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SOUTH AFRICA 2025

Solidarity
Equality
Sustainability

BIOENERGY FOR INDUSTRIAL AND HOME SCALE SOLUTIONS

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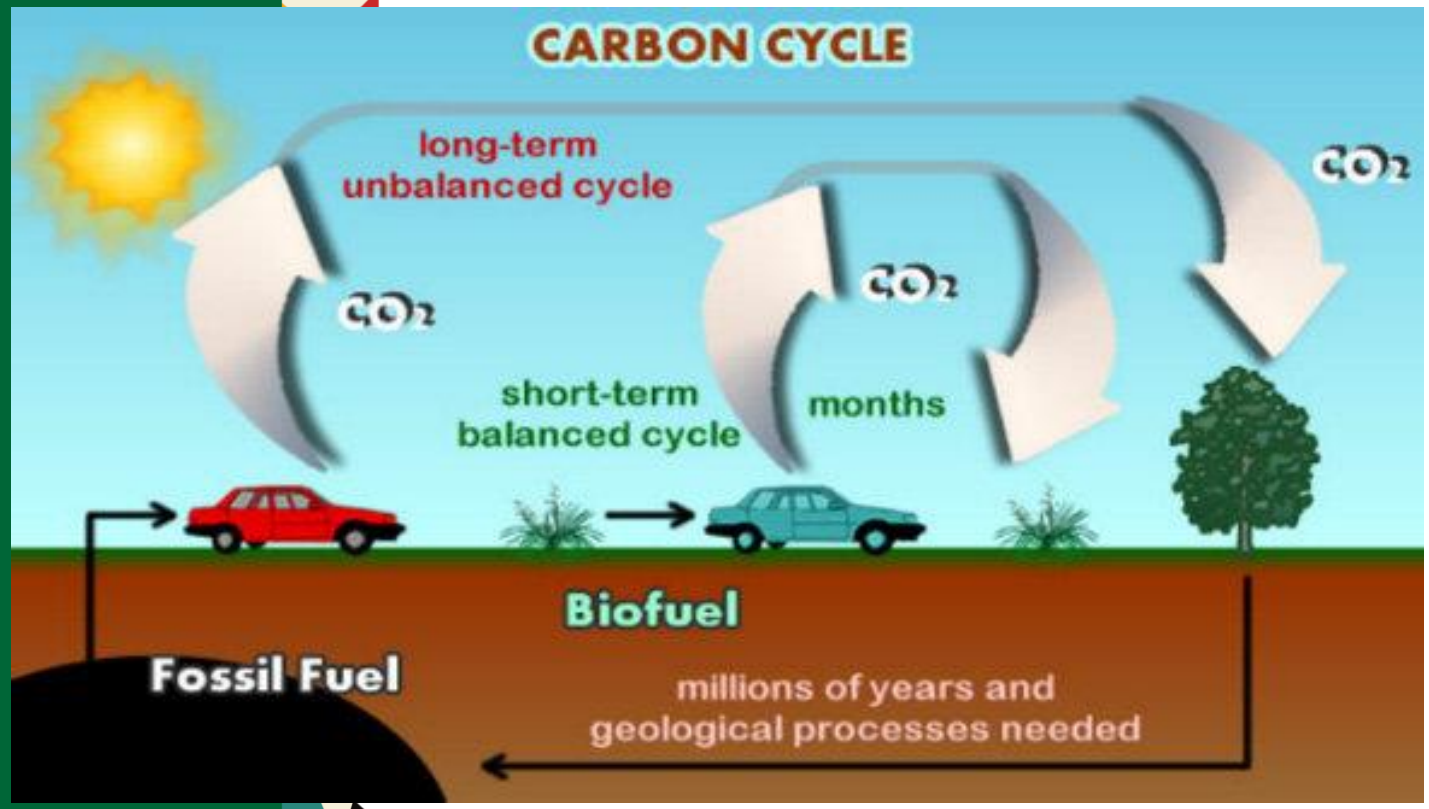
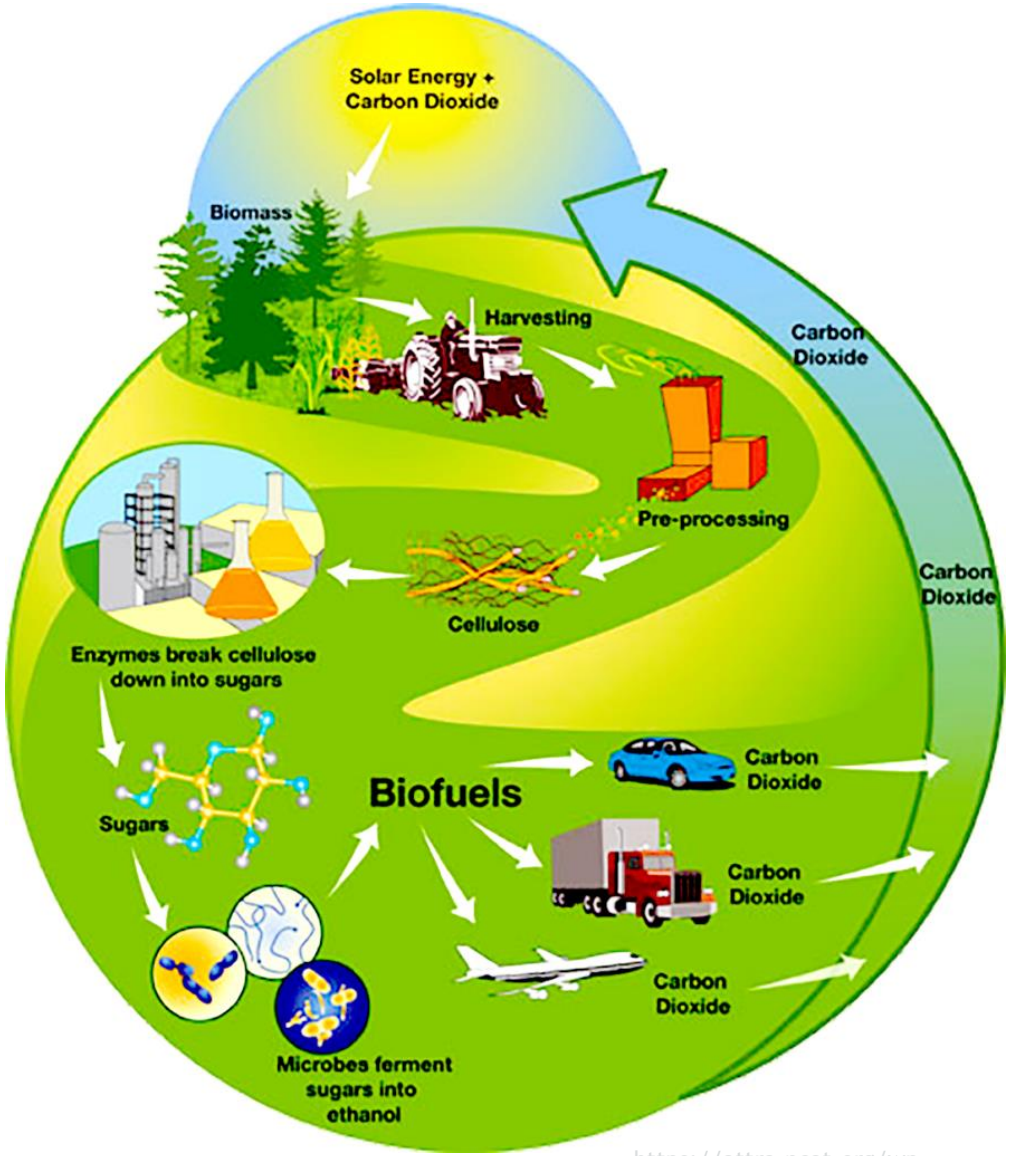
CARBON CYCLES





