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Final report

Final review statement on report “Comparative LCA assessment of Fontinet filtered tap water vs. Natural sourced water in a PET bottle”

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CHAPTER 1 INTRODUCTION

In this document the draft final report of the study "Comparative LCA assessment of Fontinet filtered tap water vs. Natural sourced water in a PET bottle" is reviewed against the ISO 14040 and 14044 standards. This study compares the environmental impacts of water used by households for drinking purposes delivered by municipal tap water filtered by a Fontinet system versus natural sourced water from single use disposable PET bottles. The external expert review is done considering the comparative character of the LCA study and the aim to use the results for communication purposes. Based on the responses of Futureproofed on all review statement reports, a final review report will be made by VITO.

According to the ISO 14040 and 14044 standards, the critical review process shall ensure that:

- the methods used to carry out the LCA are consistent with the ISO standard;
- the methods used to carry out the LCA are scientifically and technically valid;
- the data used are appropriate and reasonable in relation to the goal of the study;
- the interpretations reflect the limitations identified and the goal of the study;
- the study report is transparent and consistent.

CHAPTER 2 REVIEW STATEMENT ON THE DRAFT FINAL REPORT

2.1. DESCRIPTION OF THE REVIEW PROCEDURE FOLLOWED

Futureproofed provided the draft final report of the study, for each of the stages of the LCA study: goal & scope definition, life cycle inventory assessment, life cycle impact assessment and interpretation. VITO formulated review comments, listed actions to take and prepared additional questions where needed. The recommendations and questions of the VITO reviewer were included in three review statements, which is shown as a whole in Annex A. Futureproofed gave feedback on these review statements to VITO (shown in blue in Annex A) and made an update of the LCA study. Finally, VITO made this final review statement, based on the report on Fontinet filtered tap water received on the 27th of February 2014.

2.2. FINAL REVIEW STATEMENT

Overall, the report of the study "Comparative LCA of Fontinet filtered tap water vs. Natural sourced water in a PET bottle" complies with the ISO 14040 and 14044 standards. The methods used to carry out the LCA are scientifically and technically valid. The assumptions that were made are explained and justified and the limitations of the study are sufficiently described. The (non-confidential) data are reported in a transparent manner. Data quality and sources are in accordance with the goal and scope of the study. The interpretation of the results is consistent with the goal of the study. A number of sensitivity analyses were made to assess the robustness of the results. A rough check of the validity of the results was done, which indicates the calculations are performed in a good manner.

The authors have been very helpful to answer questions and provide data and have taken into account the main comments and recommendations of the reviewer. The main issues that were raised by the reviewer and addressed by Futureproofed are the following:

- a more elaborate description of the function of the system was given;
- a more detailed description of system boundaries completed with graphical representations of both systems was provided;
- data quality has been discussed more thoroughly;
- thorough explanation of graphs and figures in the LCIA was given;
- clear reference to information sources was added.

The reviewer found the overall quality of the methodology and execution of the study appropriate for the goal and scope of the study. The study gives an adequate overview of the environmentally relevant data for the two systems under study. The environmental impact of the water for drinking purposes in both systems is calculated and assessed in a transparent and consistent way.

When communicating the results of the study, one should bear in mind that ISO only recommends the use of results on the midpoint impact category level. Weighted results should not be used for communication purposes. Since in this study, the results are very clear no matter what impact category one wishes to focus on, there should be no problem in clearly communicating the results on that level.

REFERENCES

ISO 14040, 'Environmental management – Life cycle assessment – Principles and framework', (2006).
ISO 14044, 'Environmental management – Life cycle assessment – Requirements and guidelines', (2006).

ANNEX A: OVERVIEW OF ALL REVIEW STATEMENTS

GOAL AND SCOPE DEFINITION

GENERAL

Overall, the essential elements are present in the chapter on goal and scope. However, we would suggest to follow the ISO 14040 and 14044 standards for the study and also use their framework for reporting on the study results.
Added to the introduction on LCA methodology and using the structure as is used in the ISO 14040 and 14044.

