Critical review statement

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Life cycle assessment study of Kuura® textile fibre – critical review statement

Review background

This document forms the critical review statement for the study "Life cycle assessment study of Kuura® textile fibre" as reported by Etteplan in the report v3.0, dated 30th October 2024.

The report was prepared by Etteplan, and was commissioned and funded by Metsä Spring Oy, Metsä Group's innovation company investing in new business opportunities related to wood-based value chains.

The critical review has been performed by an independent expert:

- Michael Sturges – RISE Research Institutes of Sweden – a life cycle (LCA) assessment practitioner with specific experience of environmental studies relating to packaging and forest industry value chains

The reviewer was contracted directly by Metsä Spring and is independent of the LCA study.

Critical review process

The review was performed based on the requirements of ISO14044:2006 Section 6.2, i.e., critical review by an external expert.

The critical review was iterative in nature, being performed concurrently with the LCA study. The reviewer was in regular contact with the LCA study team and provided comments at the following stages of the study:

- First draft report including goal and scope, life cycle inventory and first draft results of the partial carbon footprint/fossil GHG emissions (provided as a pdf document – report draft version 1.0 dated 17th September 2024)
- Second draft report including (in addition to the goal and scope and draft results of the partial carbon footprint/fossil GHG emissions), the results for the full set of impact assessment results and life cycle interpretation (provided as a pdf document – report draft version 2.1 dated 11th October 2024). This draft included amendments and clarifications provided in response to the first round of comments
- Final report (provided as a pdf document – report draft version 3.0 dated 30th October 2024). This draft included amendments and clarifications provided in response to the second round of comments.

At each stage, comments from the critical reviewer were provided using a MS Excel feedback template. The LCA team then responded to the comments and provided its feedback, also describing subsequent changes to the data, models and report, by using the appropriate section of the feedback template. The reviewer considered these responses and changes and was ultimately satisfied that appropriate clarifications and actions have been provided.

Result of the critical review

The critical reviewer finds that the study has been performed in conformance with ISO 14040 and ISO 14044. In addition, the reviewer finds that the partial carbon footprint results have been produced in conformance with ISO14067.

Opinion of the reviewer

The reviewer concludes that the study's level of quality, detail and transparency is appropriate considering the goal and scope. The scientific methods applied and data used are acceptable and justified. The results are presented in a detailed manner, using contribution analysis, and appropriate sensitivity analysis has been applied. Subsequently, the interpretation is appropriate and reflects the results and uncertainties of the study.

As with all LCA studies, there are methodological choices and modelling limitations that need to be understood when interpreting the results. All methodological choices are transparently documented; it is of course important that users of LCA reports take account of such aspects.

In this particular study, as with all LCA studies including systems for forest industry products, the treatment of biogenic carbon requires consideration. In the analysis, a +1/-1 approach has been applied, as required by ISO14067. This means that all flows of carbon (fossil GHG emissions, biogenic GHG emissions and removals, and emissions associated with direct land use change) are transparently reported, including consideration of biogenic carbon contained in the product which will ultimately be released back into the atmosphere if final end-of-life of the fibres is considered (i.e., cradle-to-grave boundaries).

A further limitation is the fact that production of Kuura® fibre has not yet been scaled-up. Therefore, it is acknowledged that the study is based on design values for a full capacity facility. This acknowledgement is appreciated, and it is recommended that the models are revisited in the future if actual operating values deviate notably from design values for any of the inputs and outputs which have greatest influence on the impact assessment results.

Overall, the reviewer considers the results and conclusions to be a sound and fair reflection of the potential environmental impacts of the studied systems representing the production cradle-to-gate impact of of Kuura® fibre. The results are specific to the studied systems. The critical reviewer is aware that the impacts of producing pulp (the raw material for Kuura® fibre, can vary significantly from mill to mill, depending on the mill's energy strategy (degree of self-sufficiency in electricity, fuel source used for generation of heat and power, grid electricity mix considered, etc). Therefore, the results presented and subsequent conclusions drawn are relevant to the specific production scenarios considered. Care should be taken not to apply these conclusions to other production supply chains for similar products.

Critical review sign-off

The reviewer certifies that the statement provided is a fair reflection of their assessment and views of the study "Life cycle assessment study of Kuura® textile fibre" v3.0, dated 30th October 2024

Signed……. **Dated:** 8th November 2024

Michael Sturges, RISE Research Institutes of Sweden