



# Anaerobic Digestion of Poultry Litter

Ciara Beausang

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An Roinn Talmhaíochta,  
Bia agus Mara  
Department of Agriculture,  
Food and the Marine



# Anaerobic Digestion

- Organic matter converted to biogas in the absence of oxygen
- Biogas consists of methane, carbon dioxide & minor constituents
- Can be used in different ways:
  - Generate heat and electricity: combined heat and power (CHP)
  - Purified: injected in the gas grid or used as transport fuel
- Digestate: material remaining after digestion, used as fertiliser



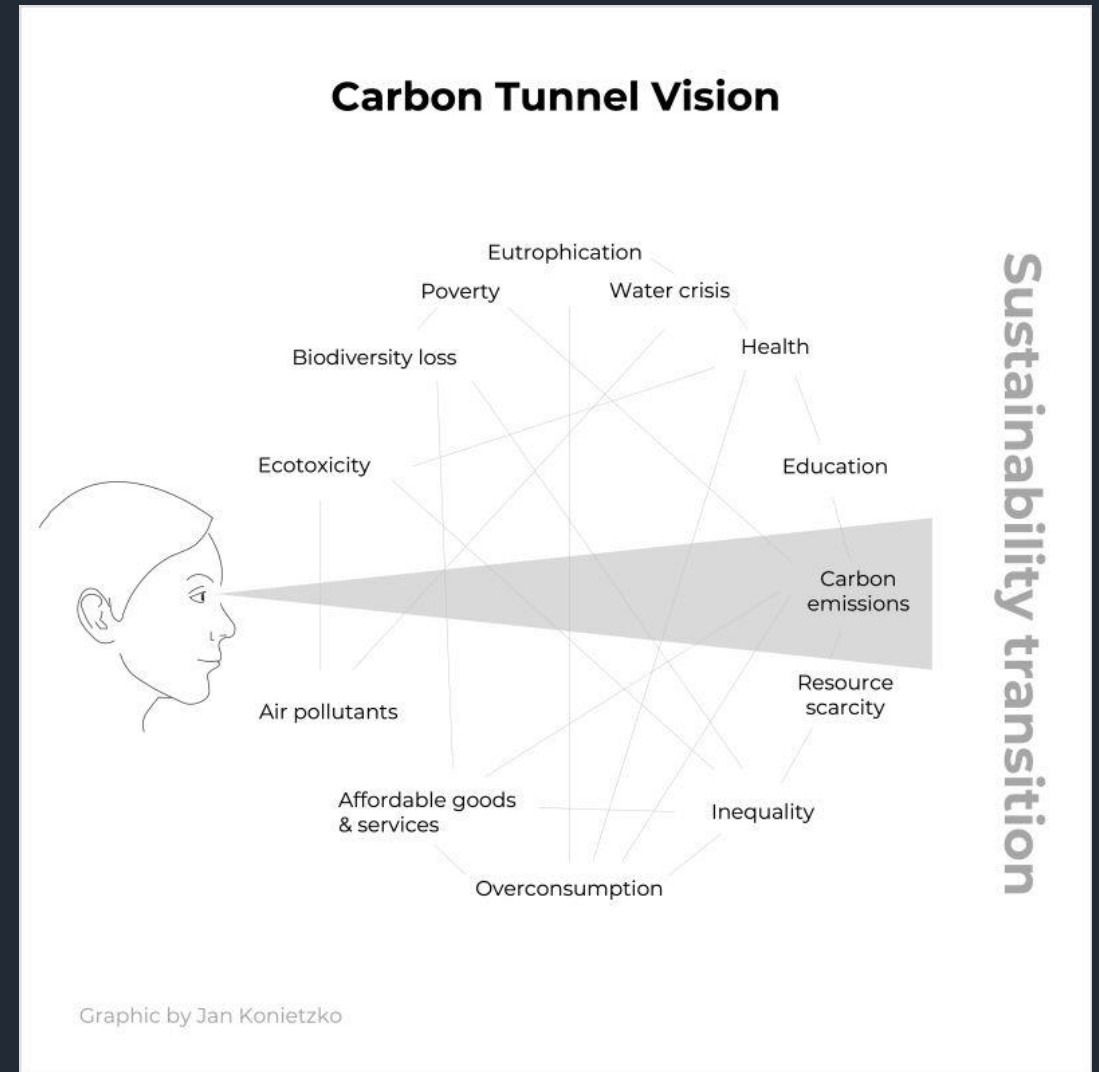
# Monaghan - Poultry Litter

- Mixture of bedding material, feathers, manure, urine and food particles
- Current uses: mushroom compost or land spreading
- Litter from applications in 2019 for additional bird places: 20,000 tonnes
- Potential for large scale facility: 1.5 MWe

