples.
1440	321	47	321	49	There are possibly other important trade-offs (negative side effects); Environmental destruction through mineral extraction, international conflicts and raw materials, etc.	We have added one more example but please observe that the sentence starts with "such as" and is therefore not an exhaustive list.
1441	322	1	322	1	In this section risks and uncertainties associated with CCS etc. are not addressed. It seems to me that the evaluation of the comments to the NEKP (2024) paint a fairer picture of CCS etc.	This comment is adressed to Ch. 4.6 which deals with CCS in much more detail. The following sentence has been added to the paragraph: Risks, potentials, and uncertainties of Carbon Capture and Storage technologies are discussed in more detail in section 4.6."

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1442	322	1	322	2	This sentence is possibly misleading as even though it is true that the overall mining will decrease, the mining of minerals (Critical Raw Materials, REE, etc.) will need to increase substantially and unprecedentedly. So, to clarify this, I would suggest adding a sentence which specifies this aspect here. To reference the importance of raw materials for the green transition see this article: Sovacool, B. K., Ali, S. H., Bazilian, M., Radley, B., Nemery, B., Okatz, J., & Mulvaney, D. (2020). Sustainable minerals and metals for a low-carbon future. <i>Science</i>, 367(6473), 30-33.	We have added "additional mining for raw materials". The paragraph in total discusses the impacts of mining, so I do not see a need for further changes.
1443	322	22	322	22	Table 4.3: Please explain the logic of order of this table somewhere, thanks.	The table was moved to the Appendix and ordered in terms of technology and year, which was also explained. It is referred to in the beginning of Section 4.5.2.
1444	322	12	322	13	This sentence sounds very general. What does it mean? What is the argument in Haas et al. 2022?	The sentence was rephrased.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1445	323	11	323	22	What is the evidence that it will be possible to capture 230-430 Mt/y through CCS in 230 and even 47 - 800 Mt/yr through CCU in 2050? Still, there is not one large scale CSS installation working that is commercially viable. To build an entire strategy on such highly speculative assumptions is not credible.	It is a demand assessment by the EU as stated in the text – please see the given reference (Butnar et al., 2020) and the references therein. There are also economically viable CCS projects - see, for example, the summaries in the references “Global CCS Institute, 2021, 2023”. In addition, the status of CCS is discussed in this subchapter and underpinned with literature. No action has been taken.
1446	323	19	323	19	This statement is not viable.	Thank you for the comment - the phrase “will enable” actually anticipates the future and is replaced by “can support”.
1447	323	29	323	29	Is the energy consumption of CCS quantifiable? If yes, is this amount of energy integrated in the models of overall energy consumption in Austria and Europe? Possibly, other states' climate policies will rely on the same speculative assumptions.	The energy consumption of a CCS operation can be quantified individually and varies depending on the source of the CO ₂ and the capture process to which it relates. It also depends on the distance to the storage location. An overall or average figure may therefore not be meaningful. The last point in the comment is a personal statement by the reviewer.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1448	323	11	323	22	Are there reliable estimates of the quantities of CO2 that can be reliably captured, stored and possibly utilised by CCS and CCU in Austria? As long as there is no reliable information on this, it is not appropriate to base a climate strategy to a large extent on these technologies. An appropriate assessment also includes financing? Who should finance CCS? Who should bear the enormous investments? Who should bear the operating costs? The massive increase in energy consumption due to CCS also needs to be clarified. If CSS had to be partly fuelled by fossil fuels, the situation would be absurd.	The commentary combines personal opinion with arguments that can be answered mainly by reading the chapter. The CO2 quantities that can be reduced by CCUS and the energy intensity of CCUS are discussed in detail in the subchapter. No changes to the text are required for this. We included a statement and references regarding investment and operating costs.
1449	323	17	323	22	This sounds like a key message of the subsec and might need a confidence statement	Confidence statements are only given in the key messages. No action has been taken.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1450	323	1	323	2	The subchapter focusses strongly on technical feasibility and costs of ccus and emphasizes its potential to foster decarbonization. However, there is little reference to the debate on possible risks of ccus and ccus-based cdr, especially those relating to climate politics. There is an emerging literature arguing that ccus and ccus-based cdr can undermine mitigation efforts (mitigation deterrence, climate delay, etc.). For example: https://www.sciencedirect.com/science/article/pii/S1462901123002897 https://www.sciencedirect.com/special-issue/10Q2VFJNMFO https://wires.onlinelibrary.wiley.com/doi/10.1002/wcc.826 With regard to ccs in particular, the danger of carbon lockin is highlighted. For Austria see: https://www.sciencedirect.com/science/article/pii/S2214629624002883?v	The subchapter actually and intentionally focuses on technical feasibility. Climate policy aspects of CCUS are dealt with in the corresponding chapter. However, the application of CCUS to emissions that are difficult to avoid, as also called for in the Austrian carbon management strategy, is made clear. These aspects are briefly discussed at the end of the introduction and in the subchapter “4.6.2. CCUS potentials in and for Austria”. Based on the comments, we have added “hard-to-abate industries” to the title of the subchapter. Furthermore, we now reference some of the recommended references and the carbon management strategy for Austria published in the meantime and discuss these briefly.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1451	323	7	323	7	In combination with bioenergy (BECCS), biochar production, enhanced weathering or direct air capture (DACCS) technologies ...	The subchapter and sentence to which the comment refers concern CCS and derivatives. They do not refer to biochar production and accelerated weathering, which are CRD methods but have no relation to CCS. For our response to the reviewer's comment, we refer to the response to reviewer's comment 1453.