https://attra.ncat.org/wp-content/uploads/2022/11/cellulosic_biofuels_and_carbon_cycle-896x1030.jpg

COMPETING BIOMASS APPLICATIONS

- Bio-energy has found application in **electricity**, **transportation fuels** and industrial/domestic **heating**
  - Some of these dominatred by **more cost-effective options** for renewable energy, e.g. solar/wind-electricity
- **Prioritise future biomass applications** for products that require a **sustainable source of carbon**.
  - Sustainable aviation fuels, biofuels for long-distances, industrial-, household- and cosmetic chemicals, food products, bioplastics, etc.
- **Sustainable carbon captured from the atmosphere** by growing plants or algae remains as the most affordable option.

TYPES OF BIOMASS FOR ENERGY

- "First generation" (1G) crops
  - Vegetable oils, starch grains, sugar/molasses
  - Food and non-food crops
- Lignocellulosic biomass ("second generation"- 2G)
  - Both agricultural residues and energy crops
  - Pulp wood, timber, construction, animal feeds
- Municipal, industrial and organic wastes
- Algal biomass ("third generation" – 3G)

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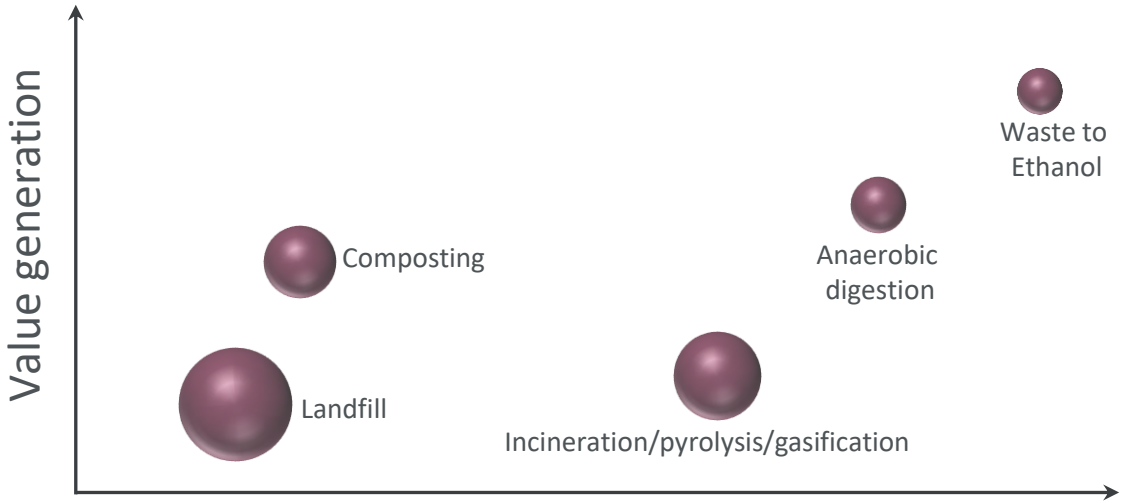
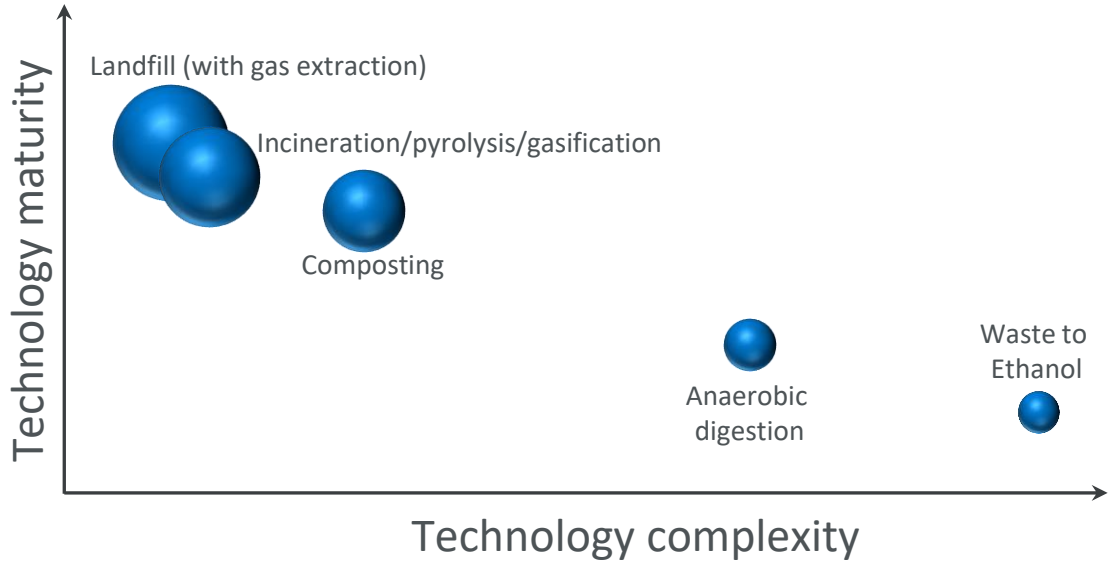
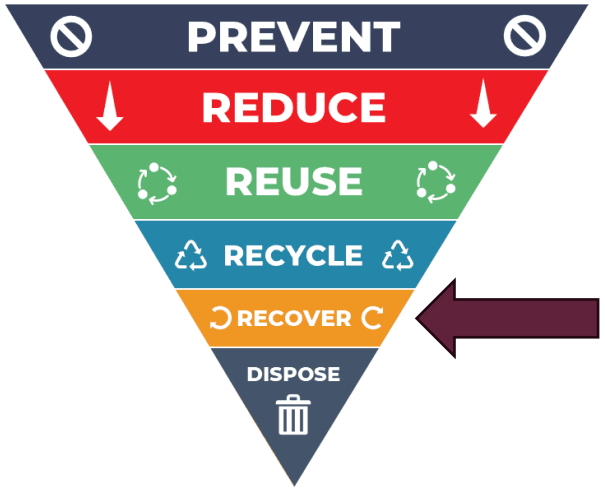
CONVERSION OF BIOMASS OR ORGANIC WASTES TO ENERGY







