

Method for Evaluating the GHG Impact of UK Biomass Resources

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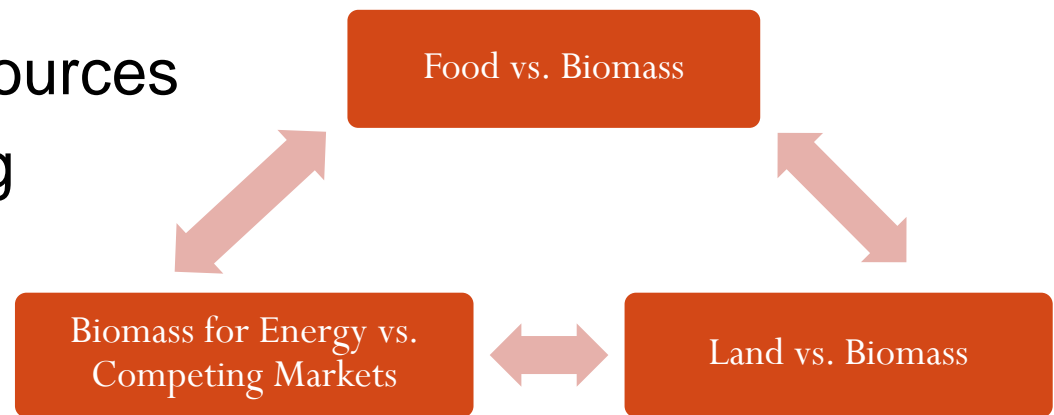
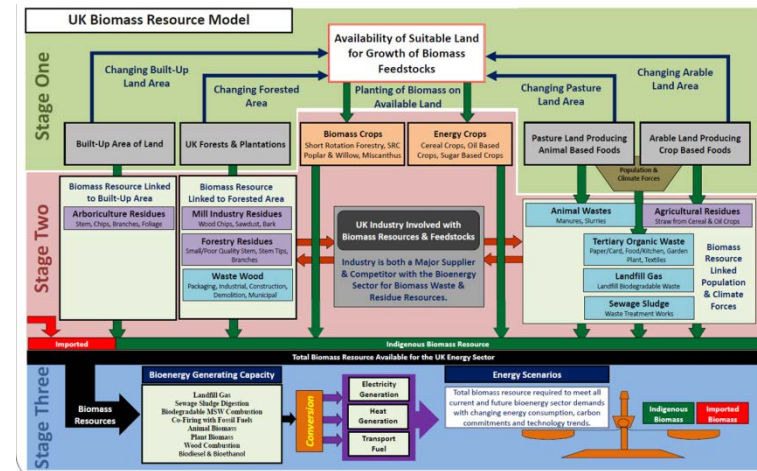
Today's Presentation

- Collaborative research project
- Research from Tyndall Manchester
- Influencing research from DECC
- Project focus, aims & objectives
- Introduction to analyses scenarios & pathways
- Presentation of selected preliminary results
- Project going forward



