Up-scaling methods used in ex-ante life cycle assessment of emerging technologies – a review

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1. Introduction

Ex-ante Life Cycle Assessment (LCA) assesses scenarios of possible future commercial scale implementations of novel technologies that are currently in an early stage of technology development (at laboratory/pilot scale). For these new technologies system specifications and process data of their future implementation are still highly uncertain. Up-scaling methods are often applied to explore possible future implementation and/or estimate process data.

2. Research questions

- Which up-scaling methods have already been applied in ex-ante LCA?
- What are the key characteristics, application domains, assumptions and data needs of different up-scaling methods?
- Can up-scaling methods be classified in certain classes (based on application domains, data needs,…)?
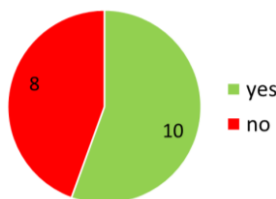
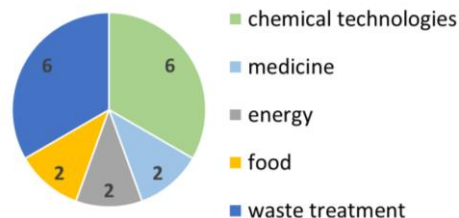## 3. Methods

Literature review:

- The literature search was done using Web of Science.
- The years covered were from 1990 to 2019.
- Different variations of the term "ex-ante LCA" were used as keywords for the literature search.
- 206 publications were found. 18 articles were selected for further review.

4. Selected preliminary results

**Did a study mention an up-scaling method explicitly?**

8
10
■ yes
■ no

What are the application domains of up-scaling methods?

6
6
2
2
2

■ chemical technologies
■ medicine
■ energy
■ food
■ waste treatment

5. Discussion

1. Your experience in up-scaling in ex-ante LCA?

2. Your opinion on how up-scaling methods could be classified?

Data estimation methods

Up-scaling methods

The figure was adapted from Parvatker and Eckelman (2018)
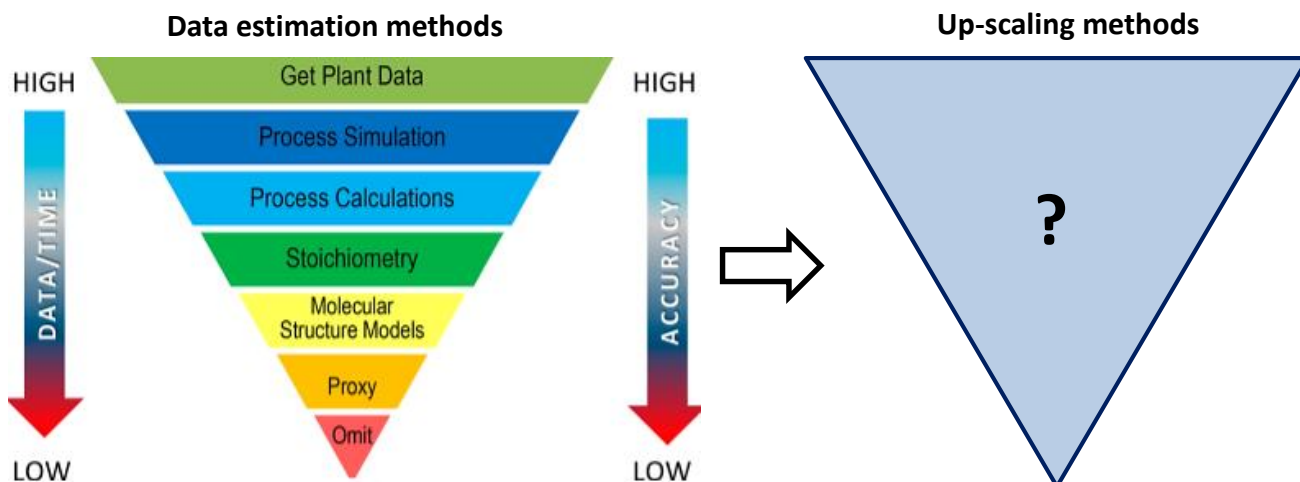
6. References

Parvatker, A. G., & Eckelman, M. J. (2018). Comparative evaluation of chemical life cycle inventory generation methods and implications for life cycle assessment results. ACS Sustainable Chemistry & Engineering, 7(1), 350-367.

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