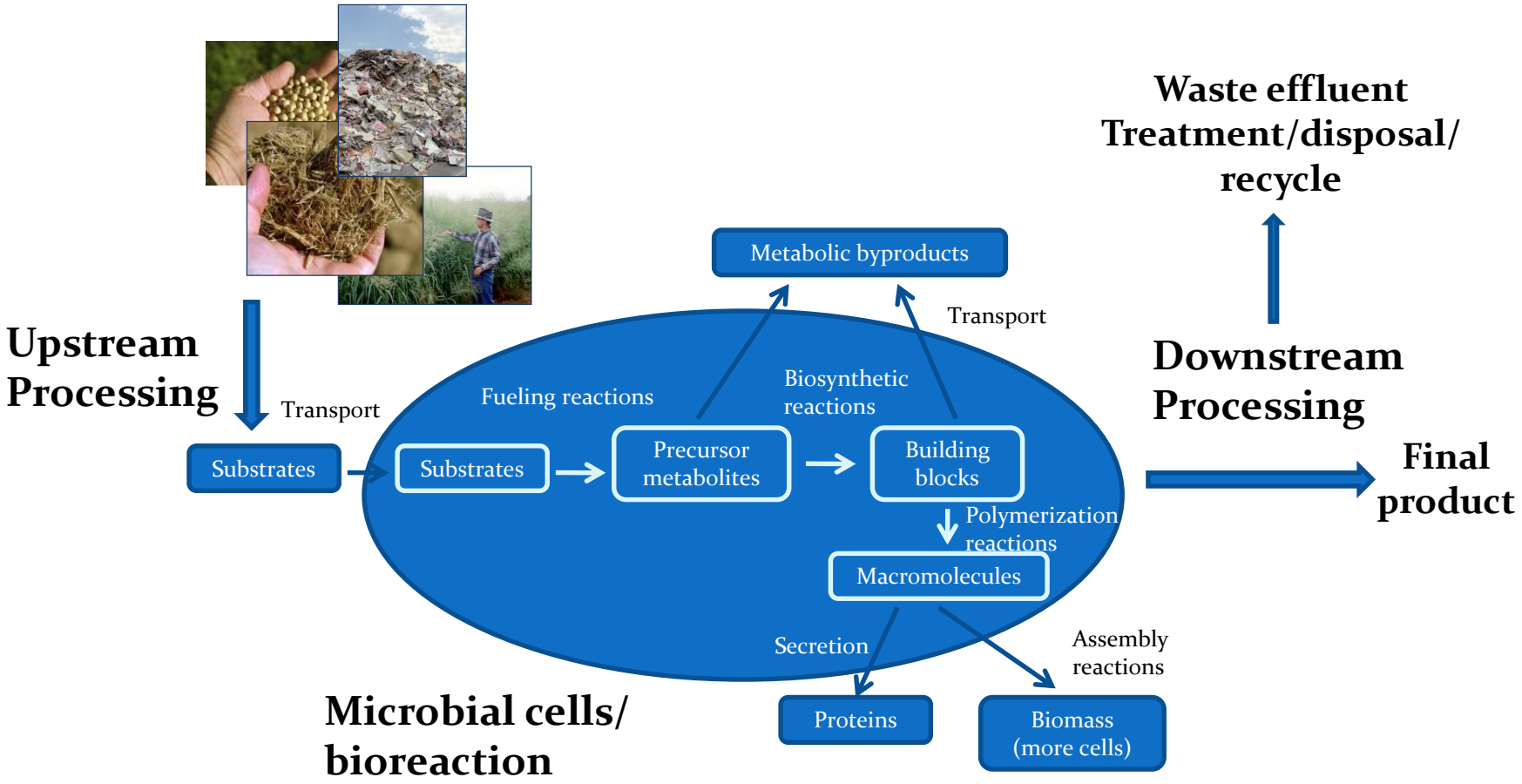

DTU

What will we use the sewage sludge in the future?