GOAL DEFINITION

According to the ISO standards 14040 and 14044, LCA studies shall include a definition of the **goal** of the study. These items shall be unambiguously stated in the goal definition:

- the intended application; was added
- the reasons for carrying out the study; was added
- the intended audience; mentioned under 'intended use of results': "communication on European Markets"
- whether the results are intended to be used in comparative assertions intended to be disclosed to the public. Mentioned

These items can be retrieved from the chapter *Goal and reason*. However, it would be preferable if they would be clearly defined and named according to the ISO terminology. OK

Goal

The goal is well described. An important remark which is missing from the text, however, is that tap water 'as such' will always have a lower impact than filtered tap water. This should clearly be mentioned, and some additional explanation on why people would use the filter should be added. Added

Context

It is good that the context is described in the text. However, some of the information seems quite unnecessary, such as the amounts of water consumed by Dutchmen. The numbers draw our attention: Dutchmen only consume 18 litres of tap water while Belgians consume 124 litre? That is a very significant difference. If it is relevant, it should be explained.

Intended use of results – purpose

The text explicitly mentions the purpose to communicate the outcome of the comparative LCA study on European markets. If this is intended, we definitely recommend to use and explicitly mention the ISO methodology for the elaboration of the study. The external review is very crucial in this context as well. ISO 14040 and 14044 even recommend to go further than a review by an external expert: it is recommended to perform a review through an expert panel. Added

Audience

Although the text refers to the 'European markets', a more specific description of the audience would improve the text. Was specified more: made clear that it is intended to be communicated to households, the potential clients of PrimeWater.

SCOPE DEFINITION

According to ISO 14040 and ISO 14044 within the definition of the **scope** of the LCA the following items should be addressed and elaborated:

- product systems studied;
- functions of the systems;
- functional unit;
- system boundaries;
- allocation procedures
- impact categories selected and methodology of impact assessment, and subsequent interpretation to be used;
- data requirements;
- assumptions;
- value choices and optional elements;
- limitations;
- initial data quality requirements;
- type of critical review;
- type and format of the final report.

Product systems studied

The report gives a clear overview of the systems (Fontinet filter system and PET bottled water system) under study. OK

Functions of the systems and functional unit

The function of the Fontinet filter and tap water are not clearly described. A description in a separate paragraph of the function that either system fulfils is suggested. Added

Functional unit

ISO 14040 and 14044 describe the functional unit as follows

> 'The functional unit defines the quantification of the identified functions (performance characteristics) of the product. The primary purpose of a functional unit is to provide a reference to which the inputs and outputs are related. This reference is necessary to ensure comparability of LCA results. Comparability of LCA results is particularly critical when different systems are being assessed, to ensure that such comparisons are made on a common basis.
> It is important to determine the reference flow in each product system, in order to fulfil the intended function, i.e. the amount of products needed to fulfil the function.'

The functional unit as it is defined now does not live up to the requirements as stated in ISO: it does not ensure that the comparison is made on a common basis. We recommend to slightly rephrase the functional unit, including the function both systems should fulfil. For example: 'making available' of 1.5 litres of drinkable water to households. Changed

System boundaries

It is not clear whether infrastructure is taken into account in the system boundaries. It is recommended to describe this. Description added

With regard to packaging, it is stated that it would be included 'if significant to the end result'. This doesn't seem logic since that criterion can only be determined once included in the study. Therefore it is recommended to take the packaging into account. When data are not readily

available, secondary data can be used in order to be complete. At least a screening of the relevance of packaging in the results is recommended. OK, taken into account

It is unclear why reversed osmoses water is excluded. It is recommended to add some explanation on why this is decided. Explanation was added

The report lacks information on cut-off criteria. According to ISO 14044, "the cut-off criteria for initial inclusion of inputs and outputs and the assumptions on which the cut-off criteria are established shall be clearly described. The effect of the cut-off criteria selected on the outcome of the study shall also be assessed and described in the final report." Additional information was added

When describing the system boundaries, a process tree for both systems is helpful. It is recommended to include a process tree to visualise the life cycle and system boundaries. OK, process trees were added.