- Waste-to-ethanol through fermentation in the newest, with highest-value product

FERMENTABLE WASTES GOING TO LANDFILL

- **Paper sludge**
  - Various mills, recycling and virgin pulp
- **Paper end-products**
  - Label backing paper, multi-layer packaging, paper sacks, newspapers and magazines
- **Various food wastes**
  - Diary, ice cream, baby food, chicken food waste, pet food, tinned food (e.g., beans)
  - Requires diverse processing strategies
- **Clothing and textile waste**

WASTE-PAPERS AND BAGASSE RESIDUES FOR ETHANOL FERMENTATION

Residues of
sugarcane bagasse

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TECHNOLOGY POTENTIAL

Waste/Product stream*	South Africa	Internationally
Paper sludge	0.5 million tons	62.5 million tons
Food waste	10 million tons	1.3 billion tons
Potential ethanol	940 million litres	1 154 billion litres

*Values on annual basis

Conclusion

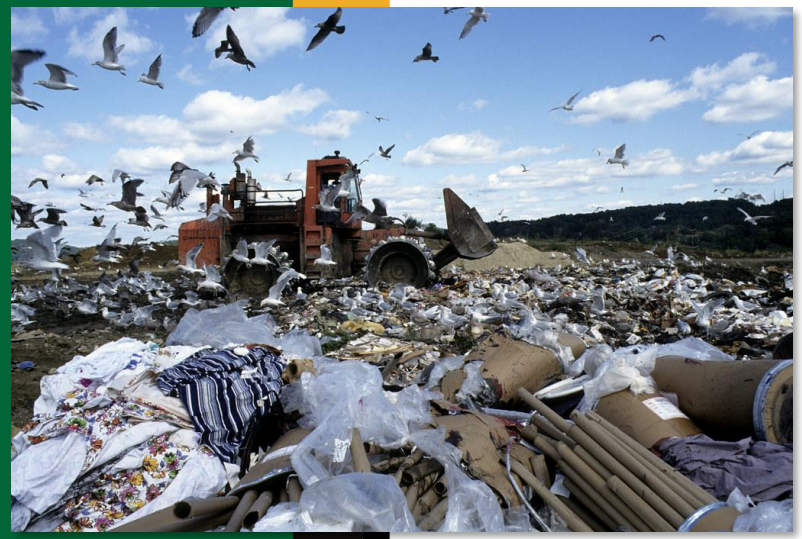
- Massive potential for global roll-out of technology
- Access to different local & international markets

Global paper sludge production

Source:
Paper sludge
South Africa: Boshoff et al. (2016)
International: DBG Bio Energy
Food waste
South Africa: WWF
International: WFP

