

## Popular science summary of the PhD thesis

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Title of the PhD thesis	Process-oriented life cycle assessment modelling of (bio)energy technologies
PhD school/Department	DTU Environment

### Science summary

(Bio)energy technologies as a means of resource conversion into energy play a relevant role in a defossilized society, with national and global targets promoting sustainability, material recirculation and valorization, mitigation of emissions, losses and resource competition within different sectors. From a technology level, the focus is on conversion processes with the aim of providing better insight, performing technology in terms of emissions, consumables, production, affordability, and stability. From a system level, the focus is on integrated technologies and assessing the synergy of performing together. Life cycle assessment (LCA) has been applied as decision support to quantification of environmental consequences of introducing (bio)energy technologies in the energy sector. This PhD project introduced a process-oriented life-cycle assessment modelling framework allowing quantitative and parametrized physical chemical input-output relationships, in contrast to black-box processes. The process-oriented modelling approach allows to link the material input characteristics to the expected outputs. The framework was applied on a range of case-studies involving different (bio)energy technologies to model in an advanced way different (bio)energy technologies: i) biorefinery, ii) anaerobic digestion, iii) gasification; iv) C-to-CH<sub>4</sub> upgrading. The unit-processes of each of these technologies were implemented in the LCA software tool, EASETECH. Thereby providing significantly more advanced modelling features/capabilities. Finally, providing recommendations/guidelines of the application of the process-oriented modelling framework to the users of the tool.

Please email the summary to the PhD secretary at the department