

Public justification:

Report No. 1 accepts the revised version of the manuscript, with the remark on "Table 2. This table might be more effective if it was simplified or the formatting improved. Also, the crown defoliation portion of the table seems redundant with Figure 2." That should be corrected by the authors.

Report No.2 raises some more points. Firstly the authors should correct those remarks in the annotated pdf, but secondly the reviewer make two stronger points: (1) The point "review vs report" is indeed relevant. My suggestion to the authors would be: to drop the "review" in the title and replace it with a more appropriate term like "a retrospect view" or " an assessment" or similar expression together with respective changes in the introduction.

(2) the reviewer suggests more summarizing figures instead of the textual description. In view of the time necessary to generate such conclusive figures, I will not follow that suggestion and leave the current version of the manuscript as it is (supported also by review No. 1).

Reviewing the manuscript myself I found that Section 6.2 "Policies related to drought and heat waves", does not contain any information regarding the actual topics of the manuscript. Nothing is mentioned with respect to forest damages or their mitigation. Rather the text reads like a proposal to a funding agency or a talk during a fridays-4-future demonstration. I strongly recommend to drop that section from the manuscript, it is absolutely not necessary within this manuscript.

I would like to ask the authors to update the current version of the manuscript. If that is done appropriately, the manuscript can be published in NHESS.

Answer from the authors:

Dear Editor,

Thank you for your detailed feedback on the manuscript.

We have carefully followed your suggestion and revised the title of the manuscript by removing the word "review" as you recommended. We have also made corresponding changes to the introduction.

We have decided to include summarizing maps to enhance the clarity of the information. This decision allowed us to remove Table 2 entirely from the manuscript and present the data more effectively in a map of Europe. We believe this change significantly improves the manuscript. However, if needed, we can provide Table 2 as a supplement.

Regarding your comments on Section 6.2, we agree that it did not align with the main focus of the manuscript, which centers on forest damages and their mitigation strategies. In response to your recommendation, Section 6.2 was removed from the manuscript.

We hope these revisions address have enhanced the manuscript's quality. Below, you will find some additional replies to the cpoints raised in the two reports.

Thank you again for your valuable input.

The authors

Report #1:

Table 2. This table might be more effective if it was simplified or the formatting improved. Also, the crown defoliation portion of the table seems redundant with Figure 2.

Answer from the authors:

Dear reviewer #1, we have carefully considered your suggestion to simplify the table and improve its formatting, as well as your observation about the redundancy of the crown defoliation portion with Figure 2. In response to your comments, we have removed Table 2 from the manuscript. Instead, we have presented the results in a map of Europe, which we believe addresses your concerns more effectively and provides a clearer representation of the data.

Report #2:

The paper, presenting a revised version, documents a tremendous amount of work, compiling documents in several languages, from websites, newspapers, agency reports, and scientific publications. It is a documentation of the knowledge gained for the period 2018-2022, compared to a "more normal" period 2010-2014, indicating that these recent years have been exceptional with respect to heat and drought. It is a huge achievement.

However, the paper is very long and the reader is easily lost in details, in particular in the sections where the situation in each and every country is described regarding first drought and heat, then damages to forests, with just one set of maps (for the SPEI) and very few tables. It would benefit a LOT if instead the information would be presented with maps mostly, e.g. relative tree cover loss or the harvest/production rate in the period, potentially leaving the countries white where no or insufficient data are available. This visualizes the intensity of the damages immediately. There is a danger that not a single reader (apart from the reviewers, that is) will read through the whole text, but rather consider his or her own country only. In part, the numbers could also be shown in Tables, but Table 2 is awkward to read, use more columns instead of the listing of the mean values for the two periods.

Answer from the authors:

Dear reviewer #2, thank you for your detailed and constructive feedback on the revised manuscript. We appreciate your recognition of the extensive work involved in compiling and documenting.

We agree that the manuscript is very detailed, which could potentially overwhelm readers, particularly in sections describing conditions and impacts on a country-by-country basis. The suggestion of using a table is excellent. However, it's challenging to apply it uniformly due to the various specific details that require textual description. But to address this point, we have revised and shortened the relevant sections where possible, including the removal of Table 2 as was indicated.

We have followed your suggestion of using maps for better visualization of our findings. We have created and included maps to illustrate key aspects (see Figures 2 and 3). This approach aims to provide a clearer and more immediate visualization of the damage intensity, addressing the concern that readers might focus only on their own countries.

We believe these revisions have greatly improved the manuscript and thank you for your insightful suggestions, which have been invaluable in refining our work.

The authors

Some more specific comments:

- Legend to Figure 1: the explanation of SPEI is due to a recommendation of a previous reviewer to include it, but this does not belong to the Figure Legend! Put it into the main text, if you feel it is necessary (however, SPEI is a de facto standard for the quantification of droughts). The Legend should describe the figure itself - here, the very first sentence is sufficient. Please add which window length (number of months) was used for SPEI.