Hariklia Gavala
Associate Professor
Dept. of Chemical and Biochemical Engineering / Center of Energy Resources Engineering

My profile – Biorefinery conversions

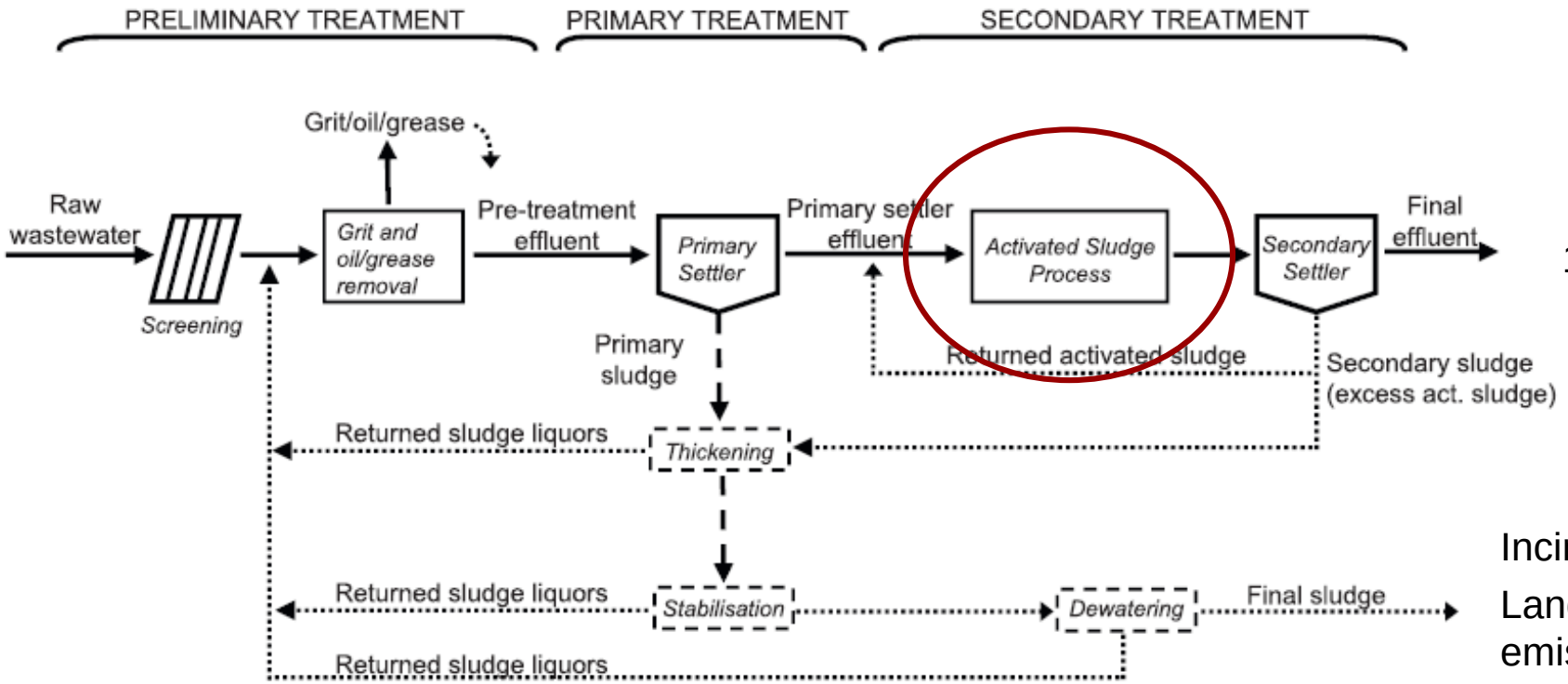


https://www.cere.dtu.dk/research-and-projects/framework-research-projects/biorefinery-conversions

Questions to be addressed in the conference

- What are the most challenging issues with todays sludge management, and what must be targeted first?
- How would a sludge management aiming to optimise resource recovery be designed and what limits the resource recovery?
- What new methods and systems may wait around the corner?
- How to improve interaction of different interests such as industry and academy. What should Green North focus on?

Sludge management – challenges



Volume – quantity of sludge

CO_2 emissions – is it really CO_2 neutral?

