Consequential Life Cycle Assessment of a Novel Resource Recovery Solution for Food Waste Management

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Content

Introduction

- Food waste generation keeps increasing
- Improper managements are harmful to the environment

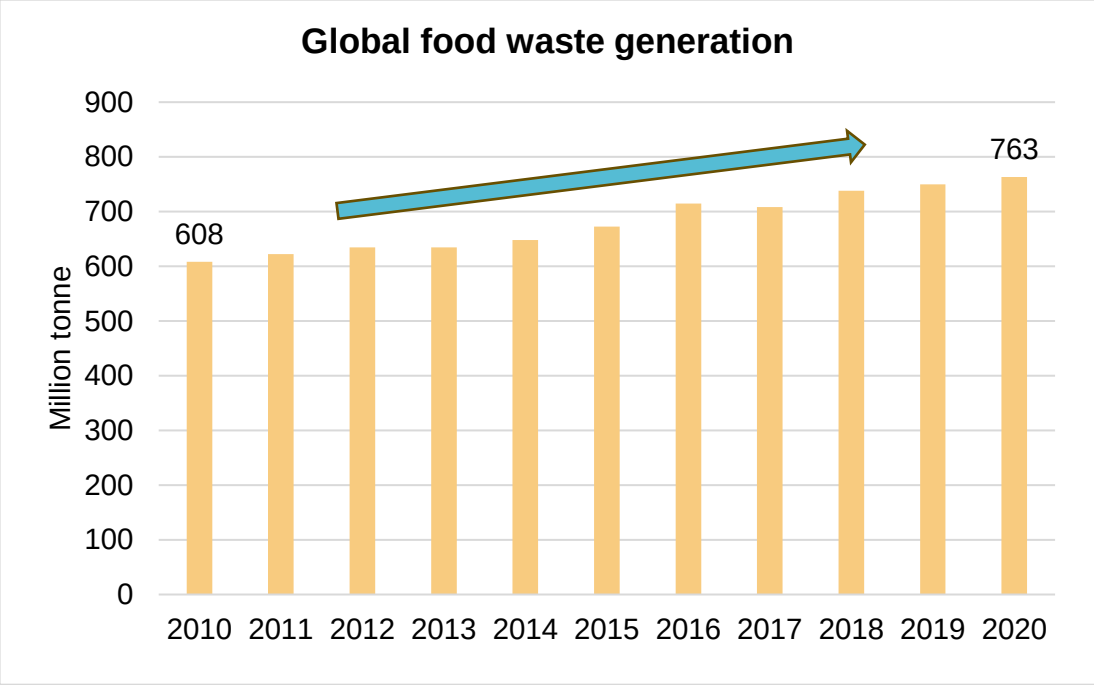

Fig 1. Global food waste generation (Hoy, et al., 2023)