Answer from the authors: We agree. We kept the references in the main text and added the window length for the different seasons."

- the climate description for the individual countries is very wordy, written in a narrative style. It is difficult to follow. Why not produce a table instead with the key quantitative indicators mentioned in the text listed?

Answer from the authors: Thank you for the suggestion. We decided not to create a table, as some explanations are better conveyed through text. However, we have thoroughly revised and shortened the entire passage to improve clarity and readability.

- Is it really necessary to show statistics for the UK first, and then England, Scotland, Wales and Northern Ireland separately afterwards?

Answer from the authors: We initially thought it might be necessary to present the statistics separately for the UK and then for England, Scotland, Wales, and Northern Ireland. However, upon further reflection, we realize that it might not be essential to maintain this separation. We have revised the text to be more cohesive and have significantly shortened and reorganized it to improve readability.

- page 34: the description of drought legacy is written in a textbook style. The problem is that this is largely unrelated to the specific situation in 2018-2022 in the different countries. Presumably, this section was written by a different subgroup of authors.

Answer from the authors: We understand your observation that the description reads in a textbook style and may not fully align with the specific situation in 2018-2022 across the different countries. We have shortened and revised that part and made efforts to adapt the content to better reflect the context. We hope these adjustments address the concerns and improve the relevance of the section.

- Similarly, ch. 6.1 about biophysical effects, is alien to the rest of the paper, mostly referring to the FPS and not directly related to the reported damages and climatic extremes in the countries considered. It seems it could be removed without doing harm to the rest.

Answer from the authors: Section 6.1 is needed to better understand future consequences of climate change to forest cover and biomass stemming from inherent biophysical feedbacks, and adaptations, to the changed climate. As the initial section of the future outlook of the paper it first summarizes some of the climate projections of more compound heat and drought during coming decades. Those trends will lead to a rise in hydrological drought and more damage to forests.

The rest of section 6.1 outlines the consequences of the projected drought on forest cover and the biophysical feedbacks, which either enhance damages to forest or reduce them, thus leading to adaptation to climate change. Results from FPS LUCAS regional climate models highlight the biophysical consequences of climate and land use changes on temperature in various regions and seasons, with potential consequences for forest cover and biomass.

The last part of section 6.1 used to be on dryland mechanisms of ecosystem functioning as an adaptation approach of European forests to a warmer and drier climate. This part has now been removed by repositioning the different mechanisms to appropriate other paragraphs, such as the discussion about biophysical implications of climate in section 6.1 and adaptation processes known from the Southern zone in section 5.

- Ch. 6.2 talks a lot of human health risks and economic impacts of extreme events. While clearly a highly important topic, it is largely unconnected to forest ecosystems per se, so why keeping it in this review?

Answer from the authors: Chapter 6.2. was removed from the manuscript.

- The reviewer did not check the reference list, but it seems to contain formatting errors on one hand, and to be incomplete on the other; e.g. Mohr et al. 2023, cited two times (1.232 and 1259) is absent from the References. Please go through this carefully.

Answer from the authors: We have conducted a thorough review of the references and made numerous corrections based on your feedback (including Mohr et al. 2023)..

The annotated pdf attached to this review contains 31 further comments, mostly small corrections for some errors.

Answer from the authors: The comments have all been accepted or implemented.

Language quality is good to very good, and there are very few typos. Unfortunately, there are a few exact repetitions, requiring further editing; some but not all of them are pointed to in the annotated pdf.

Answer from the authors: We went through the document and deleted or summarized various repetitions.

As it is now, the paper is more like a report for forest damages which have occurred between 2018-2022 in the countries considered. It manages to demonstrate that the diversity of information sources and the lack of a central database collecting the relevant information are severe obstacles to judge the current state of European forest ecosystems. Proper presentation of the information (see above) using more figures and tables and less text would enhance readability and convert it from a report to a review.

Answer from the authors: We tried to adapt it and created two maps of Europe showing the key study results (Figures 2 and 3). Furthermore, we removed the word 'review' from the title.

One aspect covered by a lot of publications is the consequence of the drought and heat for the carbon balance of forests. The theme issue "Impacts of the 2018 severe drought and heatwave in Europe: from site to continental scale" (<https://royalsocietypublishing.org/toc/rstb/2020/375/1810>) is a rich source of information. Two of the articles in that issue are in the Reference list of this paper, but there is more relevant information which could be incorporated into this review, in particular since this also opens up for future projections using ESMs which are as well underrepresented in this review. This last aspect is a mere suggestion to increase the relevance and attractiveness of this work.

Answer from the authors: We agree with the reviewer's comment. Unfortunately, we cannot incorporate this very important aspect into the current study at this stage. As with any study, there are certain limitations. However, we have noted this point in the section 'Damages to forests'