Research from Tyndall Manchester

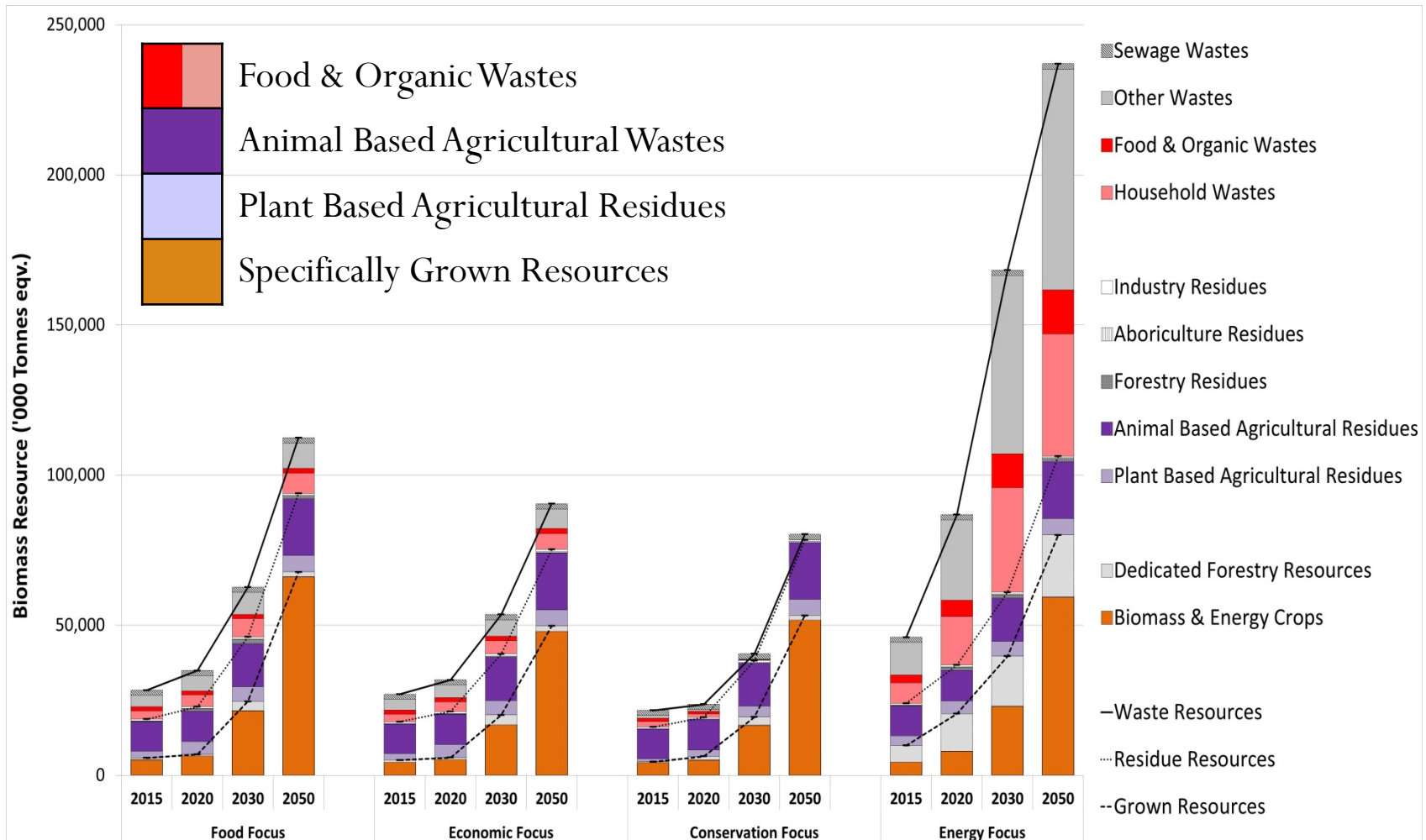
- Biomass Resource Model
- Model supply chain dynamics of chosen geography
- Forecast the availability & bioenergy potential of terrestrial biomass resources
- Key focus on analysing interfaces:



- Welfle, A. Gilbert, P. Thornley, P. (2014) Securing a Bioenergy Future without Imports. *Energy Policy*, 68. p. 1-14.
- Welfle, A. Gilbert, P. Thornley, P. (2014) Increasing Biomass Resource Availability through Supply Chain Analysis. *Biomass & Bioenergy*, In Press.