14-25% of TOC is of fossil origin

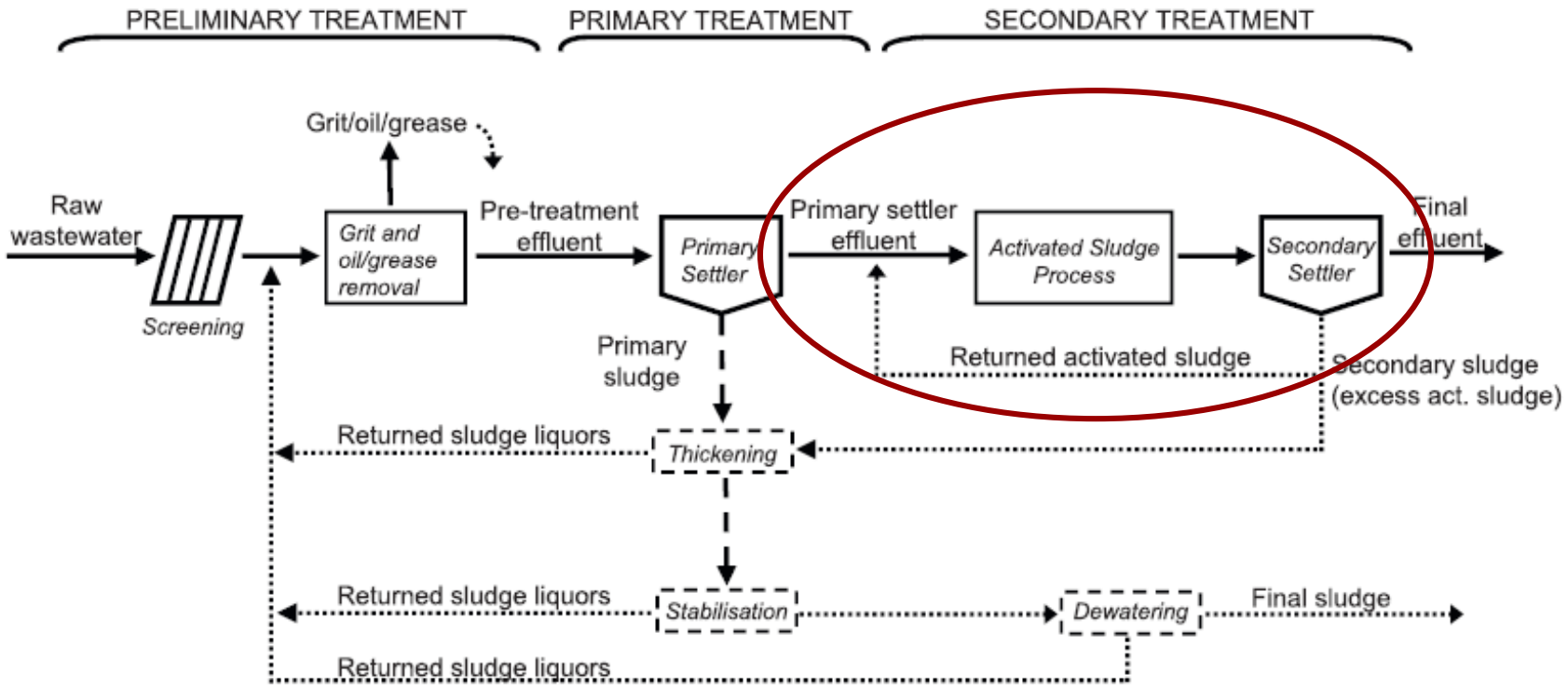
Incineration - ashes

Landfill – gas & leachate emissions

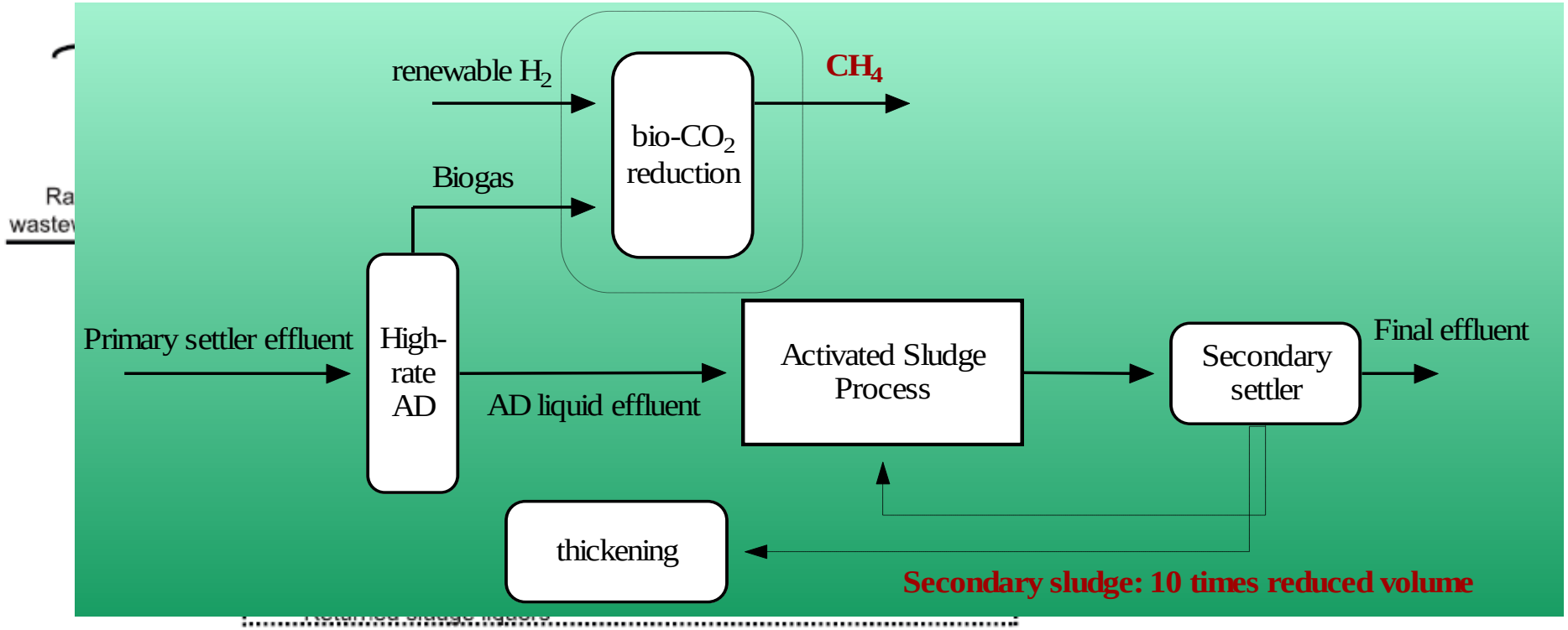
Agricultural use – quality standards

Graph source: Shatir et al. 2017 Renewable and Sustainable Energy Reviews, 80, 888-913