1452	323	18	323	18	... hard-to-reduce industrial and agricultural emissions.	This comment continues the comment 1451. For our response to the reviewer's comment, we refer to the response to reviewer's comment 1453.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1453	323	0	327	0	It is bewildering that the section on decarbonization relies on CCUS only. The authors should be aware that according to the IPCC AR6 several other technologies for carbon dioxide removal (CDR) are also available and should not be neglected because only a combination of all available technologies will give us a chance to reach the net zero with the help of negative emissions. The authors may refer to the CCCA fact sheet #38 for information about the CDR contribution of biochar. More details are summarized at the BML-homepage under https://info.bml.gv.at/service/publikationen/landwirtschaft/biokohle-potential-und-grenzen-der-anwendung-in-der-land-und-forstwirtschaft.html . Also, enhanced weathering should be considered, as it has been discussed in the working paper on CDR for the Austrian carbon management strategy. Besides, the potential of soil organic carbon increases in agricultural soils should be discussed. In summary, this section is too much focussed on point source CCUS. It is strongly recommended to take the options discussed by IPCC in AR6 more serious and to demonstrate open-mindedness to a broader range of technologies.	We agree with the statement that CCS is one part of the coin, while CRD methods must not be neglected. Furthermore, the authors are open-minded and very aware that greenhouse gas mitigation is highly complex and requires a wide range of measures and technologies. However, this subchapter focuses on industrial CCUS and CDR is the subject of the CDR box. In response to the reviewer's comments 1451-1453, and without reorganizing the subchapter, we have included a brief discussion and an explicit reference to the CRD box at the end of the introduction to the subchapter.
1454	323	4	323	6	Here it would be very good to have information on the size of households or income levels, or to point out the lack of such information. In other words, it would be good to include the aspect of carbon inequality here as well as in the sections on spatial planning.	The authors cannot see the connection between the reviewer's comment and the passage to which it refers. No action has been taken.
1455	323	17	323	22	References?	Literature for Austria has only just become available. We now cite Hochmeister et al. 2024, Kulich and Ott 2024, and the Austrian Carbon Management Strategy 2024.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1456	323	1	323	1	"Decarbonization..." of what? Header suggests that this is a viable strategy for decarbonization, while it is only suitable for mitigating residual emissions.	CCUS as a technology portfolio is much more general and can cover more than just "residual emissions". This can be seen in the business models of current CCS projects. In Austria, however, and especially in Austria's Carbon Management Strategy, only hard-to-abate emissions are targeted, but their definition is time-dependent. This is why we now have specified the title: "Decarbonization of Hard-to-Abate Industries by Carbon Capture, Geological Storage, and Utilization". This excludes the envisaged CDR measures, which are discussed separately in the CDR Box.
1457	324	36	325	2	Some researchers argue that many (if not most) CCU process chains are simply postponing emissions rather than actually reducing them. I think this more critical literature should at least be mentioned here to assure a balanced assessment. For example: https://www.swp-berlin.org/10.18449/2023C29/	The main arguments regarding product lifespan and the associated delays in emissions are already included in the paragraph to which the comment refers. The paragraph makes it clear that, e.g., "CCU contributes to an atmospheric CO2 reduction only when the CO2 has been taken from the air, or CO2 is held in a closed loop, or products are generated which bind CO2 for at least several hundred years (Hepburn et al., 2019)". No action has been taken.
1458	324	24	324	28	See p. 685. where these perspectives are also mentioned.	No action required.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1459	324	10	324	14	References?	The reference is a review article by Smith 2021 and is already cited in the text. No action has been taken.
1460	325	12	325	35	If it cannot be guaranteed that the entire amount of captured CO2 can be stored in Austria, the strategy described here becomes even more speculative and uncertain.	The comment is a personal opinion. The section it refers to provides the relevant numbers on hard-to-abate emissions vs. estimated storage capacity. No action has been taken.
1461	325	47	325	47	Reference missing!	The reference was indeed missing. We have now added it.
1462	325	4	325	4	greenhouse gas or only CO2 emissions?	It is Mt of CO2 equivalent - we now clarified it in the text.
1463	326	2	326	6	Are there quantified estimates of the requirements of the transport network to transport CO2 and, if necessary, to store it in the short term?	CO2 transport capacity and temporary storage capacity will depend on the amount of CO2 captured from CO2 sources. Transport distances will depend on volume-weighted source-to-sink routes. In doing so, hard-to-abate emissions should be considered, which are discussed in the subsection and elsewhere in the report. We have implemented a statement in this regard that refers to volumes from Hochmeister et al. (2024).

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1464	326	1	326	38	in my opinion, the decarbonization potential of ccus technologies gets highly overestimated here and the potential risks through eg. leakages are not mentioned (as shown in steininger et al., 2024). it should be clearly mentioned that ccs can only be one temporary option for hard-to-abate emissions and that it can not be used as a decarbonization strategy (as which it gets promoted in the public and political sphere at the moment).	The commentary reflects a personal opinion. Regarding the individual points: the subchapter already emphasizes the difficult-to-abate emissions, already discusses safety aspects of geological storage and CCS is already an element of the Austrian government's decarbonization strategy. No changes have been made to the text.
1465	326	2	326	6	References?	Literature for Austria has only just become available. We now cite Hochmeister et al. 2024, Kulich and Ott 2024, and the Austrian Carbon Management Strategy 2024.
