



## Critical review report

# Life Cycle Assessment on the mobility service from LIME electric scooters & electric bikes

April 26th, 2023

## 1 INTRODUCTION

---

### 1.1 CONTEXT

LIME has requested EVEA to conduct the critical review (CR) of a non-comparative Life Cycle Assessment (LCA) report prepared by ANTHESIS GROUP LLC concerning electric scooters & electric bikes for Paris context.

The document is titled: *Life Cycle Assessment on the mobility service from LIME electric scooters & electric bikes*.

The report prepared by: *Brian Bunte*, and approved by: *Caroline Gaudreault* Date: *April 24, 2023*.

Jeanne Serre (EVEA) has reviewed the report and prepared the present report. Conclusion from this CR report is dedicated to be integrated as a whole within the final report of ANTHESIS GROUP LLC for LIME.

### 1.2 REVIEWER

The report was reviewed by Jeanne Serre, as an independent expert from EVEA. As prescribed by §5 of ISO 14071, here is her resume: Jeanne Serre leads an environmental assessment expertise team at EVEA since the summer of 2022. With a degree in agricultural engineering, she previously worked in Veolia's R&D department for 16 years as an expert in Life Cycle Assessment & Climate. As part of her missions, Jeanne has the opportunity to:

- Carry out eco-design & LCA studies
- Participate in critical reviews of LCA studies as a member of the LCA expert panel
- Co-build environmental and socio-economic assessment methodologies and tools
- Contribute to the development of ISO standards (LCA, Climate, Environmental economics).
- Carry out environmental communication

### 1.3 CRITICAL REVIEW GUIDELINES

The critical review is based on the following standards:

- NF EN ISO 14040 :2006
- NF EN ISO 14044 :2006
- ISO/TS 14071 :2014



## 2 CRITICAL REVIEW PROCESS

---

### 2.1 PLANNING & ORGANISATION

EVEA has worked according to the requirements of ISO 14040:2006 and 14044:2006 concerning CR. The CR was performed once the study and report were finished. After the study was finalized, ANTHESIS GROUP LLC sent the report to EVEA that edited the comments on Excel grid based on this initial report.

The analysis of individual datasets and the review of the LCA models used to calculate the results were outside the scope of this review. It is important to note that the review committee only had access to the final report; no modeling or calculation files or LCA project in software was provided.

The critical review followed the iterative process described below:

- 1- February 15th, 2023 : EVEA received the report from ANTHESIS GROUP LLC
- 2- March 21th, 2023: EVEA sent the comments to ANTHESIS GROUP LLC from the first iteration of the report, in an Excel grid (v0). ANTHESIS GROUP LLC treated the comments and work on a new version of report
- 3- March 24th, 2023: EVEA received a new version of the study report from ANTHESIS GROUP LLC and the answered commentary grid tour 1
- 4- March 31th, 2023 : EVEA sent a second version of the Excel grid with additional precisions and suggestions on comments, and additional few new comments. ANTHESIS GROUP LLC treated the comments and work on a new version of report
- 5- April 6th, 2023 : EVEA received from ANTHESIS GROUP LLC a new version of the report and the answered commentary grid tour 2
- 6- April 21st, 2023 : EVEA sent the last version of the Excel grid with final conclusions & analysis about the taking into account of the comments, and precise in email the last minor modifications (font size)
- 7- April 21st, 2023 : EVEA received the final version of the report.
- 8- April 28th, 2023 : EVEA validates the final report, send this present review statement and its Excel annex titled Peer review\_Comments to LIME\_JSE\_2023\_BB Responses\_1Round3

The final report is the basis for this critical review report. The LCA study is a non-comparative assertion intended to be communicated to the customers and stakeholders.

For such studies, ISO 14040 standard requests the report to be reviewed by a single independent expert.

As the study discusses two products, namely e-scooters and bikes, within the same report, EVEA has informed ANTHESIS GROUP LLC to make sure that no comparisons are made between them. Any such comparison would require a review by a panel of three experts to ensure compliance with ISO 14040 standards. ANTHESIS GROUP LLC has explicitly stated this requirement in the report, and as a result, only this single review is necessary.

51 written comments were registered and consolidated in Excel grid.

ANTHESIS GROUP LLC responded to all of the comments at the end of the second tour, and addressed the majority of them in the final report. The actual implementation of the changes was verified by the CR expert against the final LCA report. In particular, the CR process lead to :

- Adding precision and information about the scope, the exclusion, hypothesis, origin of data and products descriptions
- Clarifying excluded stages from system boundaries, the choice of methodology
- Improving the presentation of results and limitations to integrate in further iterations.



The present CR report is delivered to ANTHESIS GROUP LLC and LIME. EVEA cannot be held responsible of the use of its work by any third party. The conclusions of EVEA cover the final report from ANTHESIS GROUP LLC only, titled : Life Cycle Assessment on the mobility service from LIME electric scooters & electric bikes.

EVEA conclusions have been set given the current state of the art and the information which has been received. These conclusions could have been different in a different context.

## 2.2 DOCUMENTATION

In addition to the critical review information, only general comments and opinions appear in this document. The file of specific comments (page by page, line by line) which constitutes the major part of the critical review is established in an Excel .xlsx file attached to this document.

This file entitled " Peer review\_Comments to LIME\_JSE\_2023\_BB Responses\_1Round3 " is inseparable from this document.

## 3 CONCLUSION OF THE REVIEW PERFORMED ON THE LCA STUDY AND REPORT

---

According to ISO 14044, the critical review process was conducted in order to check whether:

- the methods used to carry out the LCA are consistent with ISO 14044 requirements,
- 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, and
- the study report is transparent and consistent.