Addressing volume and CO_2 emissions



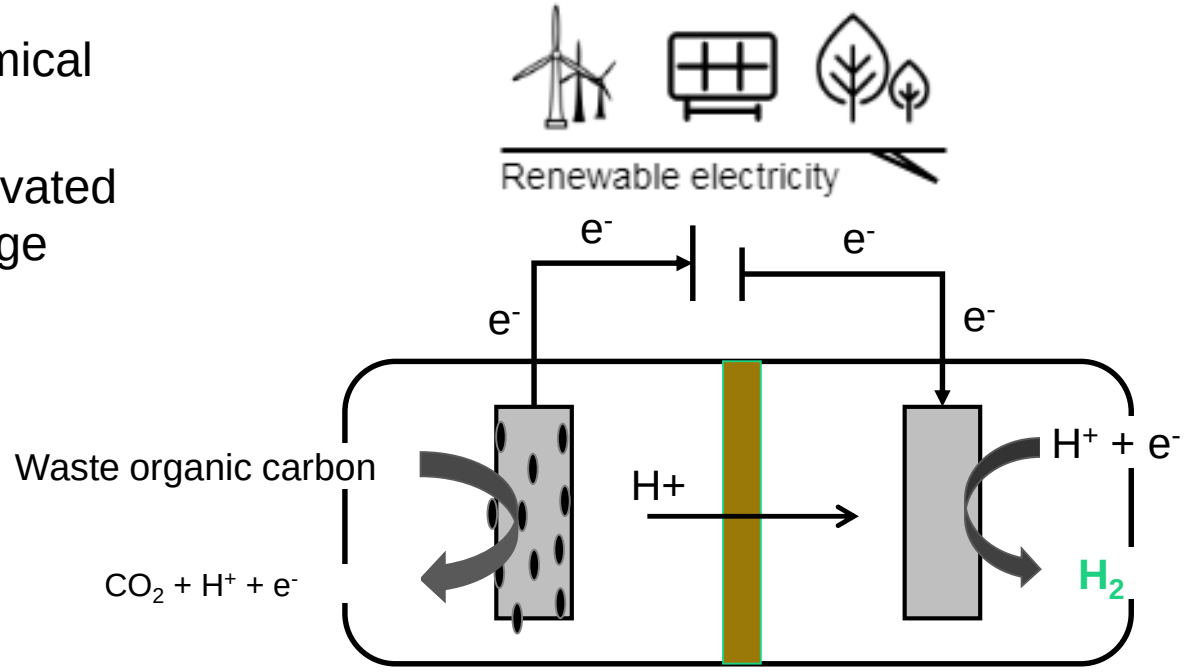
Addressing volume and CO_2 emissions



Additional technologies to be developed for reduced volumes of sludge

Use the primary settler effluent in biochemical electrolysis cells for H_2 generation