Research from Tyndall Manchester

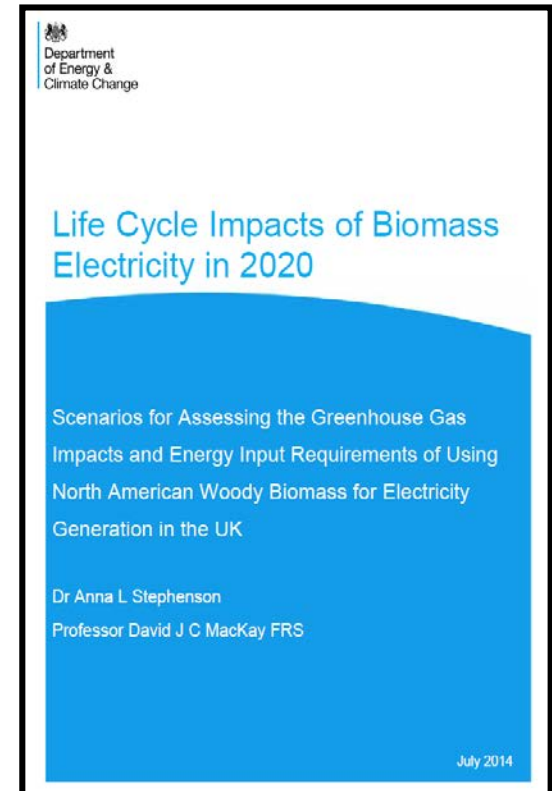
Availability of UK Biomass



UK Biomass Resource Scenarios

Previous Research from DECC

- 'Life cycle impacts of biomass electricity in 2020' sourcing biomass from N. America for UK power plants
- Analysis of the carbon balance of sourcing scenarios
- Comparison of using biomass for power generation in the UK vs. a series of counterfactuals



- Stephenson, A. MacKay, D. (2014) Life Cycle Impacts of Biomass Electricity in 2020. Department of Energy & Climate Change.

Collaborative Research Project

- Adapt and apply DECC's methodology.
- Evaluate the potential carbon impact of sourcing UK biomass resources.
- Focus on utilising these resources within heat bioenergy pathways.

Aims:

- Inform DECC's heat generation policy teams.
- Provide evidence for DECC's 2017 Bioenergy Strategy.
- Add further depth to the University of Manchester's UK biomass resource modelling research.



