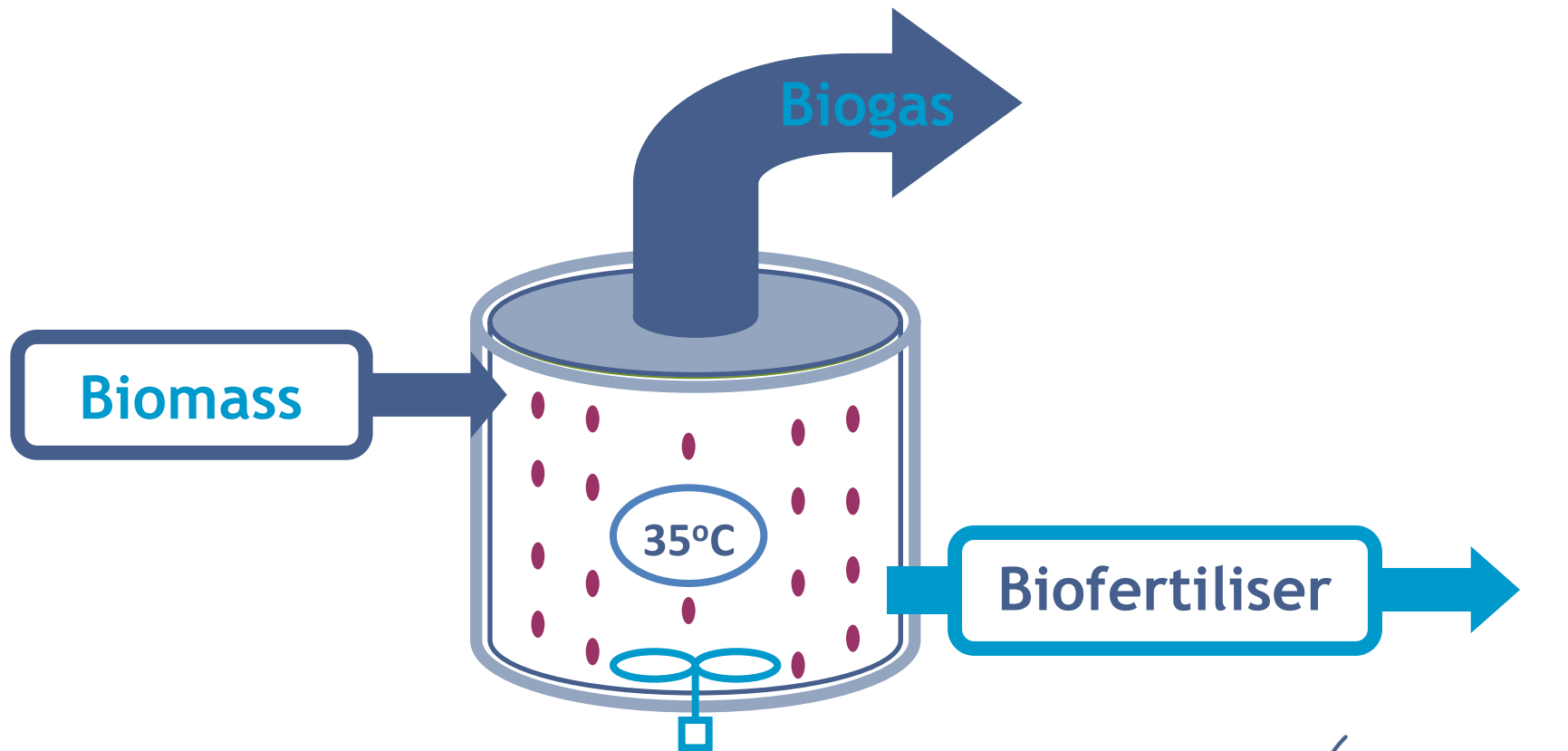


Commercial application of anaerobic digestion of food waste

Michael Chesshire

University of Southampton

Anaerobic Digestion a Natural Biological Process



4-Stage Process

1. Hydrolysis

2. Acidogenesis

3. Acetogenesis

4. Methanogenesis

Biodegradable Organic Material
(Carbohydrates, Fats & Proteins)