The data inventory is comprehensive and results are credible within the scope of the study.

The foreground assumptions align with the latest practices employed by Lime's operational and research teams. However, to enhance the credibility of the assumptions and data, it would have been beneficial to include additional external references. The background datasets have been thoroughly documented, and any known limitations have been mentioned.

The interpretation of results is done and presented and are in accordance with the goal of the study. The evaluation, interpretation and conclusions are valid in the context of the study.

Some strong sensitive effects are analyzed and documented by sensitivity analysis, and those that were not performed although they may have potential important effects are detailed in the limitations part.

The limitations to the conclusion of that LCA work are detailed in a dedicated section. The limitations regarding the quality and consistency of the background and foreground data and assumptions are detailed, and also the relevance of the impact assessment method used to perform the analysis in the context of Paris. These last may be done in a new iteration of the study (such as the maintenance vehicle manufacturing, the LCIA method).

The LCA is submitted to an external critical review by a single reviewer. As stated in the report, no comparison should be made between the two products, despite them being presented in the same report.



The report is transparent and consistent, its structure reflects the ISO standard. The reporting is in accordance with the objectives of the study, the final results of all impact categories are plausible and conclusive, since it would have been interesting to reinforce the analysis based on external studies about mobility services from electric scooters or bikes.

In view of the final LCA report, the CR expert considers that the conclusions adequately and credibly meet the objectives mentioned in the context mentioned and for the objective mentioned, and that they have been drawn up in accordance with the standards mentioned. These conclusions are in line with the limitations mentioned in the LCA report and with the elements provided in this CR report. The final LCA report is thus in line with the general requirements of ISO 14044 concerning LCA reports communicated to third parties.

The final conclusions of the report have to be used in the strict scope of the study.

## 4 CRITICAL REVIEW ANALYSIS

### Questions & answers from ISO 14044 : 2006 & ISO 14040 : 2006

Question	CR answer	Comment
Are the methods used to perform the LCA <u>consistent</u> with ISO 14040:2006 and ISO 14044:2006?	Yes	LCA meets the methodology requirements.  LCA study includes presentation of the scope, objectives, methodology, assumptions, and limitations.  ... although some assumptions or results are not presented in a way that is easy to understand and that allows for comparisons with other products or systems.
Are the methods used to conduct the LCA <u>scientifically</u> and <u>technically</u> valid ?	Yes	Due to confidentiality and lack of specific data from suppliers from Lime, the model and data are not systematically explicit. The reviewer did not have access to the detailed excel files and Simapro modeling.  The choice of impact assessment methods is understandable in order to permit that Lime can track their progress with prior LCAs which were done using TRACI due to focus on a US market. It is not a strong limitation however, for the LCIA method, it would have been recommended to use EF method for a sensitivity analysis.
Are the data used <u>appropriate</u> in relation to the objectives of the study?	Yes	The LCA meets the data requirements.  Data are presented, it would have been more comfortable for the reader to have more justifications or public sources to increase the level of confidence of the primary data.  The version of used ecoinvent database is not the most recent. It is not a strong limitation but to keep in mind for further iterations, since the most recent databases corrected some uncertainties that were highlighted in former versions (metals for instance).



Are the interpretations <u>valid</u> in the scope of the limitations of the study ?	Yes	<p>The LCA meets the interpretation requirements.</p> <p>Interpretation is detailed enough to provide some key elements about the impacts of products of Lime.</p> <p>It would have been instructive to position the results against other relevant similar studies, benchmarks or standards in order to reinforce the interpretation.</p> <p>An explanation of the findings, including the magnitude and significance of the impacts identified, and the uncertainties and limitations of the study is done.</p> <p>Sensitivity analysis proposes an interesting discussion of the significant issues and assumptions that could affect the results. Regarding the high importance of the choice of the methodology for benefit from recycling accounting, it would be interesting to disaggregate the benefits in the interpretation part.</p>
Is the study report <u>transparent</u> and <u>consistent</u> ?	Yes	<p>The LCA meet the communication requirements.</p> <p>The communication will have to be tailored to the intended audience, whether it is policymakers and Lime's operations teams.</p> <p>No comparison will have to be done between the 2 products, since it was not the intention of the study.</p>

## 5 CONCLUSION

After a detailed analysis, EVEA finds that the report complies with the requirements of ISO 14040-44 for LCAs and ISO 14071 for environmental product declarations. The different stages of the LCA were followed in accordance with the requirements of ISO 14040-44, including the definition of the study's purpose and scope, the inventory of the life cycle, the analysis of impacts, and the interpretation of results.

The reviewer found that the study report is globally transparent, consistent, and technically valid. The discussion of the results covers the relevant aspects in accordance with the goal of the study, and the conclusions are well founded on the outcome of the study and in accordance with the defined goal.

With regard to the requirements of ISO 14071, we can confirm that the report complies with the requirements of ISO 14040-44 for LCA and ISO 14071 for product environmental communication. The different stages of LCA were followed in accordance with the requirements of ISO 14040-44, including the definition of the study's goal and scope, the creation of the life cycle inventory, impact assessment, and interpretation of results. The report contains the necessary information to enable transparent and comprehensible environmental communication. The assumptions and limitations of the study are clearly stated.

In conclusion, EVEA recommend that the limitations identified in this critical review be considered for future studies on the sustainability of electric scooters and electric assist bikes / ebikes, especially with regard to the formulation of assumptions, data quality and sources of information, integration of excluded processes in this iteration (maintenance vehicle manufacturing, cables, packaging, material losses), and impact assessment methodology. We also recommend further detailing the interpretation section, especially for usage step, to enable a more precise assessment of the sustainability of these products throughout their life cycle.