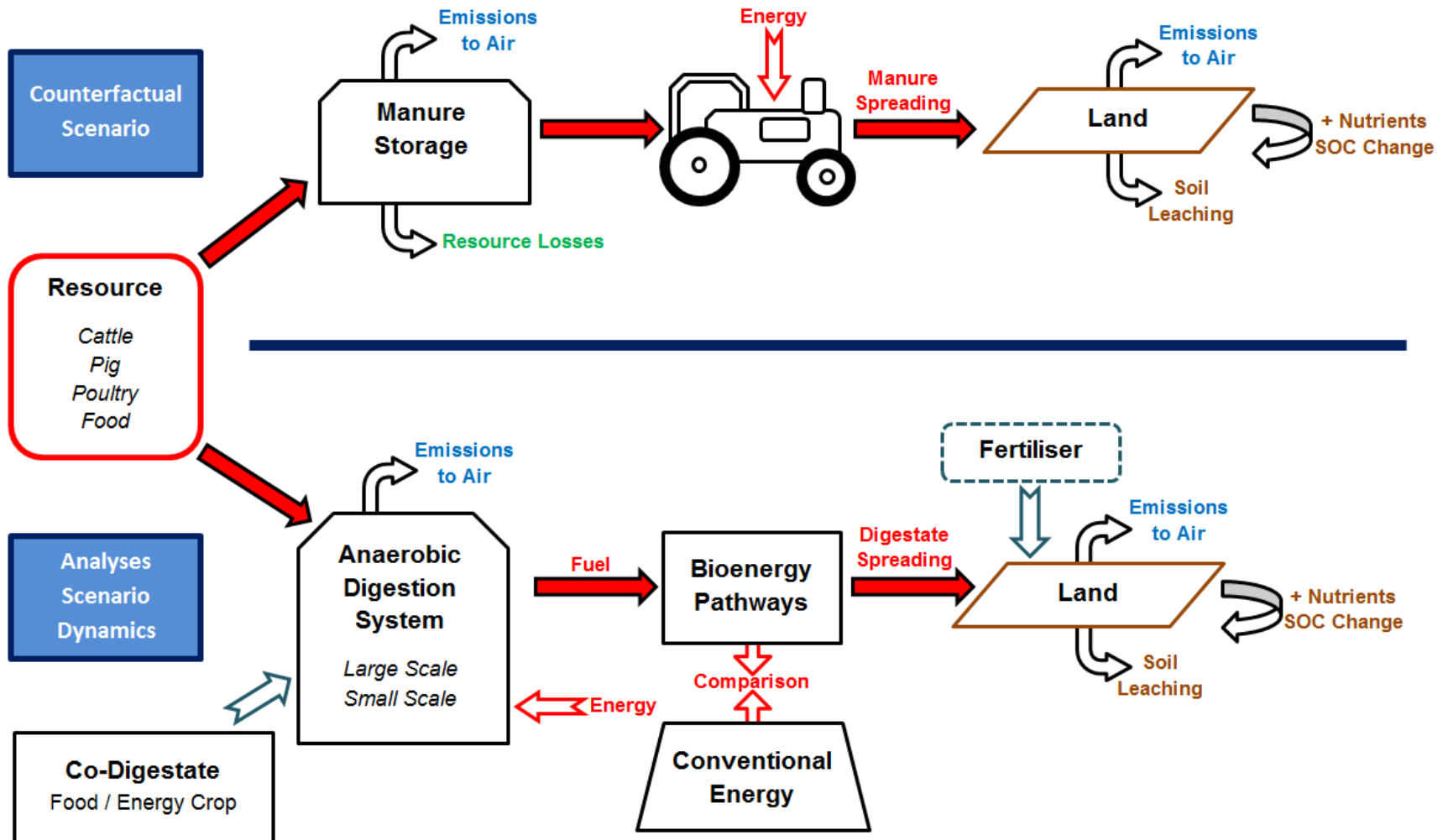
Bioenergy & Counterfactual Scenarios

Scenario	Resources Analysed	Counterfactuals
UK Agricultural Waste Resources	Wastes of agricultural processes such as manures, slurries, litter and also waste foods.	Fertilisers, Landfill, Composting
UK Agricultural Residue Resources	Residues of agricultural processes such as straws.	Returned / Remaining on Land, within Farming Processes, Products
UK Energy Crop Resources	Resources produced specifically for the bioenergy sector such as energy crops on land with alternative previous uses.	Remaining Un-harvested / Current States, Production of Wood Products.

