



# Workshop II on Ex-Ante Life Cycle Assessment (LCA) of Emerging Technologies – Scenario development

Friday, April 22<sup>nd</sup> 2022, 10:00 CET

## Motivation:

“Scientists try to avoid the word prediction because it implies too much certainty in a high complex world. I can’t predict what I will have for dinner next Thursday [...]. But I can make reasonable dinner-based scenarios, given the food I like and what I am capable of cooking (there is a high probability of beans on toast).”

*Paul Behrens*

*The best of times, the worst of times*

*– Futures from the frontiers of climate science*

For new technologies with low technology levels, there are many possible future design options. In the last workshop (see recording [here](#)) we learned about the Collingridge dilemma and how it relates to ex-ante LCA. One aspect of this dilemma is that changes made early in the development process have a significant impact on overall environmental performance. But how can we examine the future with its many possibilities?

The second workshop is also initiated by the Institute of Environmental Sciences at Leiden University as part of the [PROGENY Horizon 2020 FET-OPEN](#) project (find project webpage [here](#)). With this workshop, we not only want to disseminate and communicate our research further, but also raise awareness on the state of the art in methods and frameworks for assessing environmental impacts at early stages of development.

In this session, the audience will learn how scenarios are developed for ex-ante LCA. With this background knowledge, we want to initiate a discussion with the audience on how this method can be of help to other projects, for example, and what else is needed to improve the assessment of the environmental impacts of new technologies.

## Summary:

Life cycle assessment (LCA) is a method to quantify the environmental burdens connected to a product or a service over its whole life cycle. The method is supported by existing ISO-standards and

can be found applied to many technologies. However, capturing all of these environmental flows is very difficult and this powerful tool is not without its limitations. Especially when it comes to assessing new technologies at low technological readiness levels we face the problem that data availability is very low but on the other hand design choices made early in the process have a significant effect on the overall environmental performance. The LCA community increasingly recognizes these challenges and started to systematically address them.

In the second workshop we start with a short recap of the previous session on the challenges of defining functional units in ex-ante LCA. Then we mainly focus on scenario development to tackle the uncertainty of the future with its many possibilities. A comprehensive prospective LCA scenario development method will be presented followed by an live introduction to the open source [LCA software Activity Browser](#) showcasing the tool itself and how easy it is to integrate scenarios in the calculation (see Figure 1).



Figure 1. A 4-step procedure for scenario development (A) and LCA software Activity Browser (B).

The final presentation will focus on how scenario development was used in the PROGENY Horizon 2020 FET-OPEN project so far. We will conclude the workshop with a Q and A session where the audience can ask questions, give remarks and valuable insights on how this method can potentially be applied to other sustainability challenges they face.

## Agenda:

I. Quick recap of workshop I and general introduction	10:00-10:10
II. Scenario methodology: General introduction	10:10-10:30
	Q&A
III. Scenario methodology: LCA software and implementation	10:35-11:55
	Q&A
IV. EU funded projects and ex ante LCA: Expanding the scenario methodology to investigate future cleanroom locations	11:00-11:15
	Q&A
V. End	11:30

## Responsible institute and researchers involved:

The **Institute of Environmental Sciences** (CML; nl. Centrum voor Milieuwetenschappen) is one of the world's leading institutes for environmental sustainability with a focus on Conservation Biology and Industrial Ecology. The CML is part of Leiden University and is based in the Netherlands.

**Dr. Bernhard Steubing** has been Assistant Professor of Industrial Ecology since 2017. He has worked on a number of topics related to sustainability assessments in the context of energy generation, electric mobility, built environment, etc. Bernhard is actively working on the development of future background scenarios for various sectors to be used in prospective LCA as well as the implementation of advanced modeling approaches in the open source [LCA software Activity Browser](#), a project that he started during his time at ETH Zurich.

**Dr. Stefano Cucurachi** has been Associate Professor of Industrial Ecology since 2021. He has extensive experience in the development of methods in life cycle assessment (LCA) and on methodological improvements, in particular in the field of uncertainty analysis and in the area of quantification of the uncertainty sources related to the results of LCA studies. His research includes the application of LCA to assess the sustainability potential emergent technologies, also known as ex-ante LCA.

**Dr.-Ing. Flora Siebler** is a Postdoctoral Fellow and has joined the Industrial Ecology department in 2020. She is a biochemical engineer by training and her expertise is in process scale-up and the development of modelling tools to determine optimal operating parameters. In her current research project, she is developing methods to assess the sustainability of innovative early-stage proto-opto-electromechanical systems to help technology developers find the most promising design option from a sustainability perspective.

## Acknowledgement:

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The presenters would like to express their gratitude to Indraneel Sen from Wasabi Innovations EOOD for organizing the workshop and Bernhard Steubing also from the Institute of Environmental Science for sharing his knowledge about scenario development.

## Details for broadcasting:

This workshop will be broadcasted through Teams Webinar on Friday, April 22<sup>nd</sup> 2022, 10:00 CET. The registration link will be made available on our project website: <https://progeny-project.eu/>

The recorded lectures and discussions will be available for viewing and comments through our project [YouTube Channel](#).