1466	326	11	326	11	"For geological storage, 2030/2040 is already tomorrow," => Reference? Sounds rather Denglish...	We rephrased the sentence; a reference is not required for such a general statement.
1467	326	19	326	20	Sentence structure?	The sentence has now been formulated without hyphens.
1468	326	37	326	38	Reference?	We added references.
1469	326	11			The phrase "2030/2040 is already tomorrow" is not appropriate assessment language.	We rephrased the sentence.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1470	327	2	327	2	In Fig. 4.13 biochar is missing as carbon sink. It should be placed in the centuries to millenia period of carbon fixation. The graph needs an arrow leading directly from pyrolysis to biochar, circumventing CO2 transport. Otherwise the graph is incomplete and misleading.	Since the subchapter and figure refer to industrial CCUS and we consider biochar as a CDR measure, we did not expand the figure. The pyrolysis is therefore indicated as a source, since in addition to coal, concentrated CO2 is produced in the gas phase and thus represents a source for CCUS. Biochar and CDR are covered in the CDR box. No action was taken in this subchapter.
1471	327	4	327	6	Figure 4.14: Nice map, but please increase font size to improve readability, thanks.	The readability has been improved.
1472	327	6	327	6	I cannot imagine that 90% of Austrians are involved in care work (i.e. care duties towards elderly/children), and that for 3.5hrs a day. You might mean unpaid work in general (then the numbers are about right: https://www.statistik.at/fileadmin/announcement/2023/12/20231218ZVE20212022EN.pdf).	We verified the information and adapted the text.
1473	328	16	328	19	Revise sentences. (while...current connectors only work if used in the same sentence).	Thank you, we adapted it accordingly.
1474	328	4	328	4	shouldn't it be "high agreement, high confidence"?	Text was adapted (no statement on agreement&confidence in this sentence anymore)
1475	328	45	328	46	Maybe specify that emissions linked to housing are accounted for in self-care emissions to explain high share and avoid misunderstandings regarding policy implications?	Sentence was deleted to shorten the section.
1476	328	11	328	11	Please do not begin sentences with "And", thanks.	Thank you. Sentence was adapted.
1477	328	16	328	18	Sentence structure; this sentence is not complete	Sentence was deeted and section adapted.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1478	328	24	328	24	"An ill-fated but not coincidental link" => ill-fated	We replaced the word ill-fated with "structurally linked"
1479	328	25	328	25	Who defines which work is "essential" and not and based on what?	This is elaborated in the cited literature. Sorry, we have no space to explain in the text in detail.
1480	328	31	328	31	"are uneven distributed" => unevenly	We adapted spelling accordingly.
1481	328	34	328	34	"employment in industries and transport" => Do you mean the German "Industrie"? If yes, then "industries" is not correct here, as it means "Branchen" in German. "Manufacturing" would be much more precise.	Thank you, we adapted it to manufacturing industries
1482	328	46	328	46	"respectively (ibid.)" => Please avoid this citation style!	Sentence was deleted to shorten the section.
1483	328	6	328	6	I recommend specifying that you mean unpaid care work here	We adopted the formulation of statistic Austria and hope that is more clear.
1484	328	6	328	6	Austrian population - of all age groups?	We added 10 years or older
1485	328	11	328	11	I recommend specifying that you refer to paid work here	Thank you, we adapted the sentence.
1486	328	12	328	13	indispensible also for paid work/the formal economy in general	Thank you, we adapted the sentence.
1487	328	15	328	15	"can be a source" is a bit of an understatement, given the high dependence of individuals on employment for livelihoods etc.	Thank you, we made it clearer in the text.
1488	328	0	328	0	It is not always clear whether you refer to paid or unpaid work, or both.	Section was checked and clarified where necessary.
1489	328	34	328	34	"employment in production industries and transport" - to avoid confusion	Thank you, we adapted it to manufacturing industries
1490	328	37	328	39	This sentence is unclear - what does "face barriers" mean?	Thank you, we explain this in the text now.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1491	328	24	328	26	This is an important observation, however, it misses part of the picture. Especially in the context of provisioning, it should also be mentioned that some of the essential sectors (often discussed in the context of UBS/foundational economy) are very resource- and energy-intensive, such as agriculture, waste, energy, transport, housing, ... Unfortunatley, an economy oriented towards meeting human needs is not possible solely based on person-related, resource-light services. I recommend at least touching upon this issue, possibly also in section 4.7.2	Sorry, we have no space to discuss this in this chapter but there is a dedicated chapter to this point.
1492	328	1	328	1	I suggest that you start section 4.7 with a short introduction on how you frame provisioning in relation to work as this might not be straightforward (the "Bereitstellungsperspektive" suggested by Hofbauer et al. 2023, p. 287, might be helpful here)	Thank you, we had a look. Due to the limited space we cannot add any new frameworks in the text and think the provisioning framework is well elaborated in other parts of the report.
1493	328	2	328	23	The structure of this paragraph is not ideal. Starting with the discussion of unpaid work suggests that it is mainly unpaid work that impedes climate friendly provisioning and living.	Thank you for pointing that out. We have changed the title so that it becomes clearer.
1494	328	11	328	11	I suggest moving this sentence to the part where you discuss paid work	Thank you. We adapted it accordingly.
1495	328	3	328	3	Other forms of unpaid work (than care work) exist	We agree and adapted accordingly.