Allocation procedures

It is unclear how the end-of-life will be included in the study. Which methodological approach will be used for modelling recycling for example: the recycled content approach or the end of life recycling approach? It is recommended to specify this. Since this is a relevant issue for the PET-bottles. OK, more explanation was added.

The text mentions the fact that the 4000 litre in the lifetime of the filter is not all necessarily consumed for drinking purposes. This is indeed correct, however, the statement that 'we need to take in consideration that the environmental impact of the filtered water cannot be allocated to all the household drinking water purpose' seems strange. The aim of the filter, or the function, is to provide a higher quality water for drinking purposes, at least to our understanding. Therefore, we recommend that the entire impact related to the filter should be allocated to the drinking water amount consumed, whether this is 4000 litre or only 800 litre. The fact that variations of this sort will be studied in sensitivity analyses is considered a good approach.

On page 10 of the report, under Allocation Procedures for the Fontinet Filter, there is an error. The text now states "the average Belgian consumes 5 liters of tap water for food and drinking purposes **per year**" → this should be changed to "**per day**" I suppose? Correct, the text was changed.

Impact assessment methodology

Recommended is to include information on the impact assessment method that will be used. Best is to include a version number as well, as some adaptations to a method are made every year.
It is not clearly mentioned which method is used (midpoint or endpoint or both) and why. Please add this clearly motivated to the text.
"For each product system, a condensed impact analysis will be conducted for the 3 most important impact categories."

- ➔ Please explain what you mean with a condensed impact analysis
- ➔ On what basis will the 3 most important impact categories be selected? Based on the normalized profiles? Or…?

For the comparison of the two systems, please add more information on whether this will be done for all impact categories or not, etc.

- ➔ OK, was added

Please make sure to mention the references to the documents where you got the description of the methodology etc. from. OK, added

Data quality requirements
To be completed in first draft.
A number of data quality requirements have been discussed in the report. The time-related and geographical coverage have not been included in these. Although not strictly mandatory according to ISO 14044 for all LCA, it is recommended for comparative assertions to be disclosed to the public, that the technology coverage, precision, completeness and representativeness are specified too.

There is a reference in the text to 'Simapro' as a source of data. However, this is actually a reference to a software. We recommend to refer to EcoInvent (we suppose this is meant) or any other source of secondary data, including a reference to the version when relevant.

A paragraph was added on data requirements, explaining the issues mentioned above.

Assumptions
To be completed in first draft.
It is mentioned now that all assumptions will be clearly described in the report, in the Life Cycle Inventory part. This is ok, but in order to make sure these are thoroughly explained, more explanation will be necessary under the LCI chapter. (see next chapter of the review document) → OK, added

LIFE CYCLE INVENTORY
GENERAL FEEDBACK

All data which are relevant for the life cycle phases of the Fontinet filter and filter housing are provided by Primewater. This is very good and we therefore suggest to stress this a bit more, for example by mentioning in the table every time information is provided by Primewater.

In the table, please make sure that English is consistently used: now, some processes/materials are mentioned in Dutch. Adjusted where possible. If 'not' possible to translate, it is now indicated by using "…".

For some of the data, it is difficult to understand what is meant in the description. This might be a disadvantage of using a table and therefore trying to be brief in explanation. However, a reader of the study should be able to reconstruct what you have done. Therefore, all assumptions, data sources, … should be made explicit as to facilitate that reconstruction. Either a different format than a table could be chosen or more explanation could be added in the tables. → OK, more explanation was added

The review of the LCI report will be shown in a table. Included are the process/material concerned, the specific information to which the comment applies and the review comment itself. The comments in the table were taken into account into the report/study.

