Baltic Manure

Co-digestion of manure and others waste resources – from and since Baltic Manure project

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Baltic Sea Region Programme 2007–2013

BALTIC MANURE
BUSINESS OPPORTUNITIES

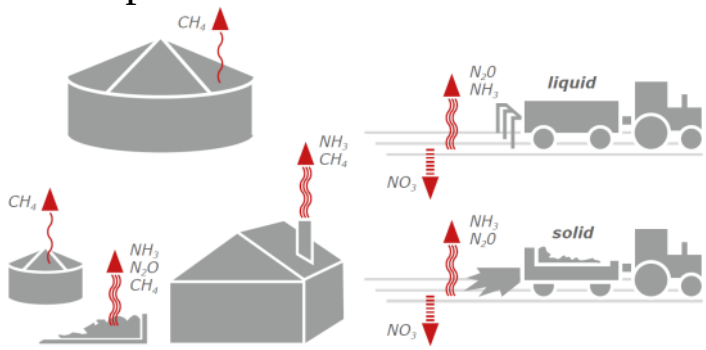
Content

- Baltic Manure Results & Recommendations from 2013
- Danish biogas results from 2016 on manure co-substrates
- A double-loop co-digestion system on Samsø

BALTIC MANURE
BUSINESS OPPORTUNITIES

Top ten recommendations…

1. Optimize animal feeding and reduce water use/spillage
2. Ensure sufficient capacity of covered, cold storage facilities
3. Analyze nutrient content of manure and
   - dose manure precisely to the needs of the crops and at the right time
4. Inject, incorporate immediately or acidify the manure when applying in the field
5. Generate energy from the manure if possible
   - biogas and sustainable co-substrates
6. Agree on norms and quality criteria for manure fertilizer products of different origin
7. Deploy a set of maximum P-limit at the EU level, depending of soil and crops needs
8. Change the status of certified composted or digestated manure from a waste into marketable products
9. Ensure that advisors and farmers are educated in manure handling technologies and related economic calculations
10. Remember that by consuming meat and dairy products one produces manure.



Manure energy

- Biogas is a key recommendation
  - Thermic gasification/ pyrolysis of fibers can be possible.
- The digestate
  - should be post-digested,
  - stored in covered storages and
  - applied to the fields with proper methods and timing