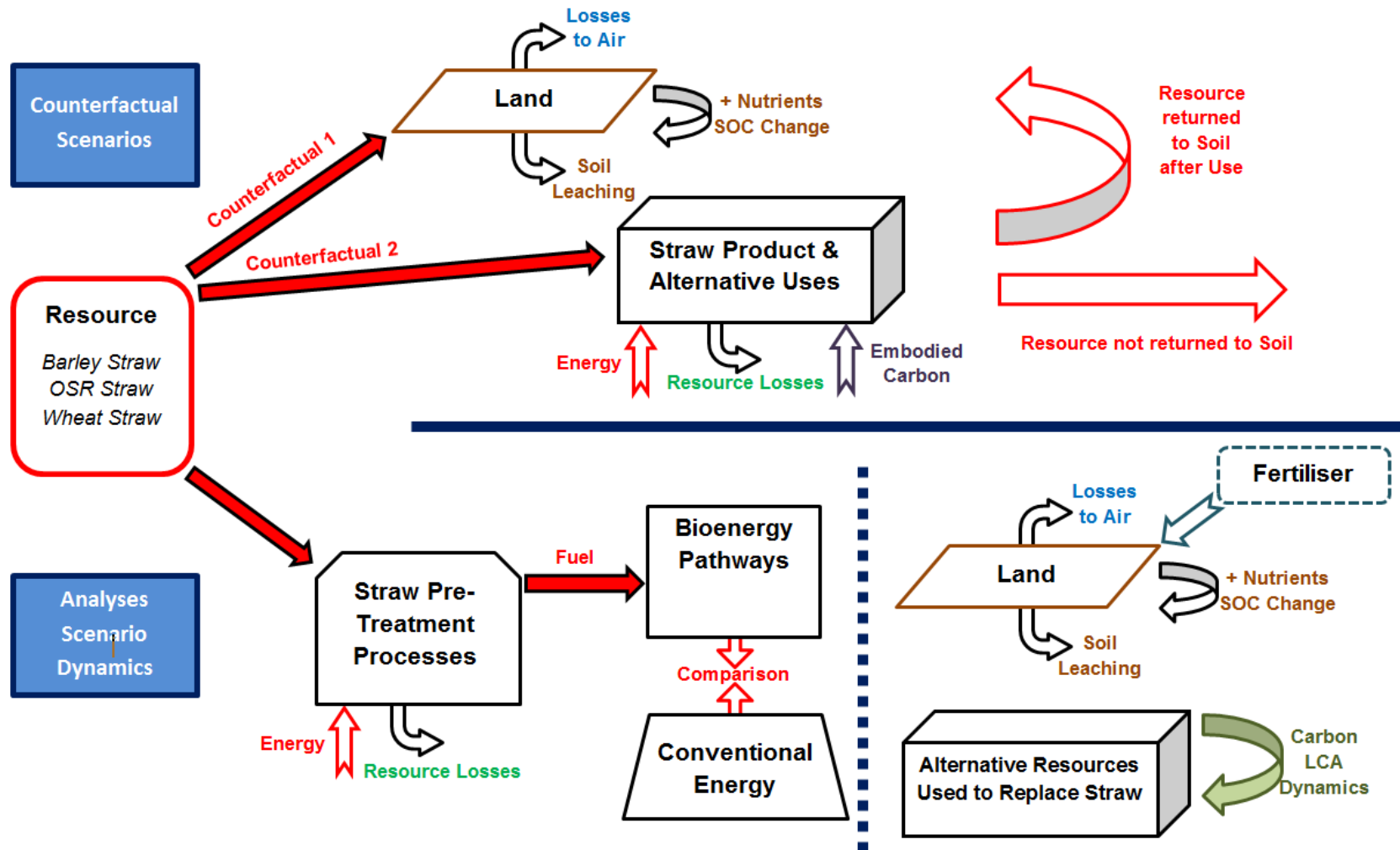
Consultation:

- DECC Engineering Teams
- DECC Policy Teams
- Forestry Research
- Forestry Commission
- Rothamsted Research
- Tyndall Centre Manchester
- Supergen Bioenergy Hub