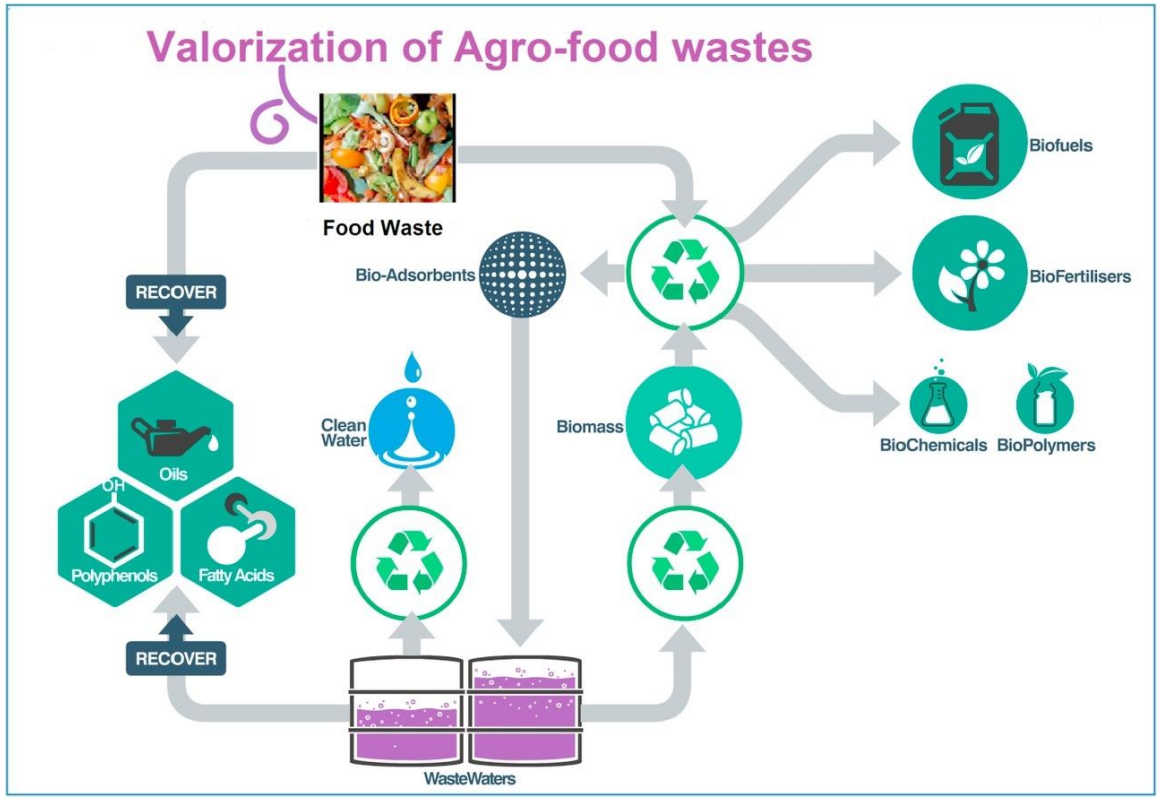

Fig 2. Examples of food waste valorisation pathway (Nayak & Bhushan, 2019).

- Valorisation of food waste have been explored, while many novel technologies are developed at emerging stage

Objectives

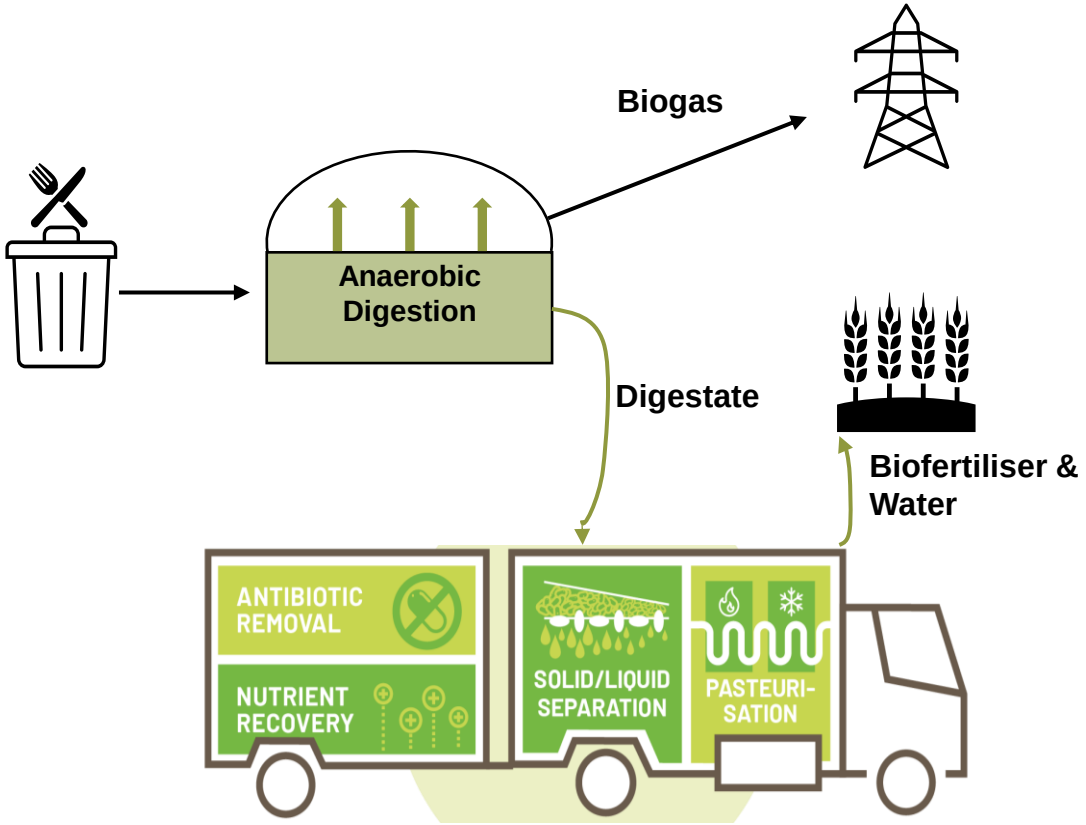

Fig 3. Schematic diagram of the RR solution developed by NOMAD project (https://www.projectnomad.eu/).