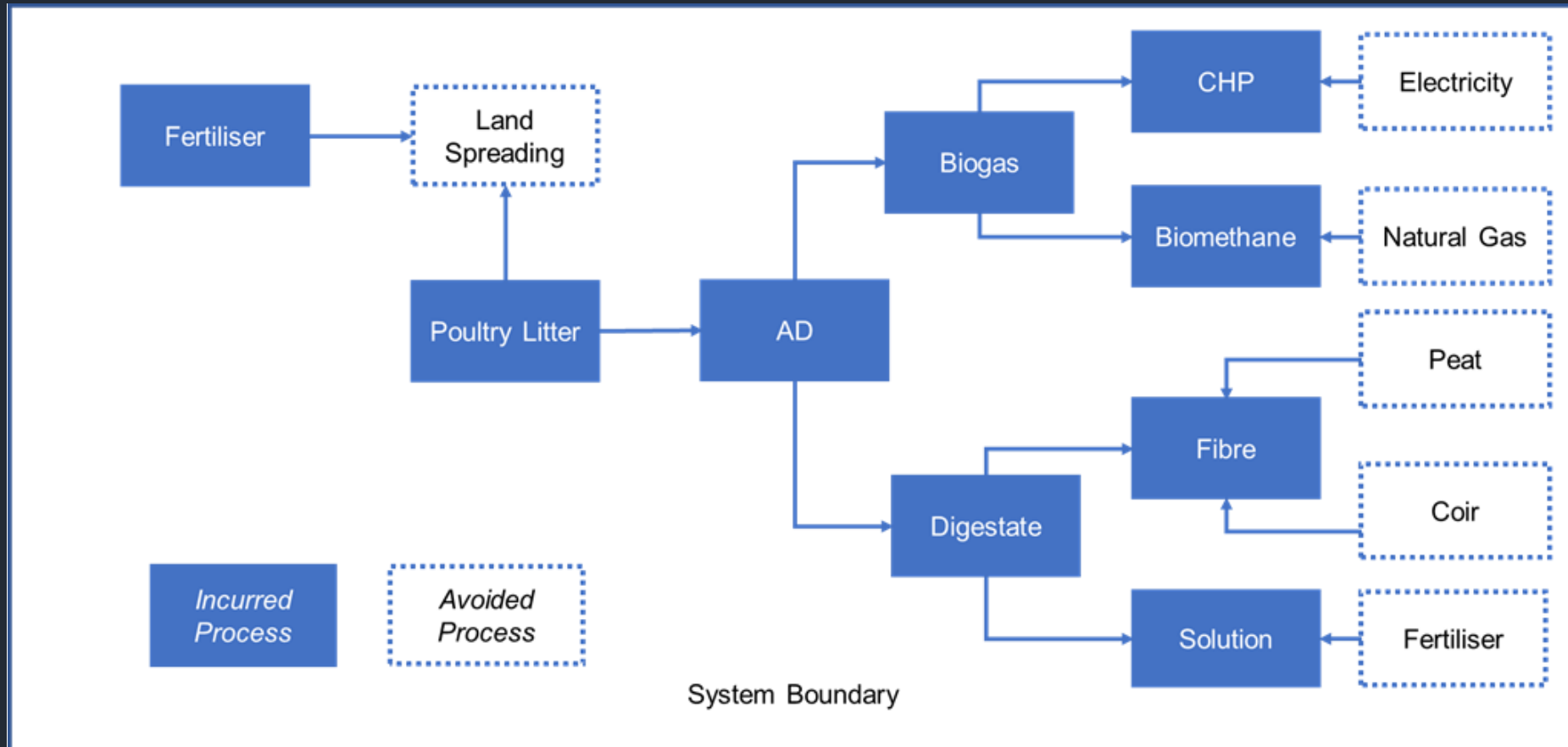


# Environmental Impact

- Anaerobic digestion: mitigation technology - decarbonisation
- Ireland's environment: other significant challenges: air, soil and water quality
- Methodology: Life Cycle Assessment (LCA)
- Impact categories: climate change, freshwater eutrophication and terrestrial acidification