1496	328	24	328	24	"ill-fated" -> avoid judgemental language	We replaced the word ill-fated with "structurally linked"
1497	328	46	328	47	"Marginalization of unpaid care" -> probably you mean unpaid work here. But beyond that, it contradicts the above statement that only half of the population is in paid work, whereas 90% are in unpaid work (or what you refer to here as care).	Thank you, we have clarified the sentence by pointing to social and economic marginalization and devaluation

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1498	328	6	328	6	Do these figures (90% of the population, 3.5 hours) refer to care work in the stricter sense (caring for people) or do they also include household chores and similar? If the latter is the case, it should be stated more clearly to avoid misunderstanding (further below care of people is addressed).	The numbers refer to 'Sorgearbeit in Haushalt und Familie', this also includes household chores. We have adopted the formulation of the report by statistic Austria. we hope this avoids confusions.
1499	328	24	328	26	As already commented in the KMs section: In which perspective is this "ill-fated" i.e. unfortunate? A clear explanation in the text is also not found. Should be mentioned/explained, otherwise omitted. Or is "unequal" meant?	We replaced the word "ill-fated" by "structurally linked". The mechanism is described below.
1500	328	24	328	50	The phrase "ill-fated but not coincidental" is not clear; it is not explained what is not coincidental about the following "link". It is also not clear what that link should be, other than these are two extremes of work.	We replaced the word "ill-fated" by "structurally linked". The paragraph has been adapted.
1501	329	15	329	15	"live-styles" => life!	Sentence has been re-written and a different expression used.
1502	329	28	329	28	"pro-environmental phenomena like climate quitting" => Please explain what "quitting" means, thanks.	This is explained in the glossary.
1503	329	28	329	28	What are "brown industries"?	We changed terminology to climate-damaging instead.
1504	329	30	329	30	"which individual form their preferences" => individuals	Adapted the sentence accordingly.
1505	329	40	329	41	The sentence is not complete here!	Thank you, we reformulated the sentence - also in accordance with the notes from earlier in the text.
1506	329	3	329	3	"work acceleration" - this a term Rosa uses? Work intensification might be a more common term	This is the term from Rosa, which the sentence is based on. So we keep this term.
1507	329	9	329	9	What kind of "changes in the work-induced consumption patterns" are you referring to?	Sorry, no word space to expand this interesting question.
1508	329	11	329	11	"contrasting" - do you mean offsetting?	Thank you, sentence was adapted.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1509	329	12	329	12	Using the term rebound effect in this context might be a bit confusing	(Time) rebound effect is this correct term for it used in the literature.
1510	329	13	329	14	"Key for a shift..." - this sentence is unclear	Thank you. Sentence was adapted.
1511	329	13	329	13	changes in unpaid care responsibilities? Because you are talking of a shift..	Thank you. Sentence was adapted.
1512	329	18	329	19	increased free time resulting from a working-time reduction?	Yes. We changed the sentence accordingly.
1513	329	22	329	22	How are "green" workplaces defined in these studies?	We cannot explain this is the text due to word count limitations, but interested readers can consult the cited literature.
1514	329	22	329	22	And how is pro-environmental behaviour operationalised? Is it an intention-based or impact-related measure?	We cannot explain this is the text due to word count limitations, but interested readers can consult the cited literature.
1515	329	25	329	27	This sentence is unclear - what does "cover" mean in particular?	The sentence was re-formulated.
1516	329	28	329	28	"brown industries" might not be self-explanatory	We use climate-damaging instead.
1517	329	28	329	28	"climate quitting" might also not be self-explanatory	This is explained in the glossary.
1518	329	30	329	30	establish and/or maintain?	This is a style question and we prefer the use of form.
1519	329	33	329	34	I think "resort" in English is rather used in the context of holiday resort ;)	Sentence has been re-phrased and we use "domain" instead.
1520	329	34	329	34	What kind of cooperations?	This was a typo initially, but the section has been re-structured and the sentence deleted.
1521	329	1	329	19	This paragraph sounds as if less paid work would lead to lower emissions. I think the relation is not as simple as that. There are several studies that show that people travel longer distances (mostly by car) on days when they do not work or "work from home".	This is covered in the paragraph (see last two sentences)

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1522	329	21	329	25	Might this be due to self-selection into such jobs?	We cannot explain this is the text due to word count limitations, but interested readers can consult the cited literature.
1523	329	39	329	41	There is a superfluous "that" at the end of the sentence. Content-wise, the sentence is not clear. What is the "will have ended" refer to?	Sentence was adapted.
1524	330	13	330	13	workers'	Changed to workers'
1525	330	20	330	20	Sentence structure full stop missing	Full-stop added.
1526	330	7	330	8	Sentence structure not clear	Thank you, we revised the sentence
1527	330	3	330	5	"will be less dominated" -> when? how? under which circumstances? I would suggest a more concrete and factual formulation of such messages	The paragraphs are about the future(!) work systems when climate-friendliness is reached, so we cannot give more "factual" messages. We reformulated to make this more clear.
1528	330	30	330	30	What is the role of telework in all of that? At least one key message should within 4.7.3. should refer to the CO2 mitigation potential of telework (or lack thereof).	Thank you for raising the issue of teleworking. We do not see teleworking as an important leverage for future systems so we do not touch upon it in these paragraphs but added teleworking in an earlier paragraph.
1529	330	15	330	15	As already commented in the KMs section: BAU scenario is meant here, or what does "BAU work" means? In case, a comma after BAU could improve readability...	The abbreviation is now spelled out.