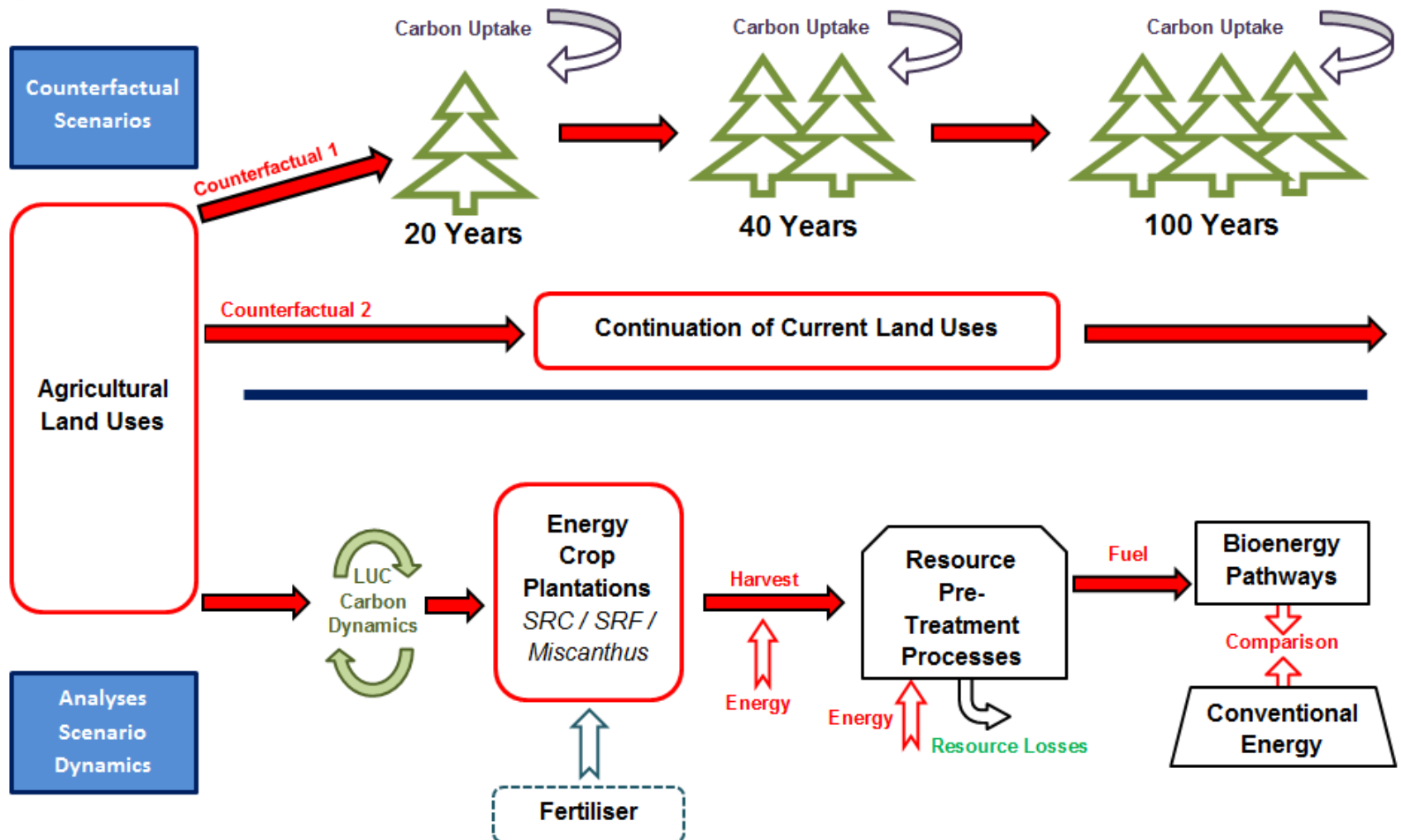
Agricultural Waste Scenario



Agricultural Residue Scenario



Energy Crops Scenario

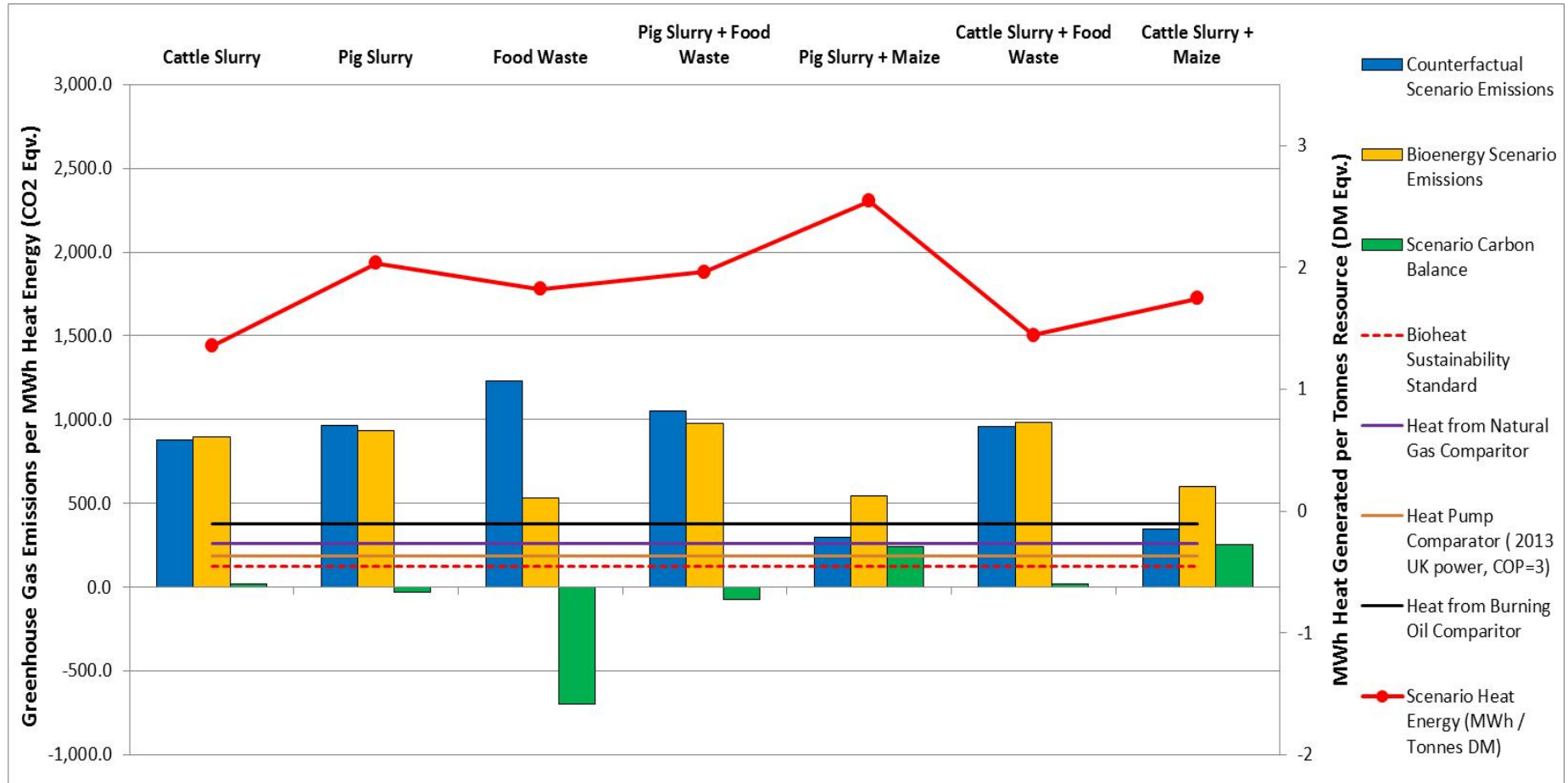


Preliminary Results – AD Pathways

Resources Analysed	Pig Slurry / Cattle Slurry / Poultry Litter / Waste Food / Pig Slurry & Food Waste / Pig Slurry & Maize / Cattle Slurry & Food Waste / Cattle Slurry & Maize
UK Farm System	Small Scale / Medium Scale / Large Scale / Average UK Farm
Heat Bioenergy Pathways	Biogas Boiler / Small Scale CHP / Large Scale CHP / Upgrade Biogas for Grid Injection
Counterfactual Scenarios	Spreading as Fertilizer (slurry/litter) / Landfill (food) / Composting (food) / Food Crop Displacement (maize)
Spreading Systems	Broadcast / Shallow Injection
Storage Systems	Lagoon / Open Tank / Closed Tank / Land Storage (covered) / Land Storage (uncovered)