# System Overview

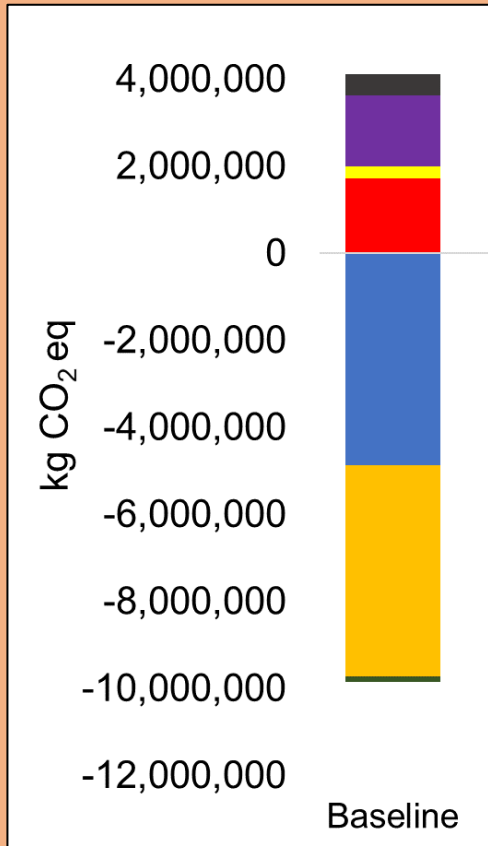




# Baseline Scenario

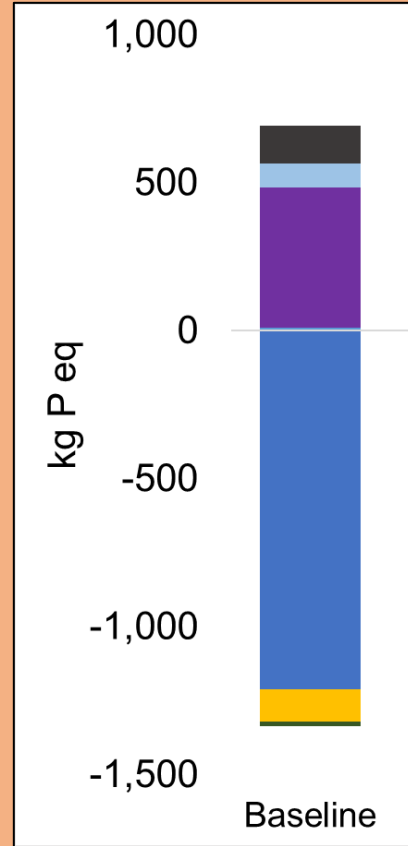
- Biogas used to generate heat + electricity
  - Displaced electricity based on projected mix for year 2024
    - 45% natural gas, 22% coal, 2% peat, 23% wind and 8% biomass
- Solid digestate fraction displaces peat moss
- Fugitive methane emissions: 2.4%