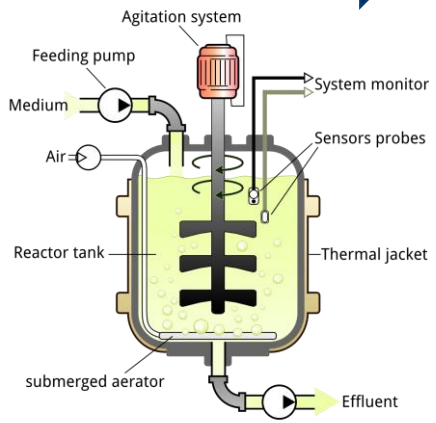
INNOVATION PATHWAY

Paper sludge waste



Food, packaging, textile, organic wastes

Technology Demonstration

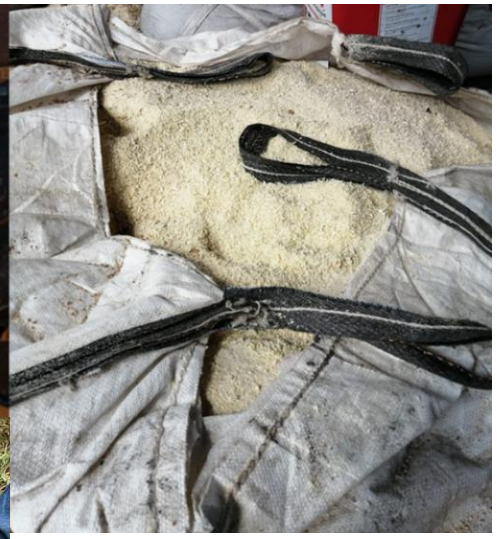


Sustainable aviation fuel

Drop-in fuel

MOBILE DEMONSTRATION PLANT FOR FERMENTATION OF ORGANIC WASTES

MACERATION AND THERMAL STERILISATION



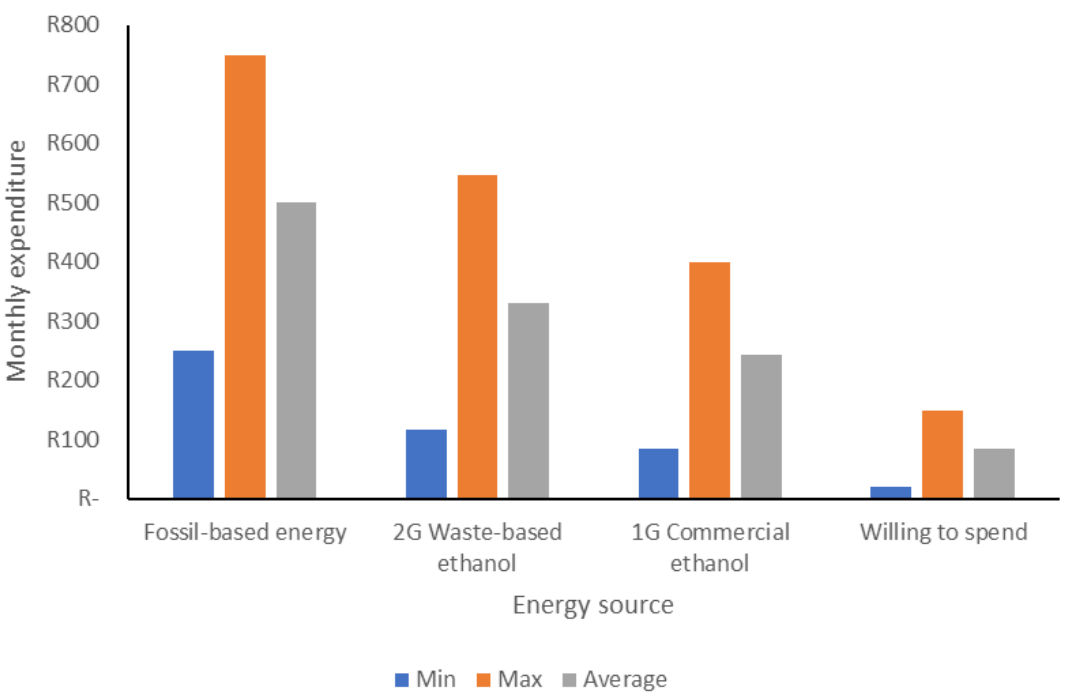
WASTE-BASED ETHANOL FOR DOMESTIC COOKING