Soluble Organics

Acetic Acid

Propionic Acid
Butyric Acid
Long Chain VFAs

Acetic Acid

$H_2 + CO_2$

$CH_4 + CO_2$

Biomass for AD

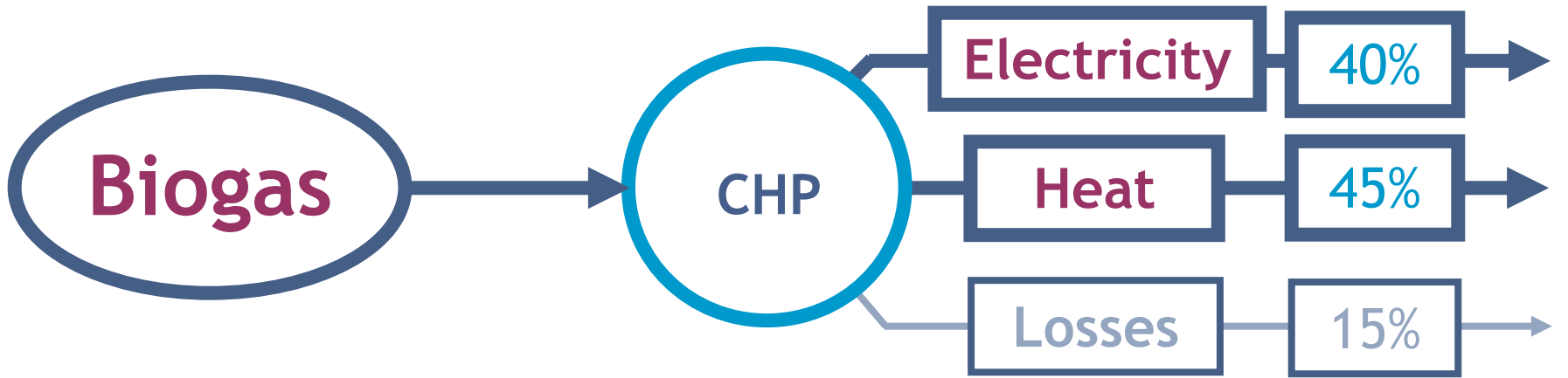
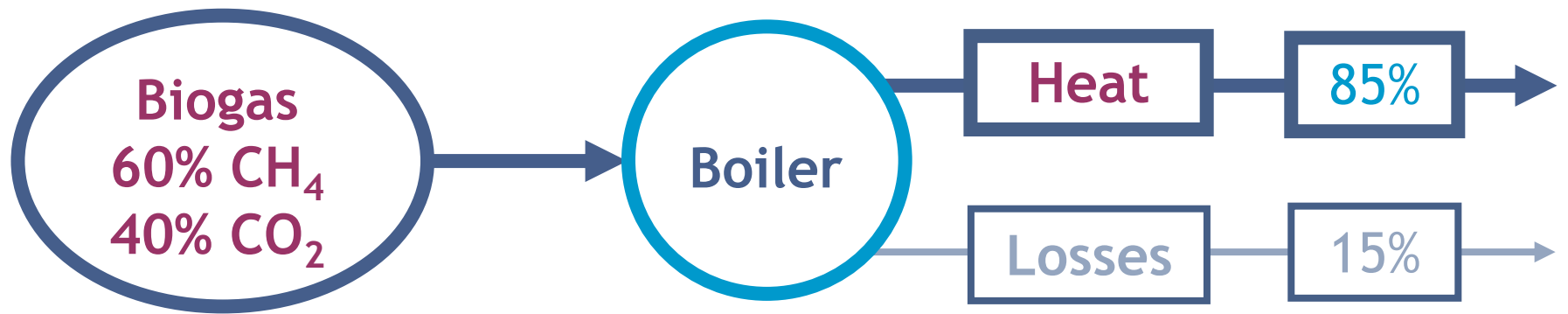
Livestock Manure