### Global Warming



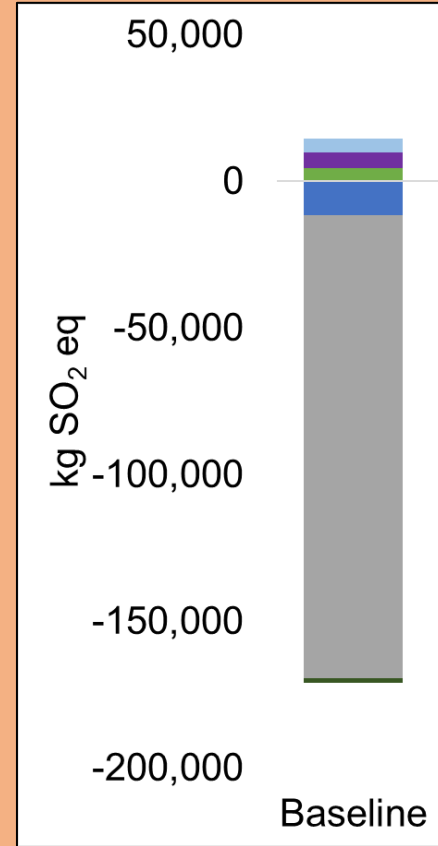
-5,722,800 kg CO<sub>2</sub> eq

### Eutrophication



-645 kg P eq

### Acidification



-156,725 kg SO<sub>2</sub> eq

Transport



Avoided electricity



Fertiliser application



Avoided peat moss



Fertiliser production



Other



Fugitive emissions



Ammonia stripper



Digestate storage



Avoided litter to land



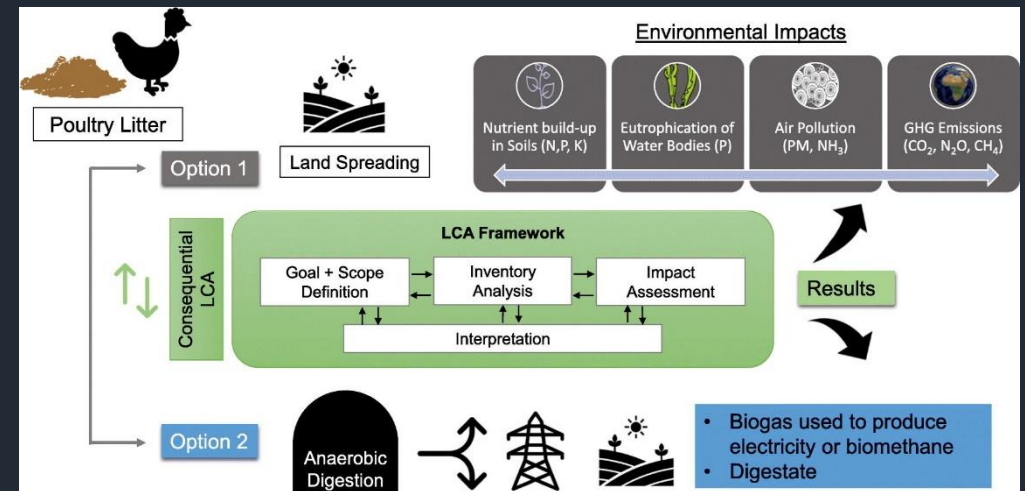


# Scenario Analysis

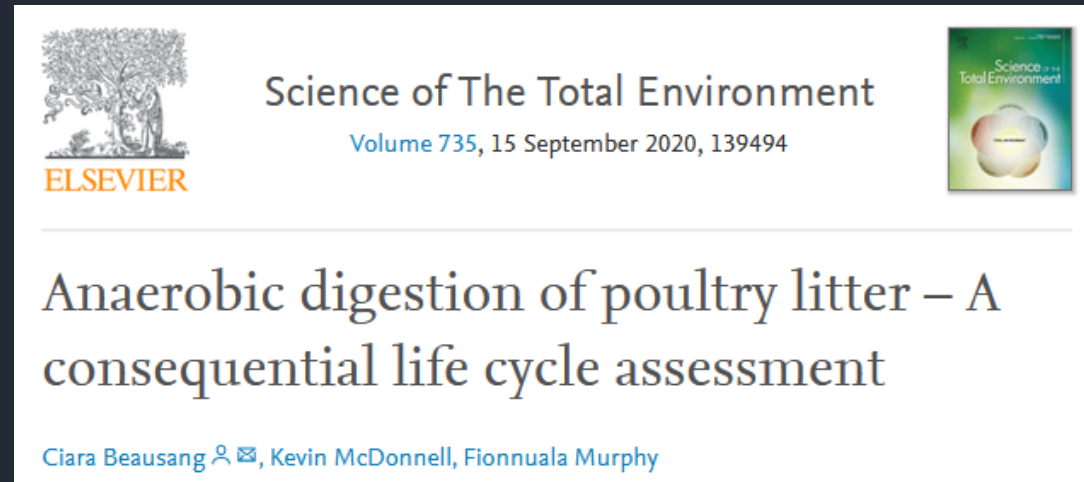
Scenario	Global Warming kg CO <sub>2</sub> eq	Eutrophication kg P eq	Acidification kg SO <sub>2</sub> eq
Baseline	-5,722,800	-645	-156,725
Coir displacement	-874,351	-538	-156,015
	<b>-85%</b>	<b>-17%</b>	0%
2030 electrical grid mix	-4,062,510	522	-145,128
	<b>-29%</b>	<b>-181%</b>	<b>-7%</b>
Upgrading to biomethane	-6,951,480	587	-144,696
	<b>21%</b>	<b>-191%</b>	<b>-8%</b>
4% methane emissions	-4,524,680	-645	-156,725
	<b>-21%</b>	0%	0%

# Conclusions

- AD is a suitable disposal route for poultry litter
- May lead to reduced environmental impacts
- Net impacts mainly depend on processes displaced by biogas and digestate
- Estimated emissions savings of 5,723 tonnes CO<sub>2</sub> eq annually for 1.5 MWe plant



# Further Information



Beausang, C., McDonnell, K., & Murphy, F. (2020). Anaerobic digestion of poultry litter – A consequential life cycle assessment. *Science of The Total Environment*, 735, 139494.

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[ciara.beausang@ucdconnect.ie](mailto:ciara.beausang@ucdconnect.ie)