1530	331	1	331	1	Climate related risks for Industry and Manufacturing should also cover the risk of climate related supply chain break downs.	This sentence is not focused on risks but on climate friendly modes of production

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1531	331	16	331	32	The OECD too states that initiatives to strengthen collective bargaining can enhance the attractiveness of jobs in low-emission sectors. https://tuac.org/news/oecd-employment-outlook-stresses-collective-bargaining-for-a-just-transition/ OECD (2024), OECD Employment Outlook 2024: The Net-Zero Transition and the Labour Market, OECD Publishing, Paris, https://doi.org/10.1787/ac8b3538-en .	Thank you, we added to the respective part below.
1532	331	19	331	20	Additional sources: Arbeit&Wirtschaft 6/2024 (https://emedien.arbeiterkammer.at/viewer/image/AC08718425_2024_06/2/#topDocAnchor) ÖGB Program 2023-2028, especially Chapter 1 - Climate, Energy, Transformation, Mobility, Transport – Just Transition (https://www.oegb.at/content/dam/oegb/downloads/der-%C3%B6gb/20--bundeskongress/beschlossen/OEGB_Programm_2023_2028_beschlossen_am_20_Bundeskongress_22062023.pdf) https://wien.arbeiterkammer.at/umbauplan	Thank you we added the references

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1533	331	28	331	28	It is unclear what the term "pro-environmental actors" refers to, how it is measured, or why trade unions are implicitly understood as being contra-environment. Trade unions are not environmental NGOs but rather represent the interests of workers. These interests are naturally embedded in an ecological context in which workers live and work. Therefore, union demands and actions are always adapted to these ecological contexts, as is evident from the very emergence of the concept of "Just Transition." Categorizing unions as "pro" or "con" environmental actors does not adequately capture their nature. The latest IFES surveys from 2023 also show that sustainability is of particular importance to works councils, yet they are predominantly not included in relevant processes. Source: https://wien.arbeiterkammer.at/service/studien/WirtschaftundPolitik/studien/Strukturwandelbarometer_2021_1.pdf	Thank you for the comment, we reformulated to avoid misunderstanding and to emphasise that we mean "strengthening the pro-environmental character of unions"
1534	331	9	331	9	What are the assumptions behind this outlook? How does it go together with your claim to reduce work hours?	This cannot be elaborated here but can be looked up in the respective study.
1535	331	35	331	38	I suggest you cite Hofbauer et al. 2023 here.	Thank you, reference was added.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1536	331	33	331	52	This paragraph sounds like wishful thinking, and has an ideological touch. Based on my knowledge of the literature, there is very little well-substantiated evidence for such effects actually occurring reality.	The goal of the paragraphs (achieving climate-friendly work....) is to list transformation options. So it is less focused on evidence on current reality but more on describing potential of strategies. We adapted the wording to make this clear and to avoid the impression that we describe evidence about today.
1537	332	33	332	36	This sentence is unclear. Please re-phrase.	Thanks, the sentence was too wordy, now it should be better.
1538	332	26	332	45	This section describes the status quo (and the literature) in excessive detail. But the actually relevant term "climate mainstreaming" is hardly explained. This section would be much better, if it actually explained what climate mainstreaming entails in the relevant sectors or at least gave some examples beyond the reference to AMS.	We do not refer to sectors in terms of economic sectors in that section. To avoid that confusion we replaced the term sector with the term dimension in the beginning.
1539	332	3	332	12	It is not entirely clear what this section refers to - what do you mean by "provisioning of basic needs at work-places"? E.g. commuting is actually something that happens outside of paid work hours, in contrast do business trips. What is meant by housing? I guess with food you refer to meals offered in e.g. canteens?	We have re-formulated and re-structured the paragraph to be clearer
1540	332	13	332	13	Not rather/also (wage) income distribution?	Wealth inequality is often neglected, this is why we emphasize it, but we added income inequality as it was missing.
1541	332	3	332	3	What do you mean by "Provisioning of basic needs at work-places, e.g., mobility, heating and cooling, food and housing,"?	We have re-formulated and re-structured the paragraph to be clearer
1542	333	2	333	2	I would quote the original source of the concept (1994 report of the German parliament's Enquete Commission)	Very good! But I do not have it.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1543	333	1	333	6	The paragraph offers a proper description of the Avoid, shift, and improve framework (ASI). However, it sounds a little redundant. My suggestions are: 1- I suggest deleting lines 2 to 6 because lines 13-33 have the same information but provide a better view (with examples) of the meaning of the ASI framework. This will help to reduce unnecessary or repeated information. 2- if it is desired to keep the paragraph, I suggest adding the word "materials" in line 4 "Avoid" refers to all mitigation options that reduce unnecessary (in the sense of being not required to deliver the desired service output) energy and material consumption by redesigning... This is important because material production is responsible for about 23% of global emissions, so reducing material needs will significantly contribute to reduce emissions. http://dx.doi.org/10.1038/s41561-021-00690-8	1) Ok; 2) As we delete the quote; this is no longer necessary

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1544	333	15	333	22	I suggest replacing the word "refers" in line 16 for "means" or "are associated" or another convenient synonym different to refer as it is already used in line 15 and sounds very repetitive. Additionally, for consistency in line 17 I suggest to replace the word "resource use" for "materials" to connect with previous lines 1-6 if they are maintained. Finally as in "shift" and "Improve" there are three examples "shelter, food, and transport" I suggest for consistency in line 20 to include one example for "avoid" referring to transport. e.g. examples of mitigation options of "Avoid" comprise reduction of unused living space, calory consumption or transport needs by doing home office (or working remotely"	Thank you for this comment. We have taken up all suggestions with one exception: we stick to "refer", as it is a quote.