- 50 households in Tembisa Township
- 2-month pilot study
- UK-funded
- Interdisciplinary study
- Create ethanol ecosystem

The Green Business College

Building Prosperity, Merging Green Skills With Business Know-How

WASTE-BASED ETHANOL FOR DOMESTIC COOKING



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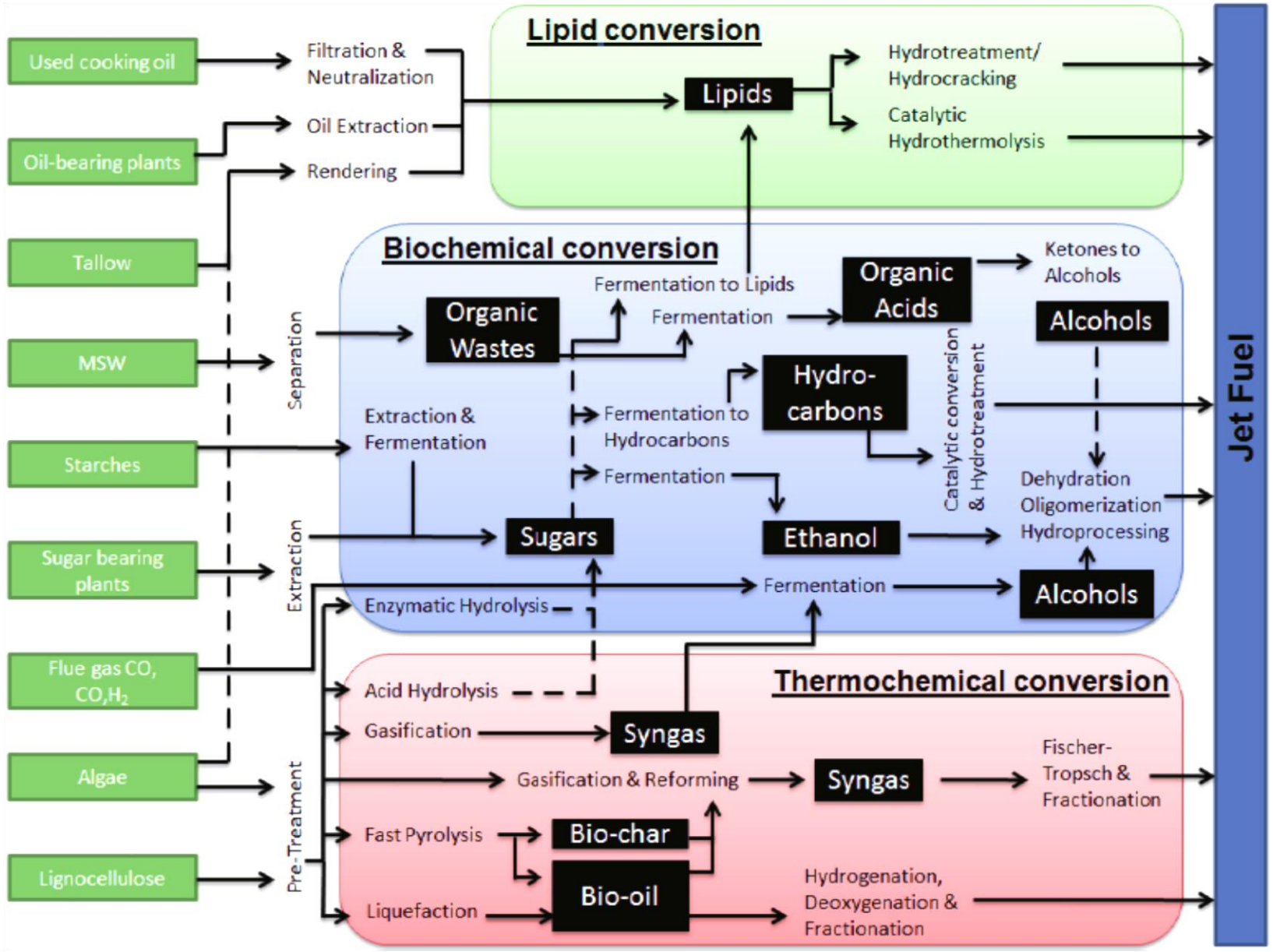
SUSTAINABLE AVIATION FUEL (SAF)



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Thank you