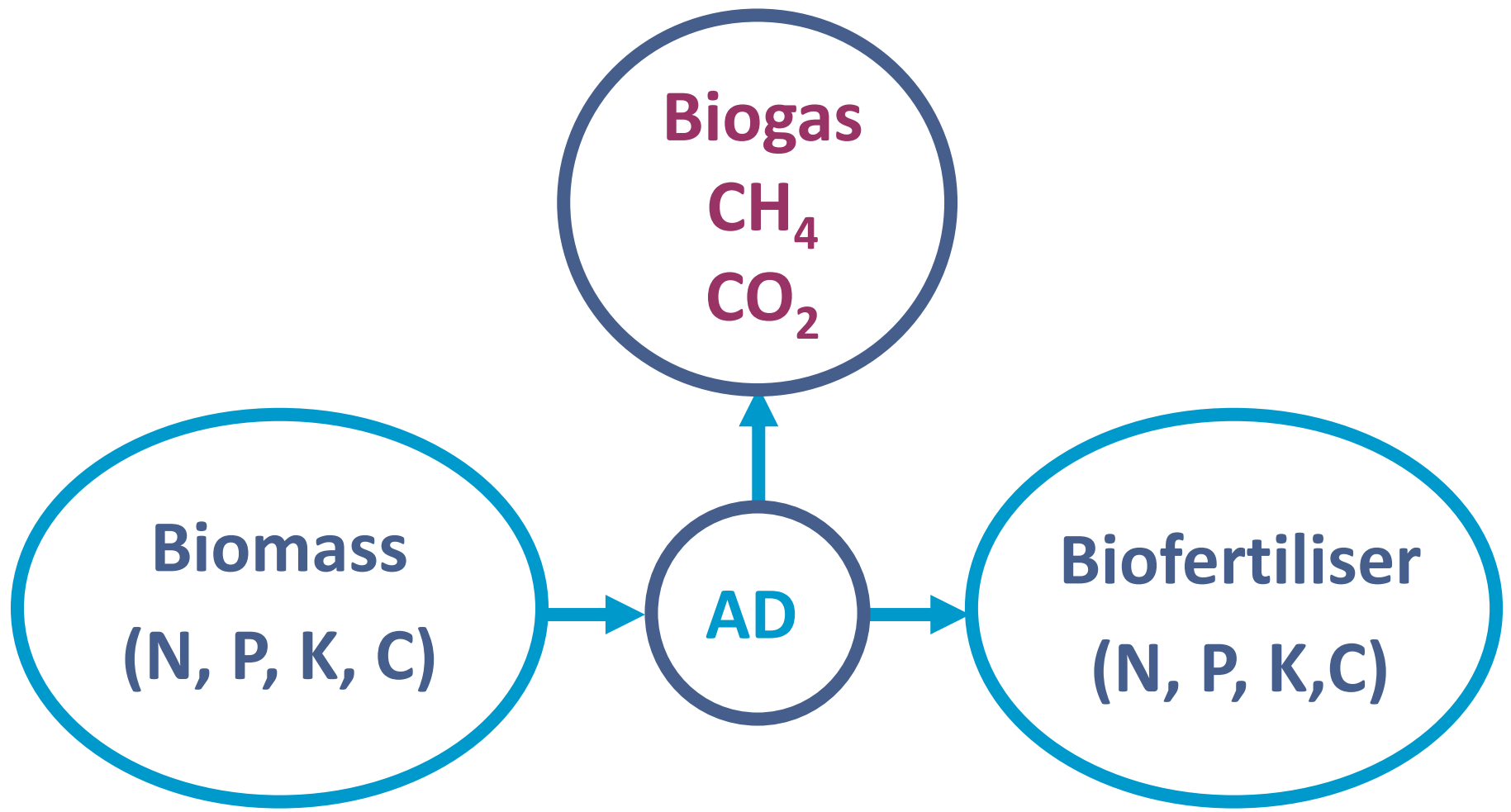
Farm Crops

Sewage Sludge

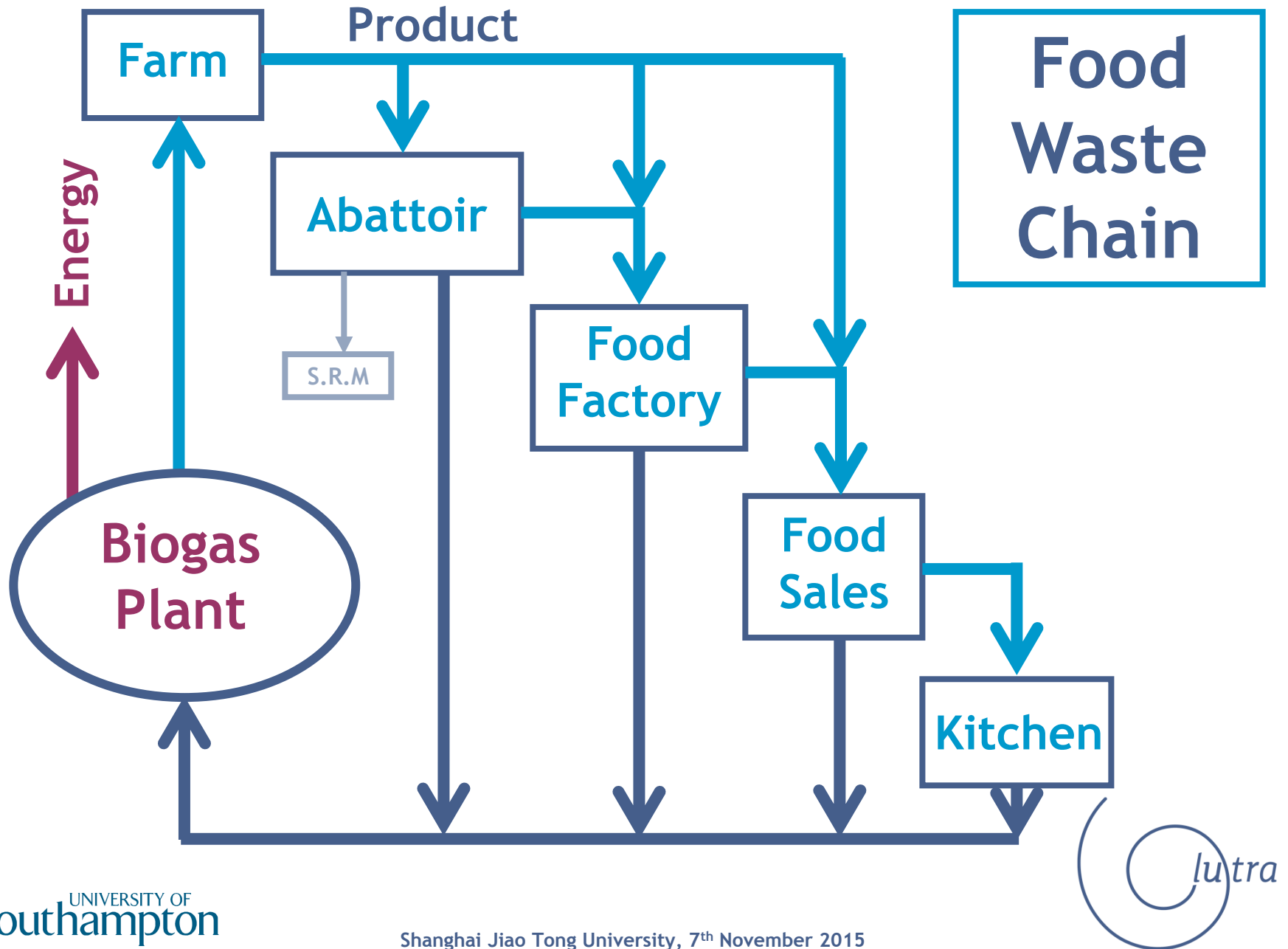
Food Waste

Fats & Oils





Anaerobic Digestion of Food Waste



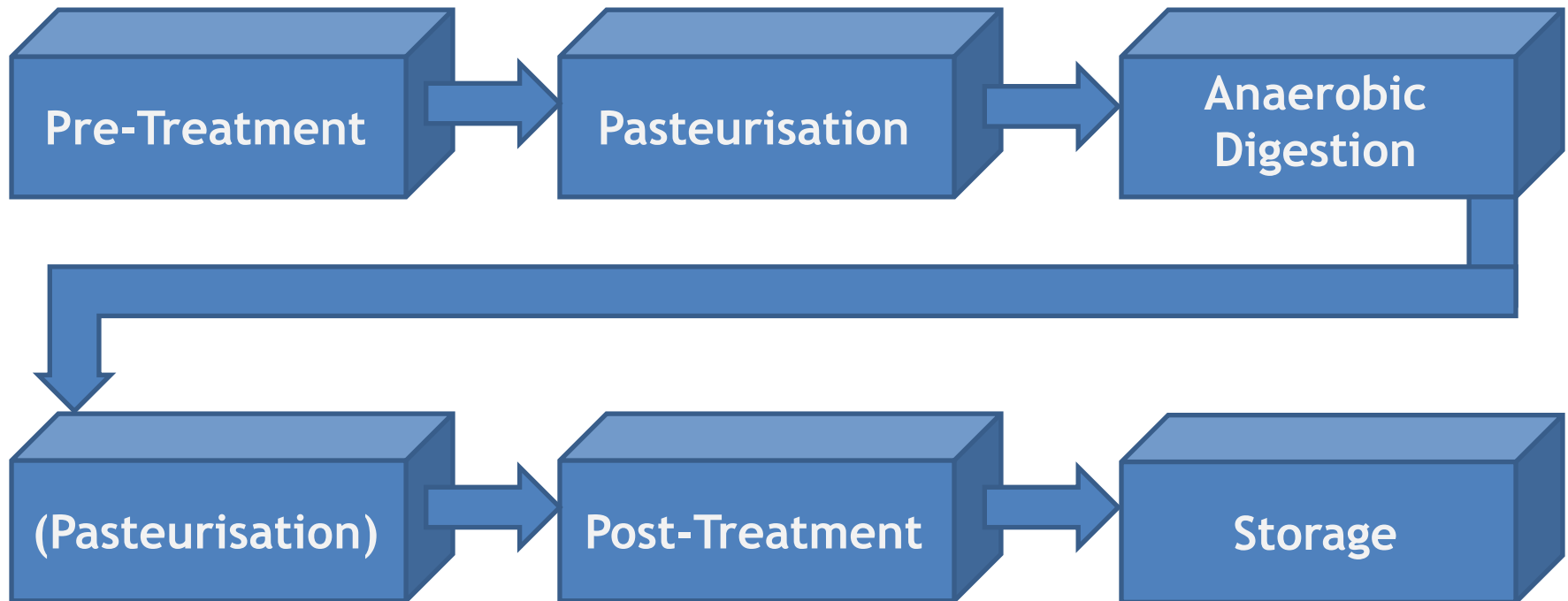
UK context

- UK has a population of 64m (30m households).
- Each household produces about 250kg of food waste per year, which is one third of food purchased.
- In total households produce 7.5m tonnes of food waste per year.
- +10m tonnes per year from commercial catering and food processing.
- Food waste must be diverted from landfill, and has the potential for the production of renewable energy and biofertiliser through anaerobic digestion.

UK potential from food waste

- 75,000 TJ of energy per year (which is about 3% of domestic gas consumption).
- 100,000 tonnes of nitrogen fertiliser per year (which is about 10% of consumption in agriculture).
- Avoided methane emissions from landfill.
- Reduction in GHG emissions of 1,000,000 tonnes of CO_{2eq}.
- Improved waste management.