1545	333	38	333	38	Are the authors also referring to "rebound effects" in that case I suggest explicitly including the word as follows: eg. As all ASI mitigation options entail synergies and trade-offs (i.e., rebound effects)	Done. Although rebound effect is mentioned further below: <i>They may also lead to rebound effects when efficiency gains induce an increase in production and consumption</i>

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1546	333	41	333	43	I suggest using the scope 1-3 emissions schema here and rephrase the sentence as follows: The framework is also relevant for scope 3 emissions (indirect emissions) of providing services (e.g., GHG emissions from concrete production as part of housing provisioning) authors may refer to the greenhouse protocol or other source of your convenience.	I am no expert on this; but the suggestion seems reasonable
1547	334	36	335	1	CCBox 5 Table 1 => No references at all?	The measures are examples to illustrate the concept. We added some references. However, for a systematic list of measures and assessment, see the respective chapters, as well as Tab. 6.2 Policy instruments for mitigation and adaptation.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1548	335	0	335	0	The table is a good summary of the ideas explained before, however, the table refers to measures across sectors (see the label in table 1). In that sense, first I suggest leveling the first column as "industry" or "sector" or similar of your convenience. Second, it is clear to me that transport, buildings, and food are sectors that provide services, but this is not the case for work. In the first place "work" is not a sector as the others presented before, so it doesn't match the logic of the figure in my point of view. I suggest to delete the last part of the table referring to work and place the service of commuting in transport and adjust the strategies to match with the sector "transport" and the services "commuting"	Thank you for the interesting suggestions. The examples are not a systematic list, but incomplete examples. The categories are also not meant to be overall all-including not mutually exclusive, and simply serve as illustration. To keep a balanced table, we kept all categories and left the first column blank to avoid a column name that would Not fit all examples.
1549	336	46	337	10	Matching the ASI and the 10Rs is also described in Chapter 5 from a demand perspective. There is a need to consolidate these parts, and probably remove paragraphs to avoid repetitions.	This is a cross-chapter box and chapter reference to boxes.
1550	336	3	336	14	At least five references are missing in this paragraph...	References have been added to key statements.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1551	336	23	336	23	Page numbers for direct quotations please	Pager number for direct quotation added to reference
1552	336	26	336	26	"broad recognition (more than 3,800 citations) is from" => stems from, comes from	Sentence was adapted accordingly.
1553	336	37	336	37	narrowing ... slowing => of what?	Sentence was improved: narrowing, slowing and loop-closing of material flows
1554	336	34	336	44	more references, please	References have been added
1555	336	39	336	39	"overextending" => over extending	We adapted the suggestion accordingly.
1556	336	46	337	4	This paragraph has no references!	References have been added; also the text has been slightly modified to comply with the overall CC-Box word count.
1557	336	3	336	4	Sollte ggf. besser von "resources of primary row material" und vom "material flow" (siehe MFA) gesprochen werden?	Thank you for your feedback. However, phrasing is based on Global Resource Outlook (GRO) 2024, as cited in the text. To clarify the issue we added in bracket the material categories the GRO is referring to.
1558	337	5	337	5	CCBox 6 Figure 1: Great figure, but source? No references?	No references, own figure
1559	337	11	337	14	References?	References have been added
1560	337	23	337	25	sentence structure and grammar not correct, please check	Sentence grammar corrected
1561	337	17	337	22	References?	References have been added
1562	337	5	337	5	"Reccycle" should probably be "Recycle" (on the bottom-right)	Typo corrected in figure
1563	338	21	338	27	The CE strategy is also described in Chapter 5. These should be consolidated, cross-referenced and probably the text cut in one place.	Cross-references to chapters 4.2.2 and 5.5 have been added.
1564	338	28	338	32	sector specific energy demand values, emission footprints, supply mix, etc. are provided sporadically in Chapter 3, 4, 5, too. There should be one overview table, which should be referenced in each instance. Maybe placed in Chapter 3 or 6?	Thank you for the suggestion. However, to comply with the overall word limit of the CC-Box, this section was removed.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1565	338	32	338	32	Unfortunately, new regulations like the Austrian waste incineration directive (2024) aggravate the achievement of circular economy goals e.g. by prescribing the mono-incineration of sewage sludge that creates ashes where phosphorus, a critical resource, is locked in (instead of recycled) and needs high efforts and input of chemicals to regain bioavailability.	Thank you for the insightful comment. However, to comply with the word limit of the CC-Box, we decided to remove this paragraph altogether. For the same reason, a section of the preceding paragraph was removed.
1566	338	17	338	19	References?	We had to shorten the text, therefor we canceld this part.
1567	338	26	338	26	"and 2 % in the electricity" => sector or production	Electricity' changed to 'electricity sector'
1568	338	27	338	27	"including industry and agriculture" => better: manufacturing	Changed to 'manufacturing and agriculture'
1569	338	41	338	46	References?	References have been added
1570	339	1	339	1	The box might benefit from a paragraph on the potential risks of cdr for mitigation efforts (mitigation deterrence, moral hazard, etc.)	The risks to mitigation efforts from CDR methods should not be the focus of the CDR box, but the mitigation options from CDR methods should be. However, we added a small paragraph on the avoidance and shifting of mitigation efforts compared to carbon management.
