Background and context
Production of biopolymers is expected to increase in the future, due to the growing awareness of consumers and companies to reduce the dependency on fossil resources and the continuous developments in the field. It is still uncertain, however, whether replacing fossil-based plastics with bioplastics is a sound decision from the climate perspective. To answer this question, further developments in the current methodology for assessing climate change impacts are needed.

In this PhD project, new climate change metrics will be developed and then applied in practice in environmental sustainability assessment of bioplastics.

Main objectives
Development of the new climate change methodology will involve:
• Accounting for the impacts of exceeding multiple critical greenhouse-gas emission levels associated with climatic tipping points
• Quantifying the damage on ecosystems caused if the use of bioplastics affects the crossing of climatic tipping points
• Accounting for the impacts induced by changes in surface albedo during biomass feedstock farming for bioplastics production

Finally, the developed method will be tested in a comprehensive life cycle assessment case study on bio-packaging material.

Expected outcome
This work is expected to operationalize the inclusion of multiple climate tipping points in LCA and provide an improved indicator for assessing impacts from GHG emissions, with respect to future abrupt changes in the climate system. When applied in practice, the methodology will provide better understanding of environmental impacts of bio-packaging, especially regarding climate change mitigation potential of bioplastics and management of feedstock supply for bioplastics production.

New value in relation to existing knowledge
The project will improve the climate change LCIA methodology in general and, thus, environmental sustainability assessment of bioplastics.

Contact:
Serena Fabbri, PhD student
Bygningstorvet, building 116B, room 102A
DK-2800 Kgs. Lyngby
+ 45 45 25 65 02
serf@dtu.dk
www.man.dtu.dk

Supervisor/co-supervisor:
Mikolaj Owsianiak, DTU management Engineering
Michael Z. Hauschild, DTU Management Engineering

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