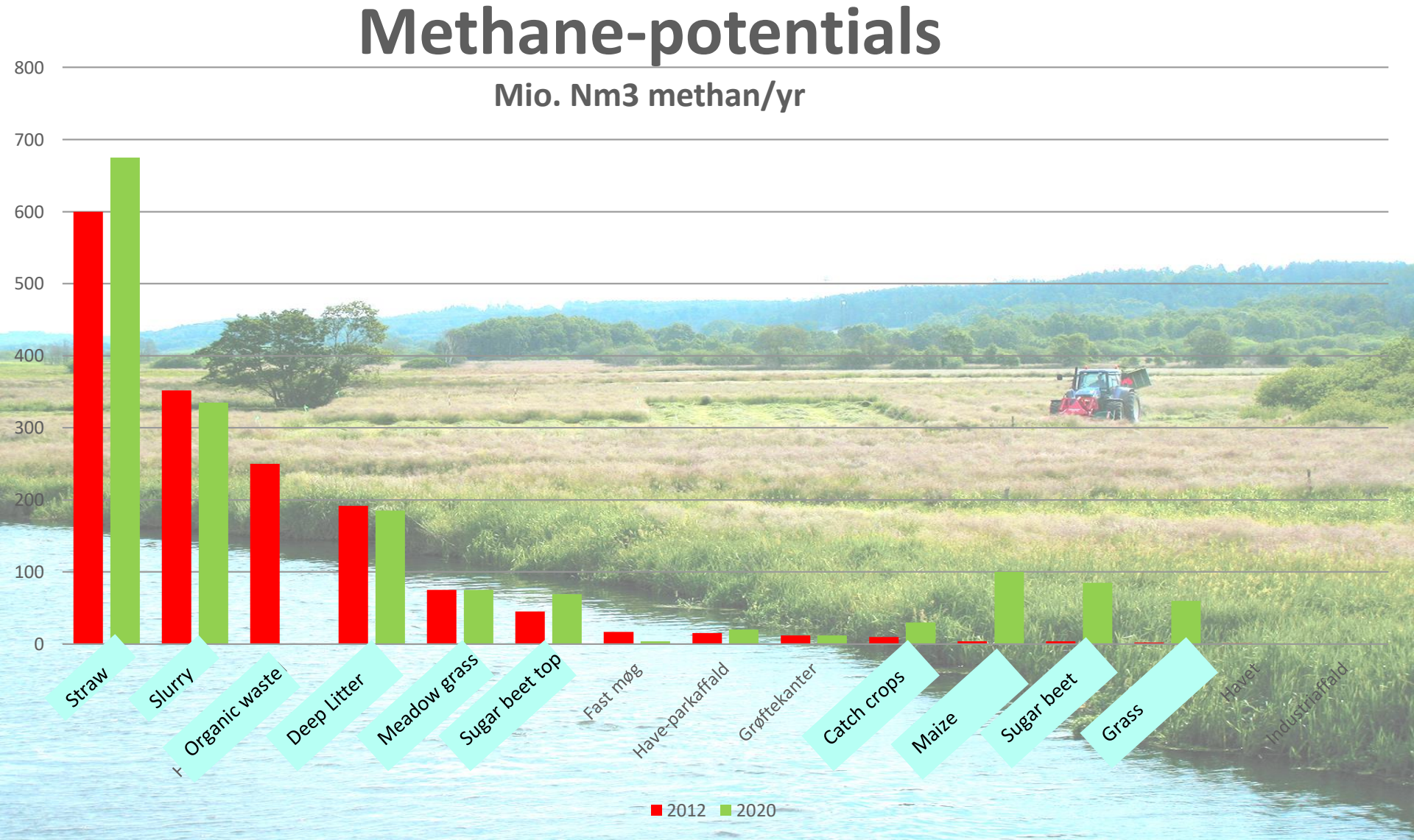
Co-substrates

- Co-substrates
  - chosen according to sustainability
  - solid manure/deep litter
  - agricultural and societal wastes and by-products
  - maize is not recommended.

Anything New from/since Baltic Manure?

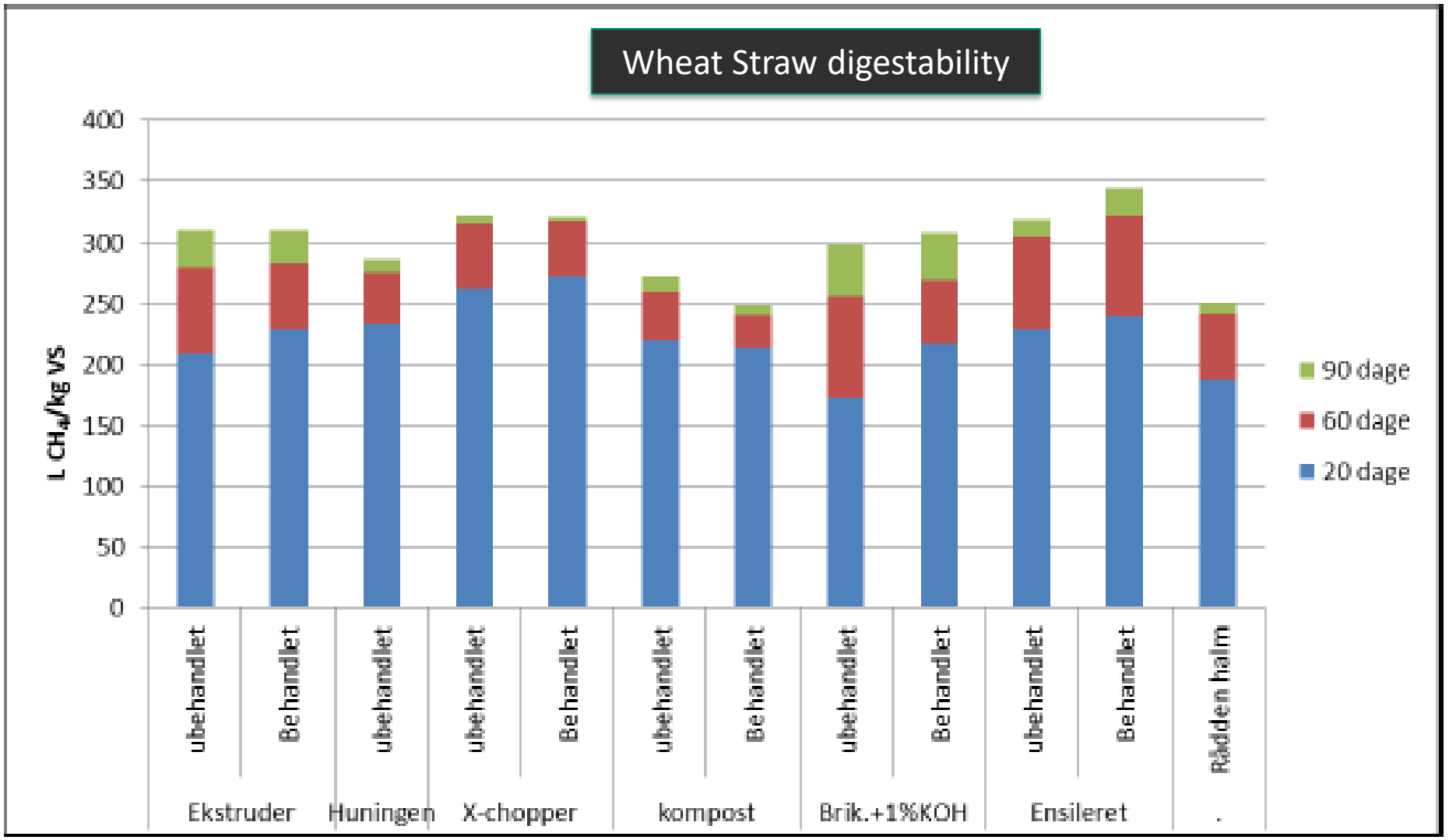
- Soy bean import is perhaps more important for the Baltic Sea pollution than manure handling…..
- Future livestock might be insect larvae, fish and rabbits!
- Bio-refining of grass for proteins and energy
  - Circular economy
- GreenHouseGas reductions from agriculture/ society
  - Biogas reduce emissions from agriculture and transport
  - Methane and fodder
  - Methane slip from reactors and gas engines