Taking a resource recovery (RR) solution as a case study

- To explore environmental impacts of consequences of introducing the upscaled RR solution in the UK at national scale in 2030
- To compare the consequential environmental impacts with a Business-As-Usual (BAU) case

Methodology

- Consequential Life Cycle Assessment (cLCA)
  - Functional unit: processing 1 tonne food waste
  - System boundary
  - 4 impact categories assessed
  - Foreground data source: primary and secondary
  - Background data source: Ecoinvent database (consequential data)

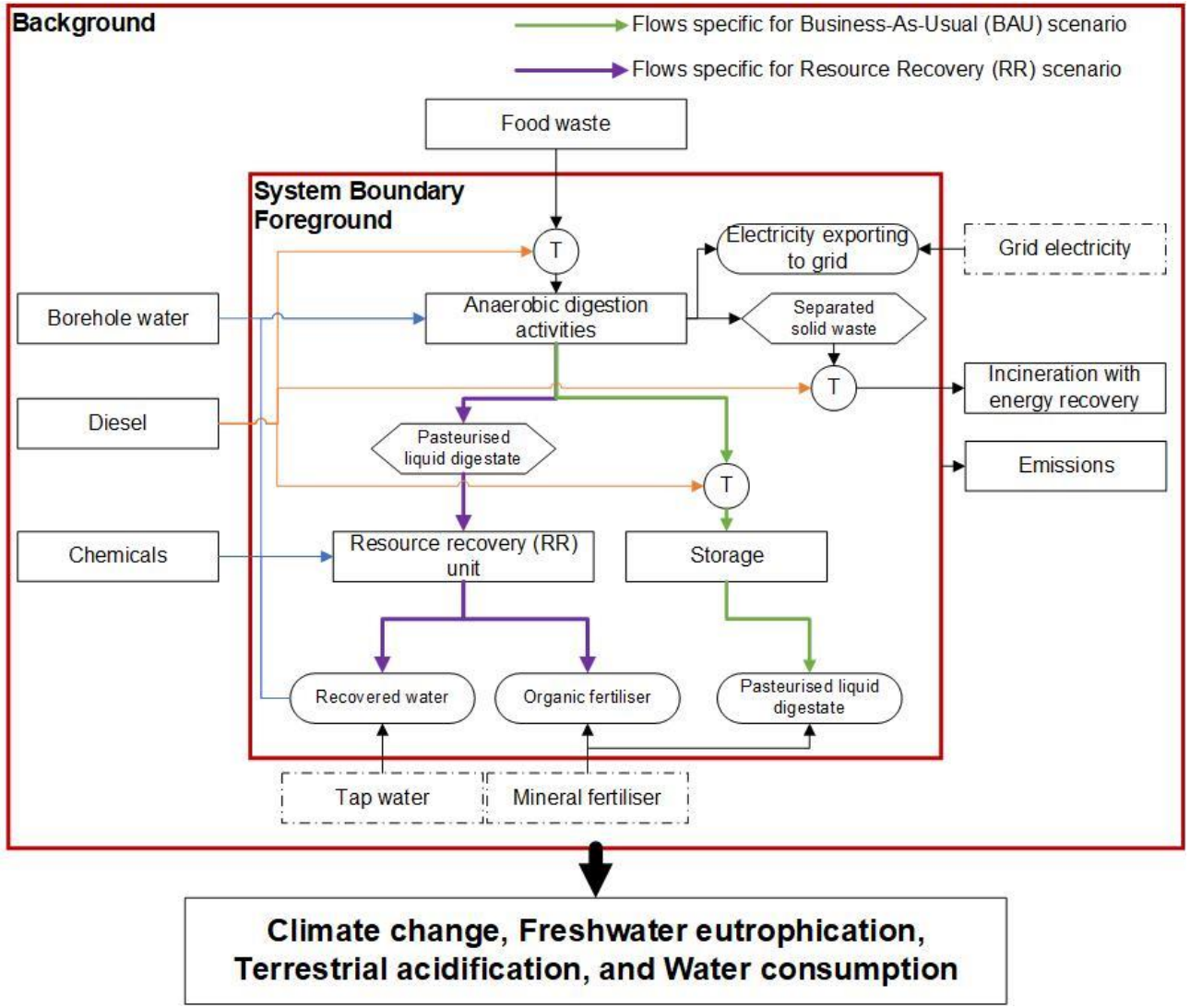

Fig 4. System boundary and 4 impact categories assessed.