DATA ON FONTINET FILTERED TAP WATER

Process/Material	Element of review	Review comment
Incoming transport for all		Make a clearer link between

products		the incoming transport line and the product to which it applies (visual). More explanation on the 'comments' is needed: you add a calculation as comment without any explanation on where data come from. Please mention at least whether transportation distances are provided by Primewater or whether they are assumptions.
Polyethersulfone Polyvinylpyrolidone	To be further examined	Suggestion: check chemical composition, production process, … and select an approximation → clearly mention that it is a proxy!
Glycerin	Glycering, from epichlorohydrin, at plant, RER	Please, explain why this record for Glycerine is chosen.
Natrium-hypochloriet	Sodium hypochlorite, without water, in 15% solution state	Please mention the solution state of the material as well and check consistency with record (maybe you did, but in that case please mention this explicitly)
MF 8 buis Extrusion MF 8 buis Kraagpakking Eindkap Dichting	Name of process/material	Please mention here from what material each of the components is made. This will make the link with the data record selected, which is now missing.
PVC housing Connector	Not taken into account: transport, energy and infrastructure	Infrastructure not included: not consistent with the other life cycle phases. Please be consistent, either infrastructure included everywhere, or infrastructure excluded everywhere.
Infrastructure (building hall)	Lifespan and allocation in comment	It is still unclear what is described in the comment. More explanation is needed to make it possible for someone to reconstruct. Also, mention clearly all the sources of the data used in the 'calculations': now it is impossible to see where some of the numbers come from.
EoL membranes, cartridges	Waste scenario/NL, Curb side	I don't immediately

	collection, Incineration, landfill	understand the choice in record. First of all, this record is not representative for BE, while a lot of data for waste treatment Flanders/BE are available. Also, all waste streams are included behind this record: was there an adjustment of the record or was it used as such? The record used was provided for review
Transport to client	500 liter per year (drinkrate)	This is under the baseline scenario? Don't forget the change all data in which this number is taken into account, when calculating the system variant.
EoL		Could you please provide us with the adjusted record (excel export)? It is difficult to understand what you have done now.

DATA ON PET BOTTLED WATER

Process/material	Element of review	Review comment
Label	Assumed to be less than 1% of the system and thus excluded from this study	Please mention clearly whether this statement comes from the study by the University of Michigan or Futureproofed. Please mention at least one reference of such Comparative LCA of bottled vs tap water system.
EoL/Recycling PET bottles E	Quantity 48%/52%	Source for this information? If possible, please use specific information for BE/IT/… depending on the scenario you are calculating. In this way you can also investigate the importance of the EoL/Recycling rate. For example: annual report Fostplus.
EoL/Recycling PET bottles E	Records selected	It is unclear why the 'Waste

		scenario/NL, curb side collection' record is selected. Behind this record all waste streams are included while you only should look at PET in this case. It is unclear which record is selected for the recycling of PET. Could you please explain in more detail.
Recycling PET	End-of-life recycling approach	Please provide some more explanation on the approach and why you chose it. Also, link this to the selection of records.
EoL		Could you please provide us with the adjusted record (excel export)? It is difficult to understand what you have done now.

SYSTEM VARIATIONS

It is mentioned that the assumption that one filter can generate 4.000 liter drinking water should be analysed. Again, we would like to mention, as we did in the review of the goal & scope report, that the assumption that impacts should be allocated to the filter in relation to the amount of drinking water is used (depending on use of the valve) is incorrect. All impacts should be allocated to the Fontinet filter at any time. Otherwise, using the filter in a wrong way (not switch between filtered and non-filtered water) would in fact benefit the filter instead of increasing the burden related to it. OK, taken into account.

The analysis of country of origin of the mineral water is indicated as a source for different scenarios. In order to make a correct comparison between the different scenarios and origins etcetera, all data which are related to region specificities should be adjusted depending on the scenario calculated. For example the end-of-life should be adjusted depending on the recycling/disposal rate in each country. OK, taken into account.