1571	339	0	341	0	Has this content - specially the building part - been checked with Alexander Passer, TU Graz? It seems to me that is very much focussed in international literature - but Austrian research should be included as well. (It might be in Chapters 2-4 - but I haven't been able to review them yet.)	We addressed the key issues related to the construction sector in the text accompanying the box, with support from the relevant team. Alexander Passer is also a co-author of that section. However, due to space limitations, we couldn't go into detail within the short write-up. For a more comprehensive discussion, we refer readers to Chapter 4 and other relevant sections.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1572	339				This chapter deals with potential carbon dioxide removals. It is written very general and needs more content and a better conceptual outline of the different methods. Maybe it would help to improve Figure 1 on Page 340, and use this as a kind of an overview and then provide in the text more insights in the different carbon capture methods.	We improved the figure to provide a comprehensive overview of the CDR methods.
1573	339	1			This chapter could be very useful if we learn about the different carbon capture methods, the pros and cons, their application potential in Austria and what impact in terms of C storage can be expected. Several of these ideas are included but this chapter requires more work and editing.	The CDR box is very space-constrained and some carbon capture technologies associated with CCUS are covered in a separate subsection of Chapter 4. However, we improved the figure in the box to provide a comprehensive overview of CDR methods and we adjusted the text accordingly.
1574	340	3	340	3	Figure 1 in CCBox 7 is hardly readable because of a too low resolution. But apparently the option biochar is missing although it is a mature, ready-to-use technology (TRL 8-9). So this table should be supplemented. Technical potential assessments can be found in the biochar-brochure of BML, Fachbeirat für Bodenfruchtbarkeit (2024) (Link provided in a different comment).	We improved the figure to provide a comprehensive overview of the CDR methods.
1575	340	19	340	19	add in the brackets: sustainable biomass availability	The brackets only contain the reference – we ensured that “sustainable biomass availability” is associated with it.
1576	340	2	340	2	The graph is so blurred it can not be deciphered and therefore not reviewed. I would suggest checking whether the figures are in line with the CCCA Evaluation of NEKP-Comments.	We improved the table and cross-checked it with the CCCA Evaluation of the NEKP-Comments.
1577	340	10		11	Wording needs improving. CCS is not in contrast to atmospheric CO ₂ .	We re-phrased the section accordingly.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1578	340	11	340	12	It is not clear why biomass storing CO ₂ needs to be transported. The forests might just be left alone for decades.	Since CCS requires a central capture facility, biomass in any form will need to be transported to that central capture facility. The statement is about the transportation of biomass and not about the transportation of CO ₂ . We re-phrased the text to make this clearer.
1579	340	12	340	18	This whole paragraph would profit from rewording. The sentence beginning with "Technically" has you expecting some aspect relating to the afore said, but it introduces technical removal. The next sentence starting with "However" does not relate to the previous one, etc.	The paragraph will be reworded.
1580	340	17	340	18	The first sentence seems to exclude BECCS from consideration in this paragraph, but here it comes again ...	BECCS is a potential CDR method and must be included. We worked on the consistency of the box.
1581	340	3			The Figure needs work and a Figure caption.	We improved the table and added a figure caption.
1582	340	1	340	1	CCBox 7 Figure 1: Abysmal resolution... Not readable.	We improved the quality of the figure.
1583	340	2	340	2	The small text in the figure is hard to read due to image quality. And isn't it more a table than a figure..?	We improved the quality of the figure.
1584	340				CCBox7, Figure 1: Why do afforestation and reforestation have high energy requirements?	We will check and adapt the argument.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1585	341	3	341	3	The citation from Kuittinen et al. (2023) is wrong. In the paper one can read: "in comparison to a range of other NETs, biochar may bring emission reductions with less disadvantages, as concluded by Smith (2016)." Generally, the sentence is formulated confusingly. The first part of the sentence, dealing with construction materials of biological origin, should be kept separated from the second part, where additives to concrete (in amounts of partly less than 1 %) are mentioned.	We have rephrased the sentence to make it clearer.
1586	341	19			Please rework this section from a list to fully developed paragraphs including an assessment of the options and potentials	We re-phrased the list to full sentences and paragraphs.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1587	342	16	342	29	Add the following research gaps: * Security / energy independence based scenario: What would it look like, if Austria had no net imports of energy counting fuels as well as gray energy in products (ie de-industrialization is not an option)? * Cost based scenario assessment: The existing pathways and scenarios mostly focus on policies and assumptions about macroeconomic constraints like provided infrastructures, areas available and amount of imports. If costs are published at all then only as an afterthought. This report highlights many open questions like solar vs. wind, hydrogen vs. electrification and pumped storage vs. bio-energy, that would benefit greatly, if comparable system-level costs of scenarios were available. * Price sensitivity analyses, particularly regarding assumptions like import prices of green fuels etc * The future role of industry and product stocks in providing demand flexibility: Many industrial processes are friendly to intermittent operation. E.g. electric arc furnaces operate in 8h cycles; paper machines are stopped every six weeks for maintenance. These cycles provide natural break points to pause or reduce production in case of low energy availability like extended wind lull, but fixed costs need to be covered. Considering costs of over-capacities and storage, what is the resulting price of flexibility and how does this compare to other flexibility options like synthetic fuels?	Was partly considered in the research gaps.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
1588	342	2	342	3	Yes, there is for instance a lack of comprehensive data about the energy consumption of artificial snowmaking. If visitors substitute ski tourism with long-haul trips then the carbon footprint of ski tourism would most likely be surpassed.	We highlighted this issue (substitution of ski trips by long-haul travel to other destinations) more clearly.