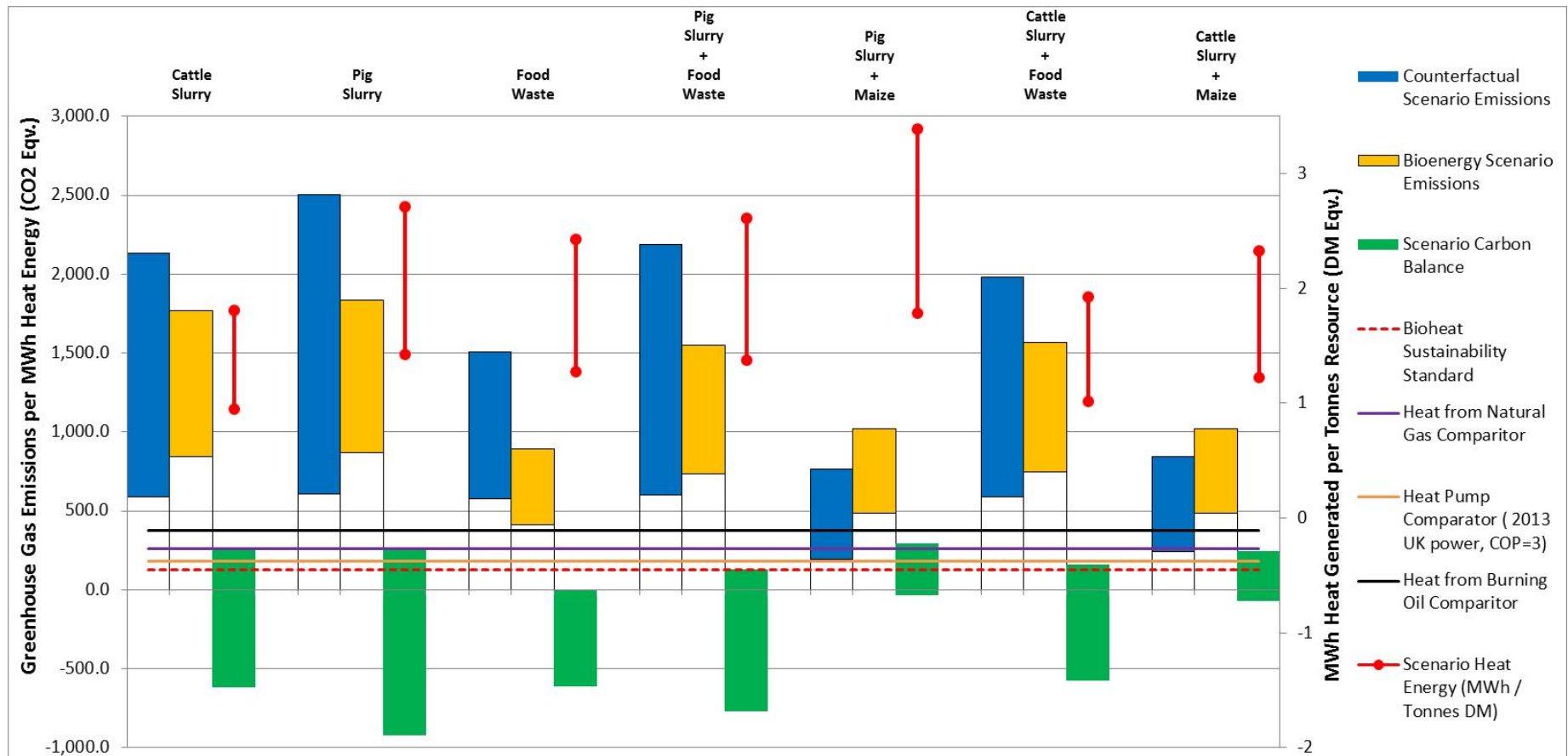
Default Scenario Options

Preliminary Results – AD Default Scenarios



$$\text{Scenario Carbon Impact} = \text{Bioenergy Scenario Emissions} - \text{Counterfactual Scenario Emissions}$$

Preliminary Results – Range of GHG Impact



Potential Range of Carbon Impact = **Range of Emissions from Bioenergy Scenarios** - **Range of Emissions from Counterfactual Scenarios**

Project Moving Forward

- Report covering all scenarios & pathways.
- Presenting GHG impact analysis ranges for scenarios
- Presenting GHG impacts of designed default scenarios
- Identification of UK resources & scenario variables with low / negative GHG impact.
- Identification of UK resources & scenario variables with high GHG impact.



Thank you

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