LIFE CYCLE IMPACT ASSESSMENT & INTERPRETATION

The calculation of the results could not be checked in this review, due to the limited time availability. The focus of the review has therefore been on the following aspects:

- Is the method of impact assessment in accordance with the ISO 14040 and 14044 guidelines?
- Have the limitations ISO prescribes for statements towards the general public been taken into account?
- Which procedure is used for quality analysis and evaluation of the results?
- …

The method used for the Life Cycle Impact Assessment of each system is the ReCiPe midpoint method. Results are both presented as absolute characterisation values, in a visual graph of the characterisation as well as a normalised environmental profile. This is clearly presented. OK
However, in the graphs (for example figure 5 and 6), please use **very clear 'labels'** for the different life cycle stages: clearly indicate if it concerns a production step (e.g. for tap water, Fontinet filter and filter housing) and if inputs to that process are integrated. Now it seems as if the 'extraction of input materials' is excluded. Labels not changed, but always referred to figure 2 or 3 (process trees).
Also, please try to make sure you are **consistent in the labels you use** in different graphs. OK – verified, but due to difference in lifecycles between Fontinet and PET it is not possible to use the same labels.
Make sure as well to always mention the **units** next to the axes in graphs (when not expressed in %s): relevant for:
• figures 6, 11, 20, 21 Not relevant
• figures 7, 8, 9 , 12, 13, 14, 16, 17, OK - added

Fontinet filtered tap water
In the interpretation of the graphs, please mention and take into account the following ISO 14040/ISO 14044 definition of relevance of contributions:

- contribution >50%: significant influence, most important
- 25% < contribution < 50%: relevant influence, very important
- 10% < contribution < 25%: some influence, fairly important
- 2,5% < contribution < 10%: minor influence, little importance
- contribution < 2,5%: negligible influence, not important

OK – added in intro LCIA

Please check if you used these categories correctly in the description of the graphs and results.
OK

Please make sure that for each graph, you describe what is presented. It is otherwise very difficult for readers to understand the analysis that follows. For example for figure 7/8/9, first describe what is shown in the graph and then start analysing that further. OK

PET bottled water
Figure 10 is missing some explanation. The graph is shown, but is not explained anywhere. Although the principle of the graph is the same as in the previous section on the Fontinet filter water, please make sure to give a clear explanation of what is shown as well as an analysis of the results. OK

In the paragraph on figure 11, there is still a 'copy-paste' error, referring to 'the filtered Fontinet water'. OK - changed

When describing the negative impact of end-of-life, please also explain where this comes from. You mention for example in the explanation with figure 12, the recycling rate of PET as reason for this, however it is in fact the fact that you decrease the virgin material production with this that creates the benefits. OK - correct

Comparison of both profiles

ISO tries to discourage the use of weighting where possible. In the analysis, you do work with weighting, however you show the results for the end point characterisation, then the results per endpoint category and only then you show the single score. This is good since this makes it possible for readers to trace the single score back to the different impact categories. OK
However, if you want to communicate the results of this study, this should be done using the separate environmental impacts. In this case, this should not be a problem: there is an absolute picture possible, being that the Fontinet filter scores better for each environmental impact category. Communication will mainly be built upon the results displayed in table 4.

Figure 15 is quite confusing: the description seems logic, however the graph shows something different so it seems. Maybe it is better to indeed set the highest impact at 100% and for each impact category show the two systems in bars *next to each other*. Now it seems as if the two systems together make up 100%. OK – graph was adjusted

On page 32, second paragraph, a part of the sentence is missing. Please complete. OK - completed

The 'top five process contribution per product life cycle' could use some more explanation. Why do you do this? What do the tables show? For example, what does 'total contribution end-of-life' mean in the table? Now no explanation is given for both of the tables. Please add some explanation or remove the tables: tables alone are not an added value to a report, the analysis of the information in the table is. Table top five for PET bottle removed. Table 6 is kept with additional explanation.

Uncertainty & sensitivity analysis
Please explain what is shown on the graphs more. It is not clear to a reader how they should read the different graphs and what the meaning and reasoning behind them is. OK – explanation added

Comparing Endpoint Single Scoring
Please add explanation, because now no text is provided.
Why do you make this comparison? What is the added value of this compared to all previous information? What are the conclusions you draw from each graph as well as from the comparison of both graphs? OK – explanation added