Simple flowsheet



Food Waste R&D 1996 to 2003



1996 to 1998 - Restaurant Waste



1999 to 2001 - Kitchen Waste



2001 to 2003 - Pathogen Research



Biocycle food waste digester, UK



Kitchen caddy, corn starch bags & kerbside bin



50,000 tonne per year food waste digester, UK



Spreading biofertiliser on winter wheat



Farmer co-operative biogas plant, Denmark

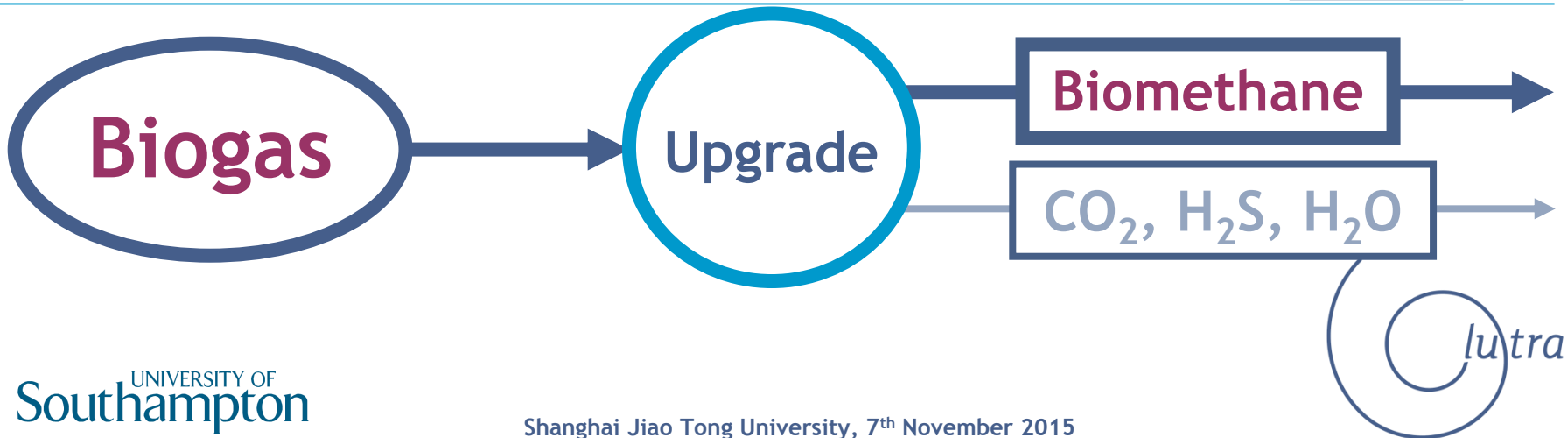
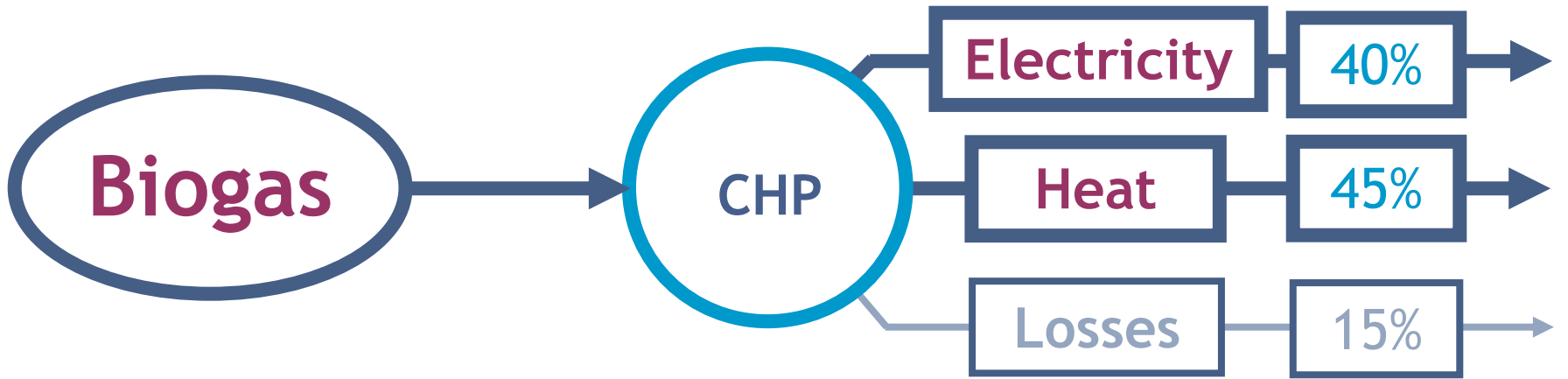
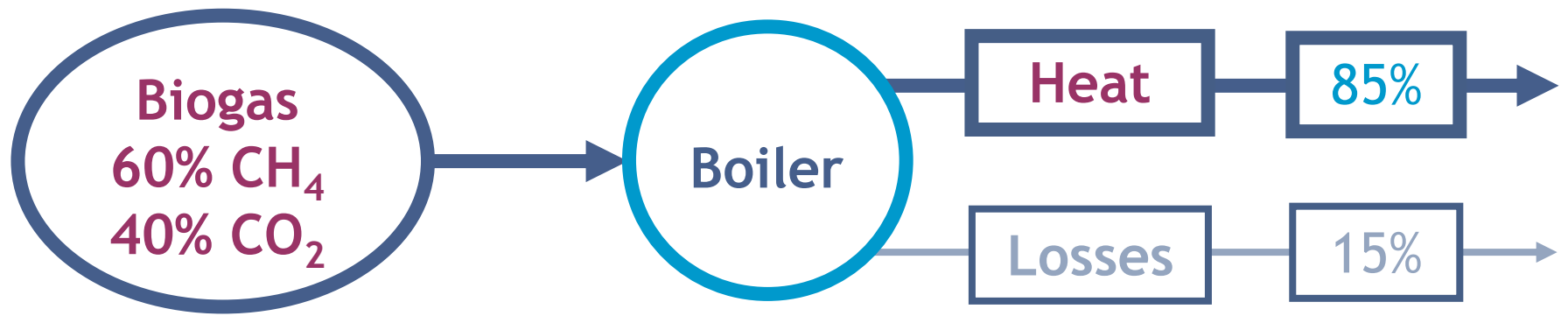