Danish manure based biogas



Pretreatment of straw

Treated straw in water after 30 min



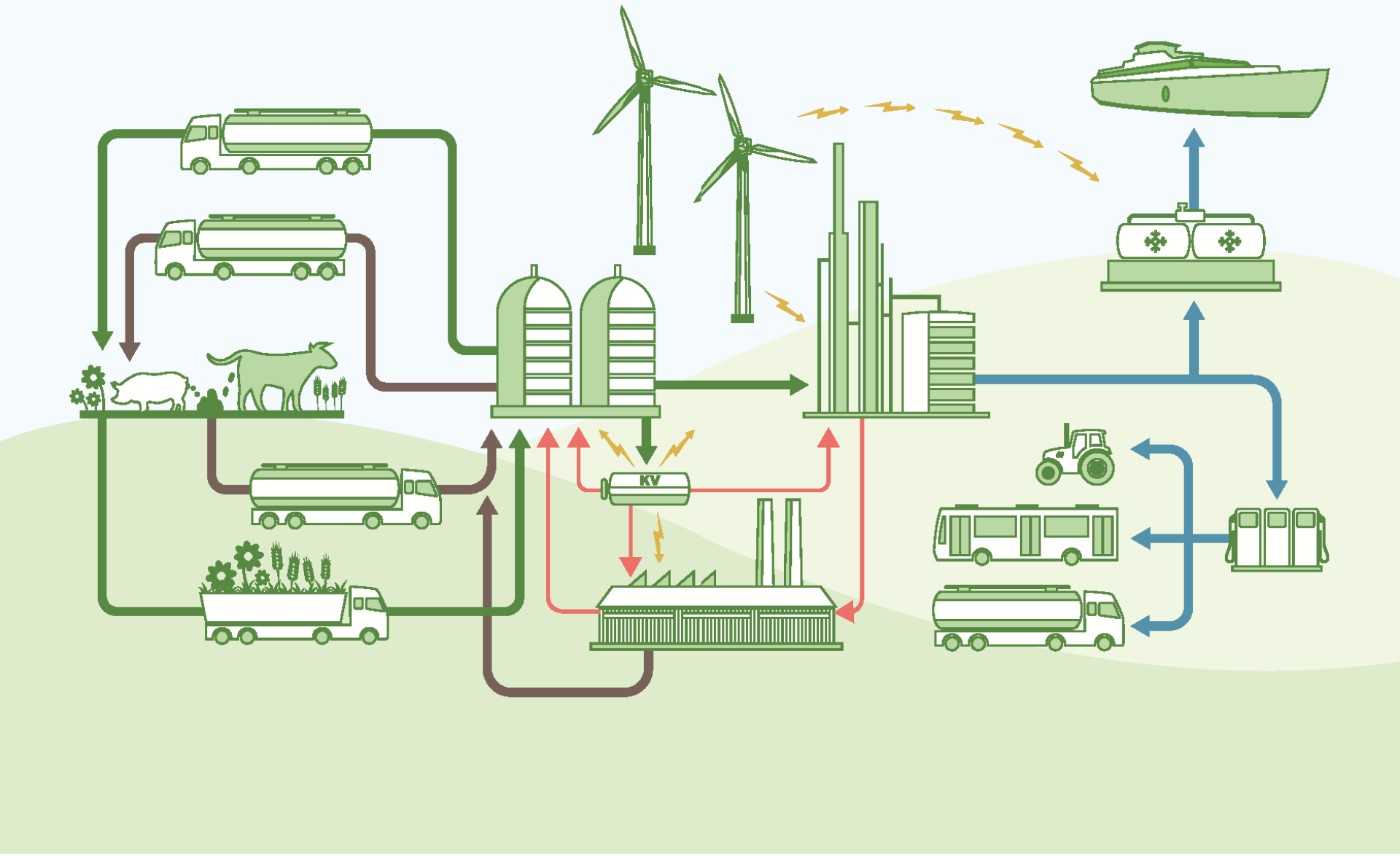
Figur 67. Gaspotentiale L CH_4 /kg VS før og efter forbehandling af halm. For Hüningen indgår kun det ubehandlede halm, da det ikke var muligt at behandle halm med udstyret, uden tilsætning af betydelige mængder majsensilage