1589	345	0	345	0	Considering 3662 scientific papers about biochar that have been published in 2023 only, it is unbelievable that the authors do not know more than 2 (partly old) papers that deal with biochar, one of the promising negative emission options for CDR. This disregard is a clear shortcoming of this section.	It is unlikely that there are thousands of studies on the application of biochar specifically in Austria, as this is still a relatively new area of research. The more technical and content-related questions about the effects and limits of CDR could unfortunately not be covered. However, to ensure that CDR is not entirely overlooked, we included at least a qualitative assessment based on the international literature.
1871	518	28	518	41	You mention several institutional, with name and abbreviations - thanks - this is missing in many other chapters and paragraphs. My suggestion: to add a list of terms, names, abbreviations to the list of content.	Thank you. We included abbreviations in the accompanying list of abbreviations.
2339	731	1	731	1	A part of the map i.e. of Austria on the map (to the north and west) is missing.	Comment does not relate to Chapter 4.
2340	733	0	733	0	Both figures seem to be deformed and not well readable.	Comment does not relate to Chapter 4.
2341	759	1	789	1	Hazard table needs to be completed, columns showing trend and columns showing information from individual chapters are not consistent.	Comment does not relate to Chapter 4.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
2343	799	5	800	5	I was asked to provide specific recommendations for improving Table A2 in A2.12, but at this stage, I can only formulate general ones: Clarify among the authors, which message you want to transmit with this table, consider which messages it might transmit in the current format, and then simplify, adjust or refine. To help with that, here is what I personally derive from this table: .) Just increasing agricultural production per area results in most GHG emissions. .) (there is no data in the last two rows, thus I - the "a bit above the average interested reader" - am not even starting to think about them and what information they could provide) .) To achieve the highest negative emissions your recommendation is to increase agricultural production per area BUT to decrease it in total AND to use the freed area for SRC in a WEM energy mix .) you wouldn't recommend going for the (more ambitious) Transition mix though .) If we just reduce total agri production, there are positive and negative outcomes; avoiding emissions can only be reached if SRC is implemented in the freed-up areas. .) Then there is the last column, which is separated from the table (I am not sure what this separation and gap tells me). After making up my mind going through the table, I get the following message: .) Using the freed-up spaces for SRC seemed to be a great, emission-avoiding option, which gives me 64 PJ of SRC. But I could make the twenty-fold if I use the freed-up spaces for PV. I assume now, that every PJ of the options here listed avoids the same PJ of fossil fuels and its emissions. Thus, I derive my personal conclusion: --> Reduce total agri production and consumption, increase productivity, do not afforest or extensify, but go for a WEM scenario and cover all freed-up spaces with PV to achieve the maximum of about -60 MtCO₂ eq/year.	Comment does not relate to Chapter 4.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
2344	799	6	799	7	Continued comment on Table A2 in A2.12 (which seemed to have been cut due to length): Especially the extra column invites the reader to derive conclusions on an implicit kWh_electric basis, with the definitive result that any surface radiation is best valorized through electricity production via PV. Is this "Dyson-sphere vision" matching the vision of the authors? From a bioenergy perspective, the comparison is too pragmatic. Potential electricity produced holds much less value than chemical energy carriers produced, which can be stored and used in many more ways (versatility) than electricity, also with regard to CO2 avoidance. Plus, there are many more values beside the CO2 and energy value along the supply chain (especially for more hybrid options than bioenergy only). But the biggest interpretation risk for this pragmatic last column and the implicit "Dyson-sphere vision" is, that it puts electricity production before all other biosphere/ecosystem use of land surfaces (including but not limited to for bioenergy use). I can imagine that the signal of this column overshoots any intentions of the authors and holds the potential to backfire considerably.	Comment does not relate to Chapter 4.

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Comment ID	From page	From line	To page	To line	Comment	Final reply to comment
2345	800	1	801	1	A2.14. Mitigation potentials of Interdependent measures related to forests and wood use - Table A2. There is no reference where the data of the two tables are extracted or compiled from - please add this information and references.	Comment does not relate to Chapter 4.
2346	811	22	811	34	This sub-section seems somewhat biased against standard economics. It seems to neglect that ethical considerations on distributional impacts can enter social welfare functions (which then are maximized) directly. Also hard, binary constraints (e.g., "doughnut economy principles") could be made part of social welfare, by tying a prohibitively large shadow price to the dummy indicating meeting the constraint. (see for instance Stiglitz & Atkinson: Lectures on Public Economics)	Comment does not relate to Chapter 4.
2347	884	10	884	10	(1) "... shift in glacier" ... (2) I'm fully fine with the projections of earlier peaks in runoff from high mountain catchments due to earlier snow melt but I think the situation is different for glaciers where I don't expect a pronounced peak. I argue that high discharge can occur on all days in summer with (still) high solar radiation once snow cover has mostly vanished and thus, the dark(er) ice is exposed. Be it already in June (in years with very little snow accumulation during the the core accumulation season and seasonally early melt conditions) or be it latter (in years with much snow in winter/spring).	Comment does not relate to Chapter 4.
2348	885	35	885	36	I have never heard the expression "temperate Europe" - maybe it could be replaced by a description that is easier to understand for non-botanists.	Comment does not relate to Chapter 4.