- less organic carbon directed to the activated sludge process – reduced volume of sludge



Biochemical Electrolysis Cells

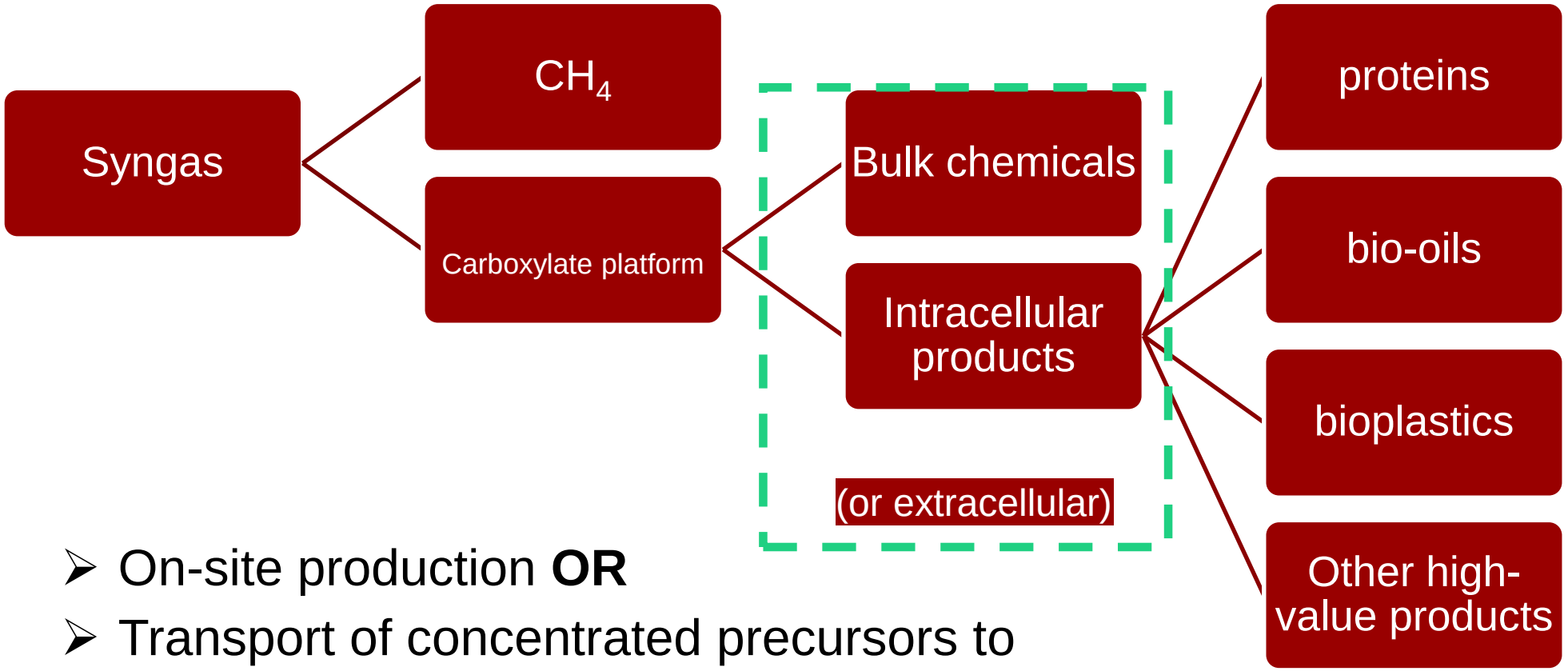
Quality standards (?) for agricultural use

- Continuously updated
- Our ability to detect contaminants and pathogens depends on diagnostic tools
- Prions are usually overlooked – until when?

- Could thermal treatment be a solution?
  - Incineration – energy as a low-value product (ashes could potentially be used in construction materials)
  - Gasification – syngas as a precursor for several fuels and interesting chemicals for further conversions

Gasification - Applications Potential:

Production of Carboxylate Platform from Syngas / partial recovery of N and P is also possible



- On-site production **OR**
- Transport of concentrated precursors to industrial production units

Potentially interesting directions

- Apply methods for minimization of the volumes of sludge and CO_2 generated with concurrent valorization of wastewater carbon
- Consider gasification of sludge for carbon recovery and valorization and partial recovery of N and P
- Technoeconomic feasibility of the different scenaria needs to be assessed