Danish Biogas Task force results/ recommendations 2016

- Methane collection in pre- and mixer tanks is recommended
- Methane leakages should be stopped
- Need for innovation to remove sand (cattle and cast seaweed, beets)
- Ensure 100% sale of gas (no flaring)
- Inoculum is important for straw digestion (adapted culture)
- Load /unload and pretreat biomass in closed buildings with air cleaning
- Increase DM content – especially hay & straw
- Longer Hydraulic retention time is recommended, especially for straw (> 35 days-100 days)
  - Pretreatment of solid co-substrates important with < 35 days HRT
- Pretreatment of straw important for mixing

Energiteknologisk Udviklings- og Demonstrationsprogram

Samsoe Feasibility study



600 pax
160 cars
1 hour trip
Dual fuel engines

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27 million euro

7.000 euro per islander

Biogas as the engine towards circular economy

The challenges

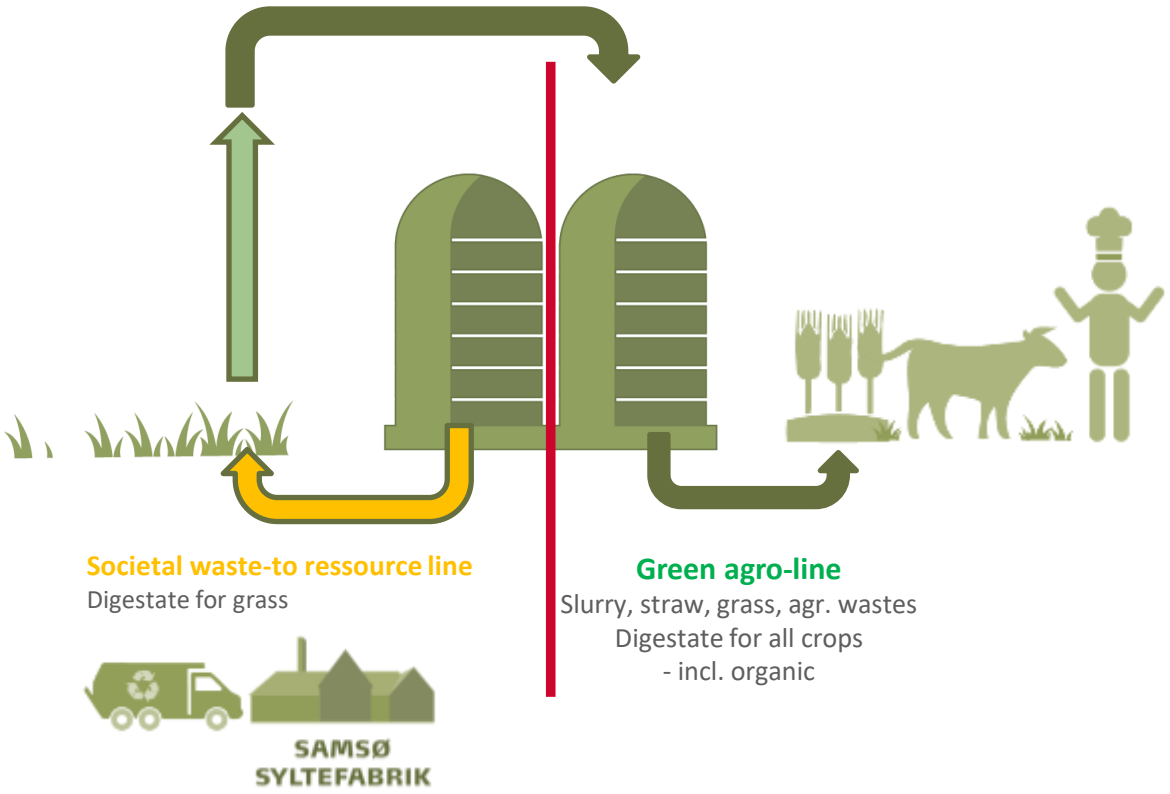
- Decreasing livestock
- Potatoes, cabbage, onions
- Low precipitation
- Low % organic farmers