Barrett's Mill community food waste anaerobic digester, UK



Food waste collection from pubs & restaurants

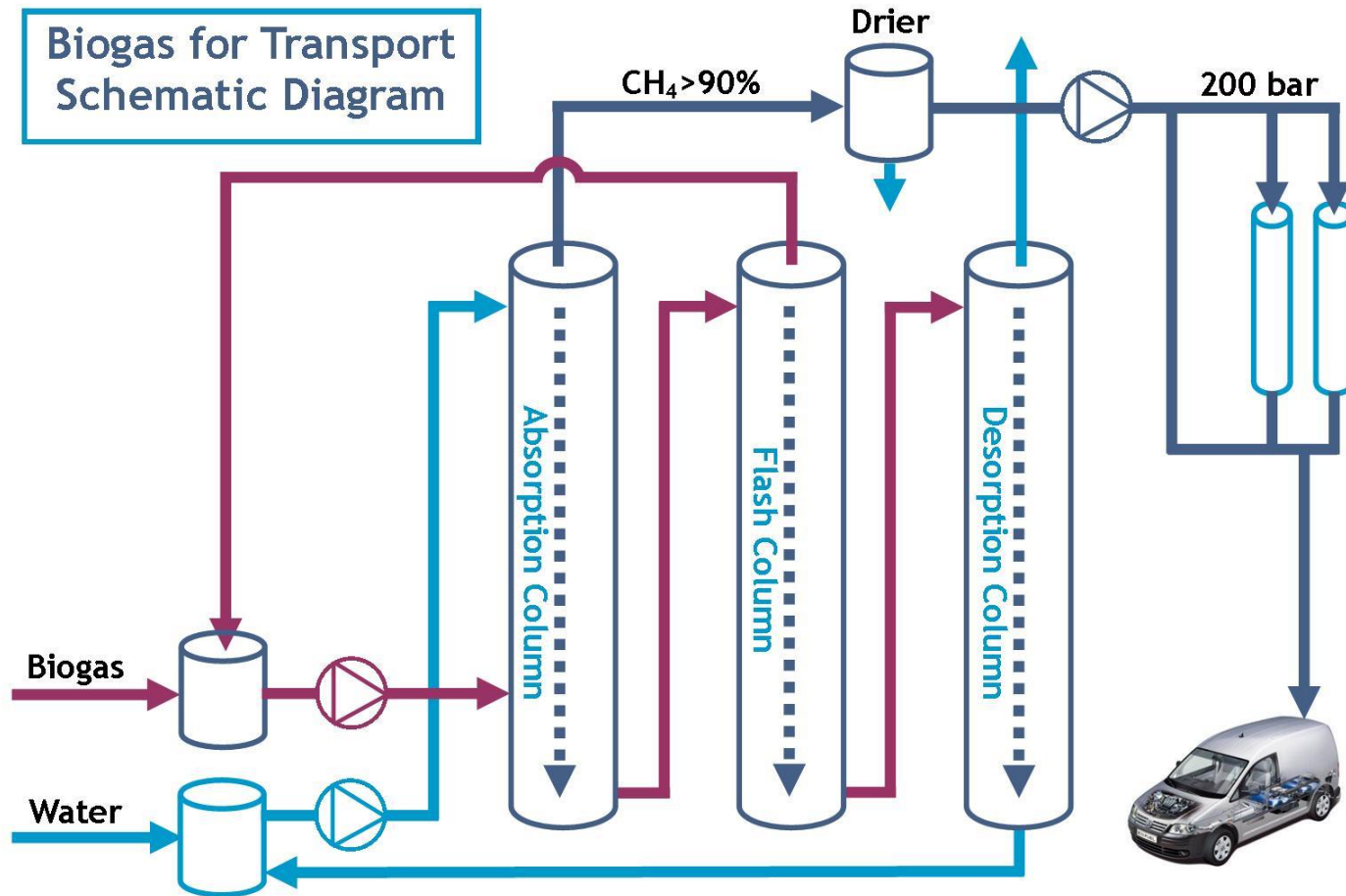
Biogas Utilisation





Combined Heat & Power (CHP) units

Biogas for Transport Schematic Diagram





Biogas upgrade plant



Biomethane bus, Sweden

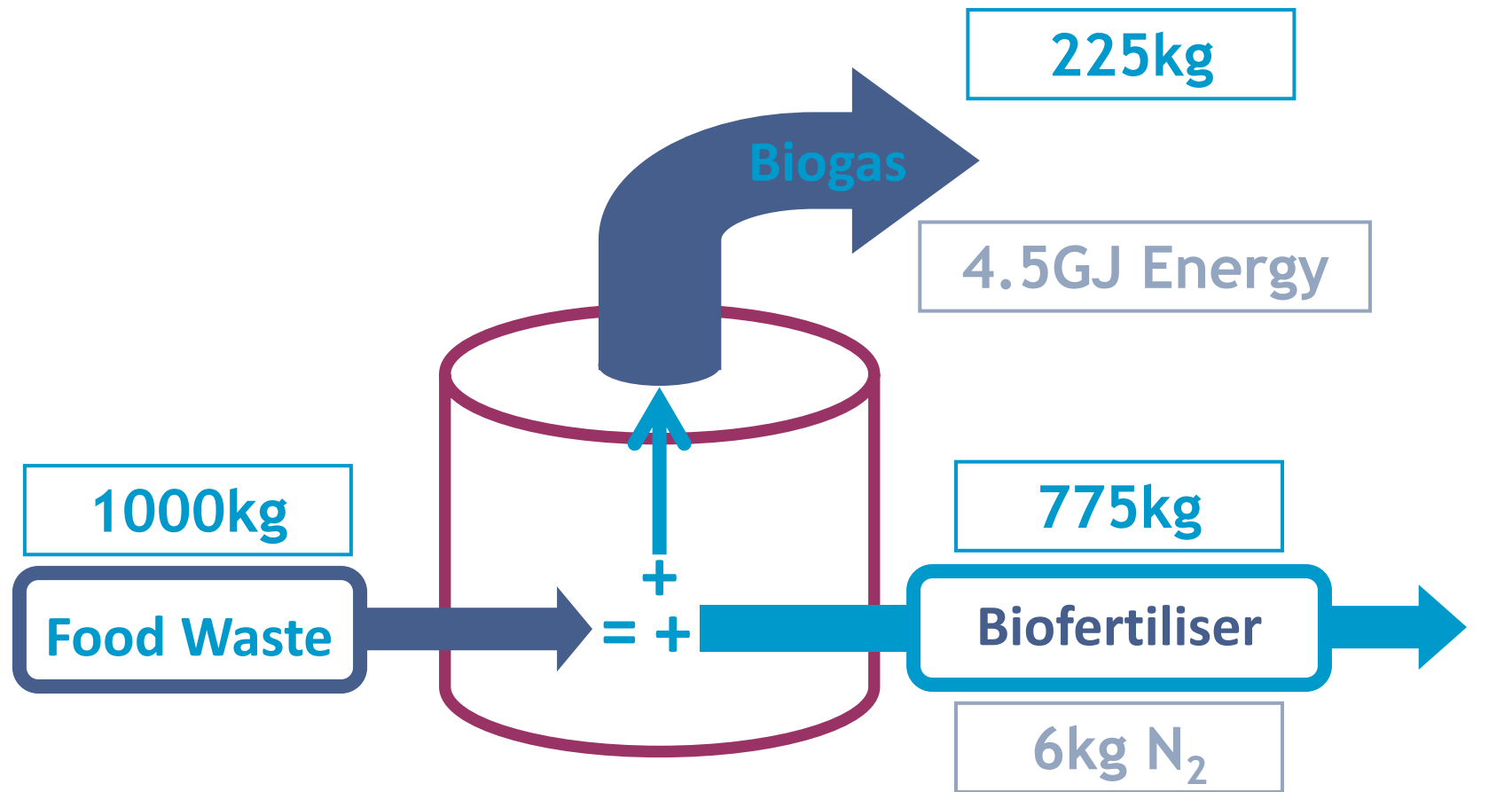


Biogas Filling Station, Finland



CNG taxis, Dehli

Mass Balance



Conclusions

- Food waste is a resource.
- Anaerobic digestion of food waste produces energy.
- Plus fertiliser.
- Putrescible waste is controlled.
- Separating food waste enables dry recycling.
- GHG emissions are reduced.

Thank you