Results

- Environmental impacts of the BAU and (resource recovery) RR scenarios

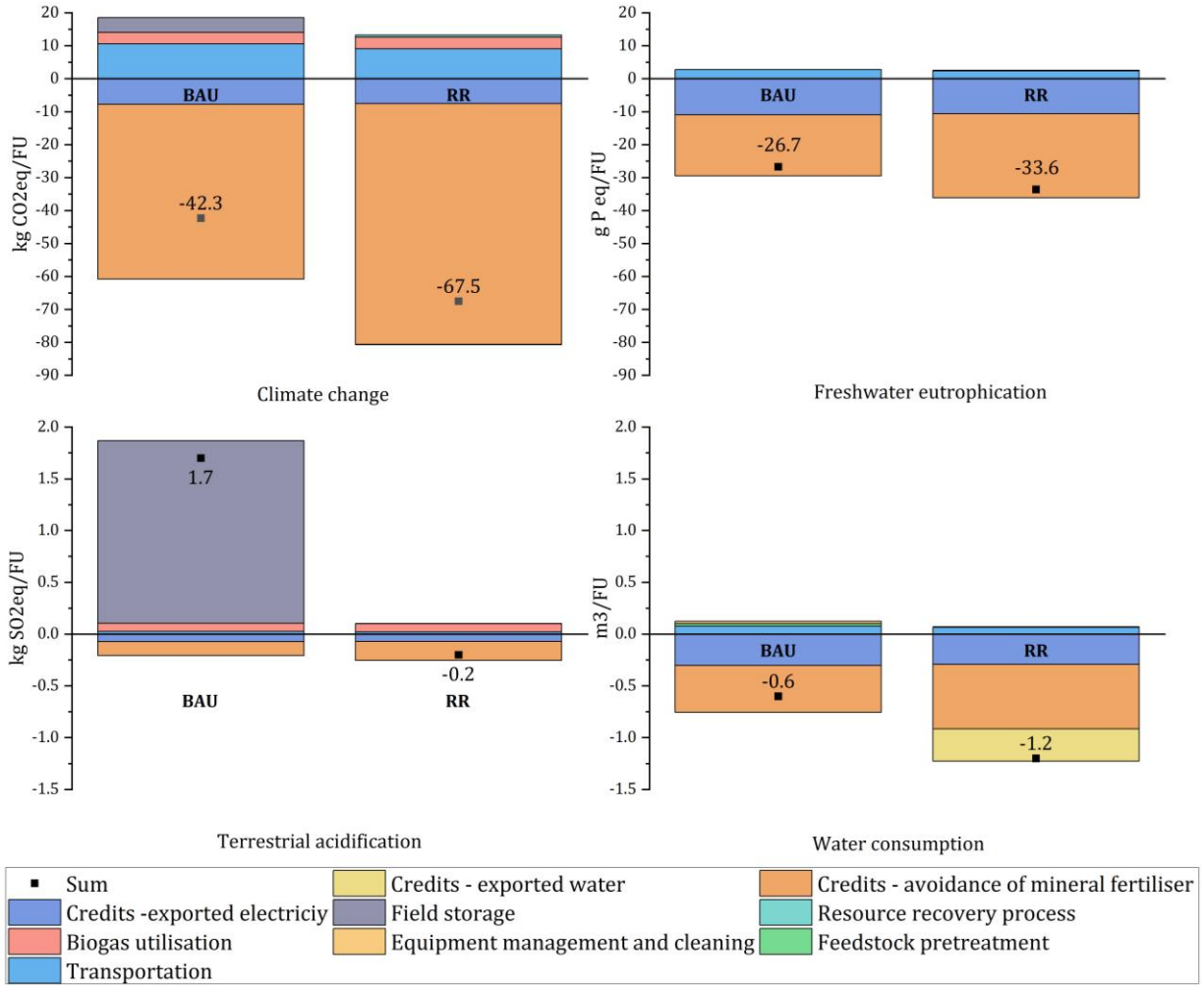

Fig 5. Environmental impacts of the scenarios assessed.

- Both scenarios can mitigate environmental impacts in terms of all impact categories except for BAU scenario for terrestrial acidification
- Digestate storage dominants terrestrial acidification impacts due to NH_3 emissions
- RR solution has better environmental performance, due to
  - High-quality biofertiliser and water recovered from food waste
  - Avoiding digestate storage

Conclusions

- Consequential Life Cycle Assessment (cLCA) method can support the upscaling emerging food waste valorisation solutions
- High-quality biofertiliser and water recovered from food waste are promising for environmental impact mitigation, which could contribute to Net-Zero GHG target in the UK
- NH_3 emissions from digestate storage is highlighted for terrestrial acidification impacts
- Low data availability and quality – future data gaps, e.g., food waste generation in 2030, inventory of upscaled solution, and marginal background data
- Uncertainty analysis will be conducted next in future study

Many thanks for listening!

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