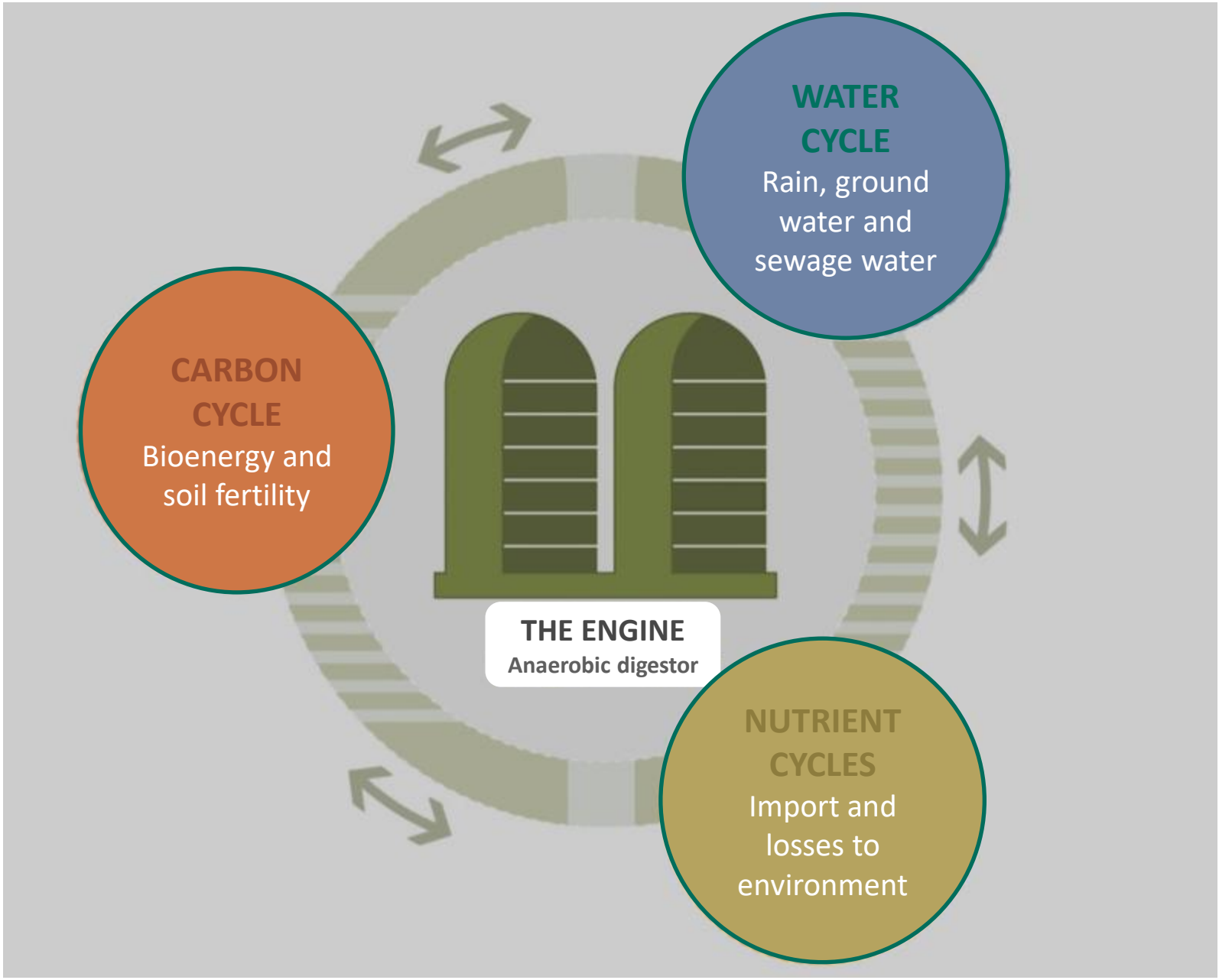
The Solution

- Double loop nutrient cycling

Input Samsø Biogas:

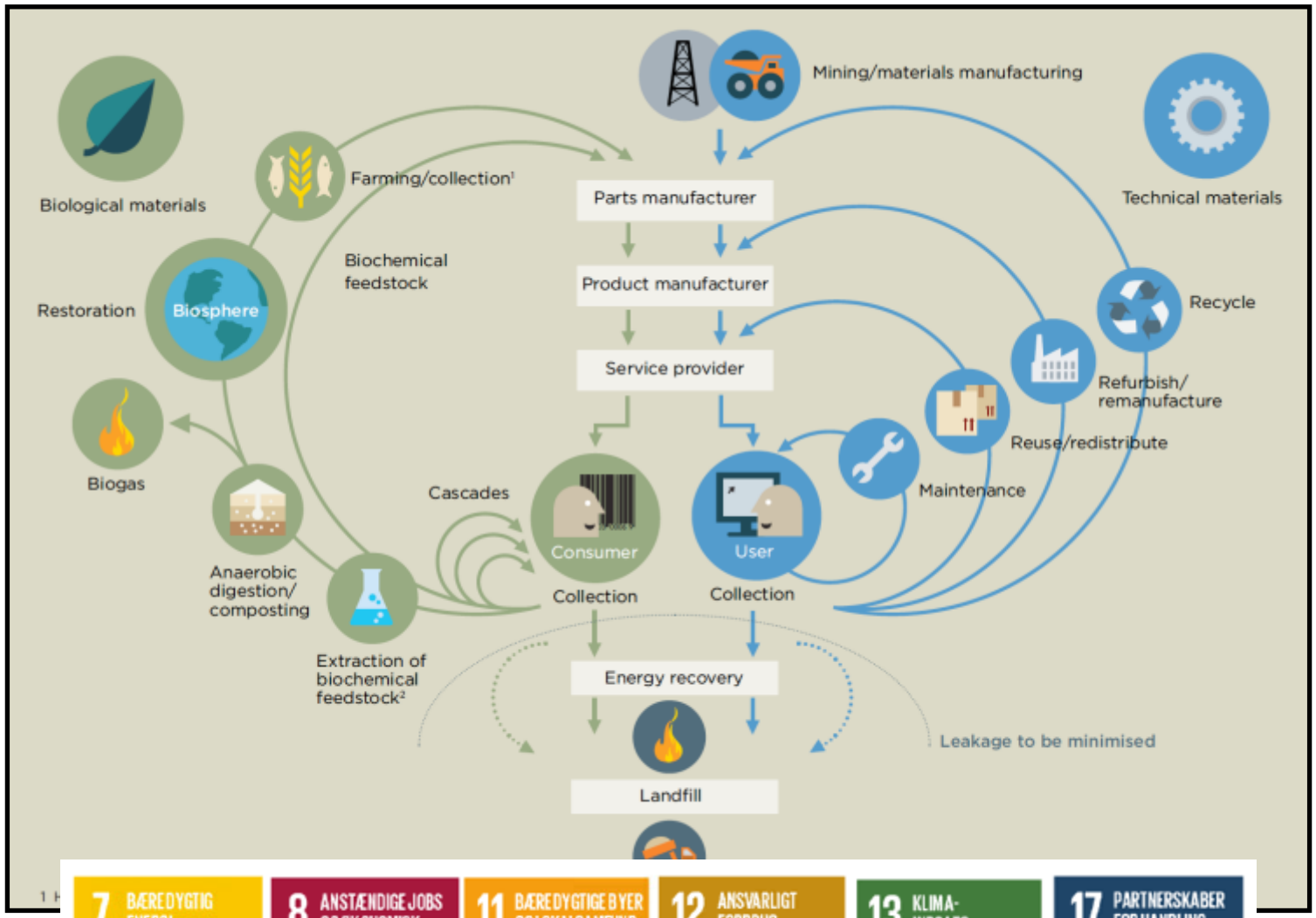
- 1/3 Slurry
- 1/3 food industry sludge
- 1/3 straw, deep litter, catchcrops etc




WATER CYCLE
Rain, ground water and sewage water
CARBON CYCLE
Bioenergy and soil fertility
THE ENGINE
Anaerobic digestor
NUTRIENT CYCLES
Import and losses to environment

Circular Economy, the Butterfly model

Ellen MacArthur Foundation



Steps towards Liquefied Biomethane

- The small scale is the major challenge
- LNG at large scale > 1 mio tonnes annually
- Global LiquidBioMethane prod is < 50.000 tpa
- Samsø < 3000 tpa LBM

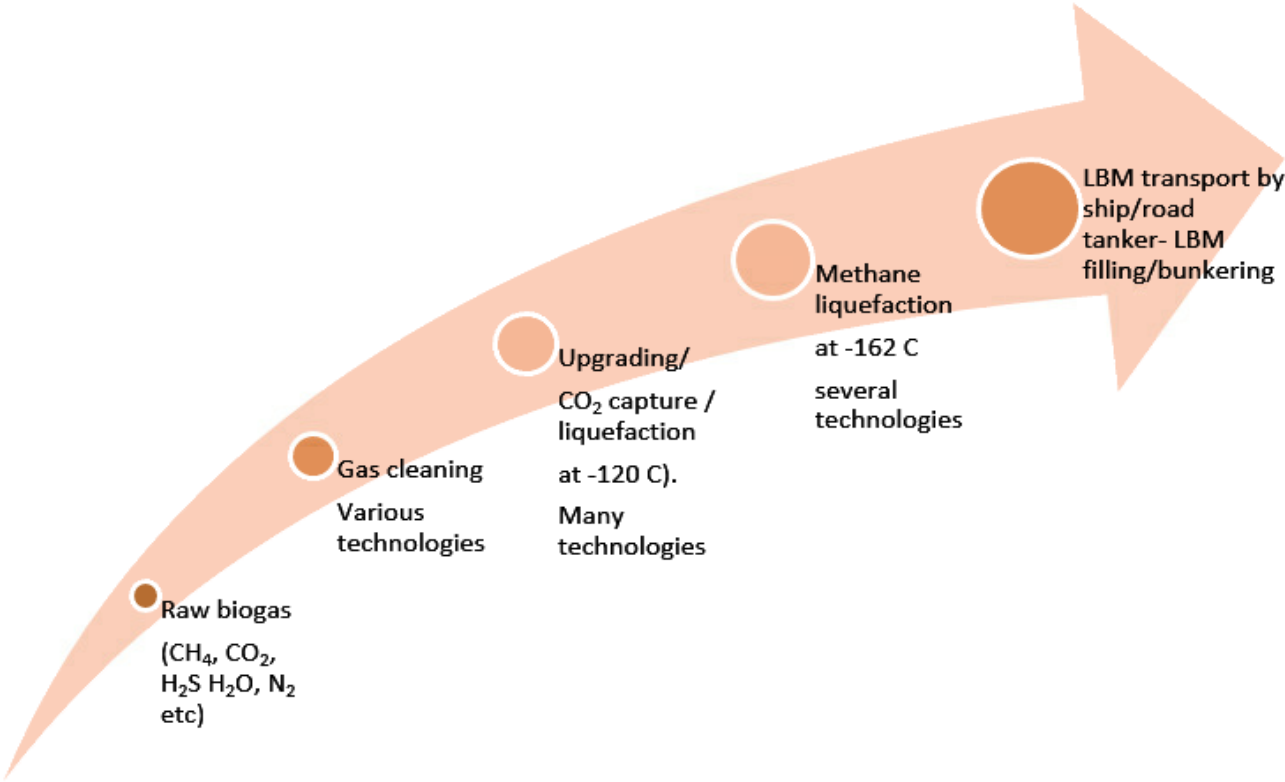


Figure 5. The major steps from biogas towards LBM. For further explanation, see text.

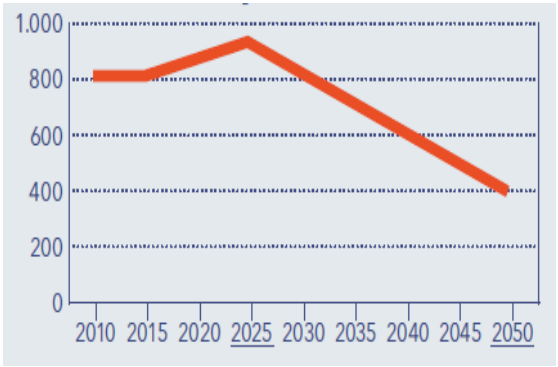
Status for Samsø business case

- Environmental permissions OK
  - Samsø Municipality is the gas customer
  - The biogas plant should be private

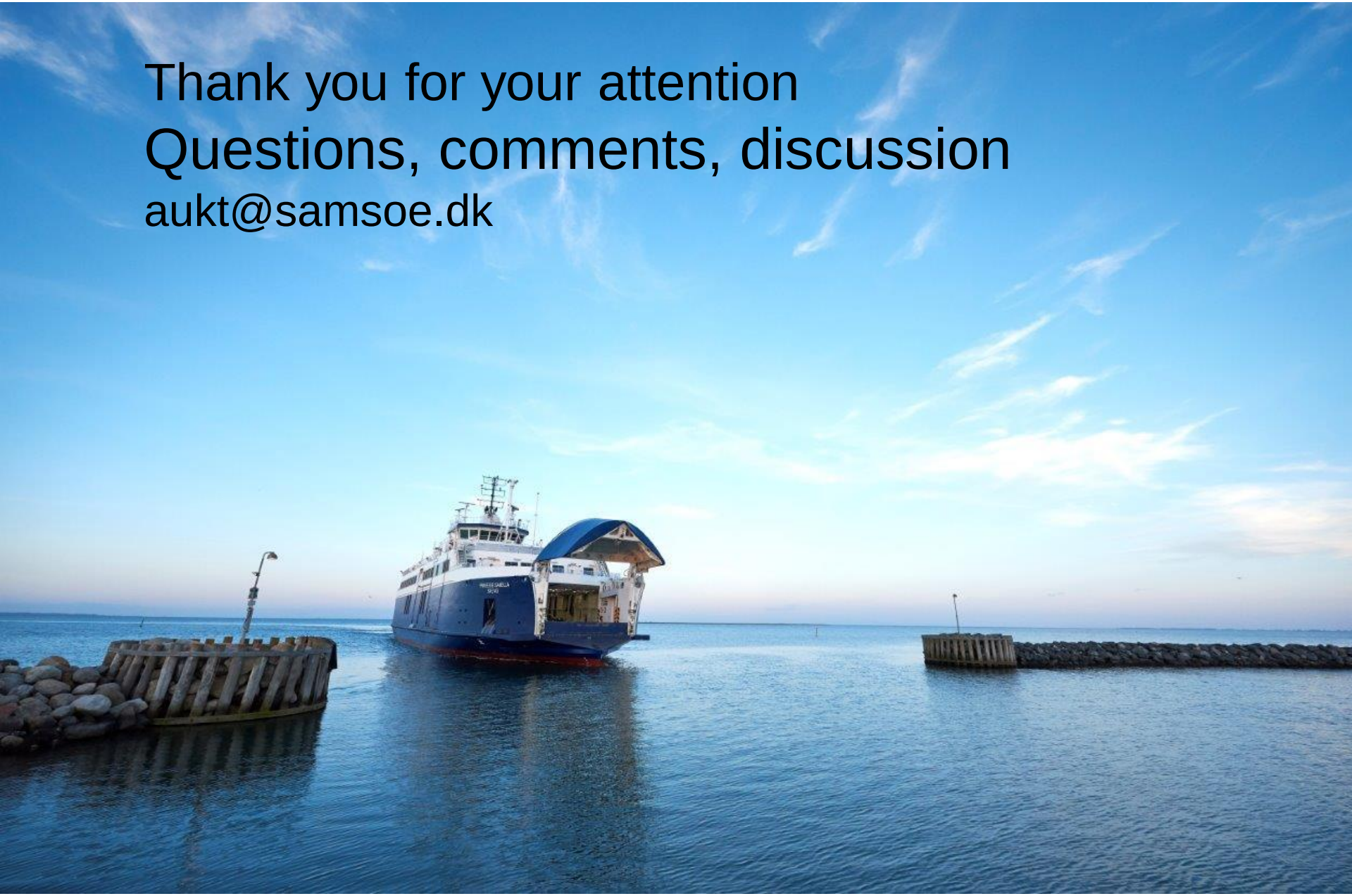
The business case in an island context consist of many 'non-monetary' values such as innovation, branding, pride, tourism and sense of coherence.

The strict business case may not be profitable on short terms but the long term business for the Island is clear.

Coming actions to make Samsoe waste into ferry fuel



- Danish Climate Law
- National Climate Action Plan 2020
- Liquid Biomethane for heavy transport could become part of this
  - Sweden/Norway has invested, Maersk interested
- Samsø Climate Action Plan
  - Biogas reduces emissions from livestock and ferry
- Local political interest
- Liquid Biomethane subsidy is the key



Thank you for your attention

Questions, comments, discussion

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