Global Biodiesel Focus 2015

Waste oils as resource of biodiesel

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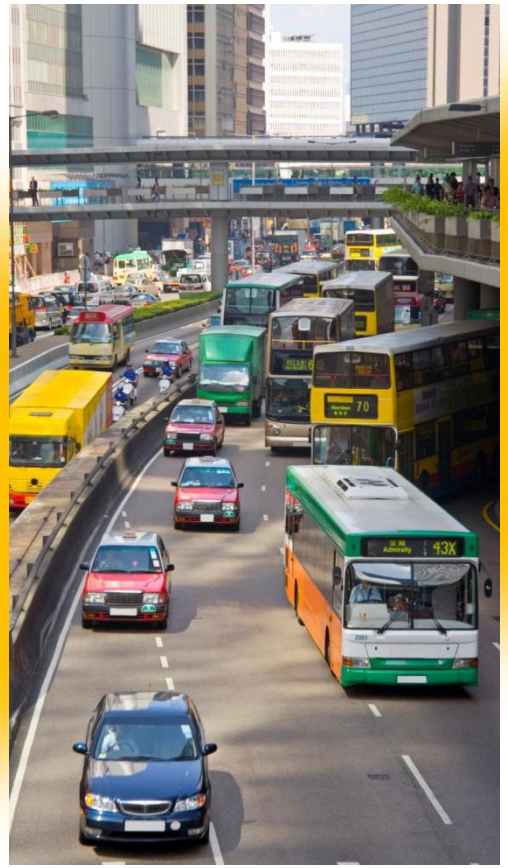


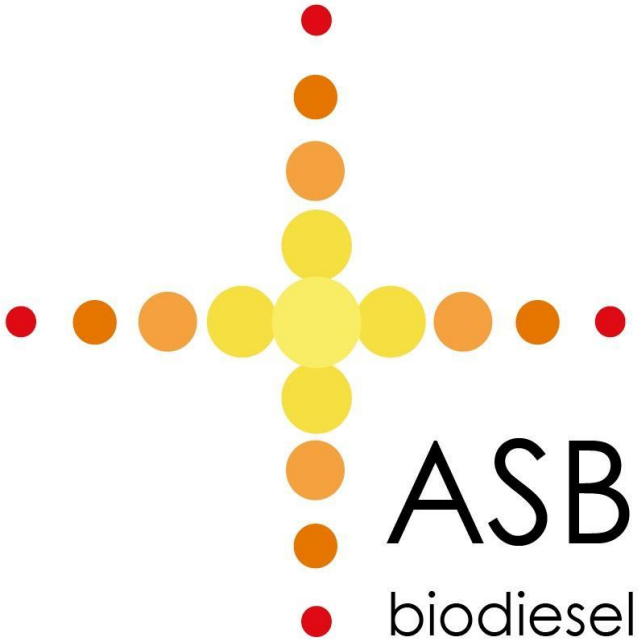
ASB
biodiesel

2nd generation biodiesel

ASB Case Model in Hong Kong

Case Model: ASB Biodiesel (Hong Kong) Ltd

Lead investor	Al Salam Bank Bahrain
Locations:	Hong Kong, Malaysia, Singapore
Production capacity:	100,000 tons / year
Technology:	Integrated GTW, WWTP and biodiesel plant: pretreatment, high FFA esterification, distillation, biogas
Feedstock:	Waste cooking oil, gutter oil (grease trap oil), waste animal fat, other waste oils.
Fuel Quality:	EN14214/ASTM 6751/China B100 standard



Biodiesel plant

2nd generation biodiesel Feedstock

Used Cooking Oil

Potential

- 5kg/person/year

Challenges

- Illegal food recycling
- Animal feed applications
- Low entry barrier for collectors. Existing network
- Reasonably low technology requirements

Outlook

- Limited growth opportunities mature market

Grease Trap Waste

Potential

- 2kg/person/year

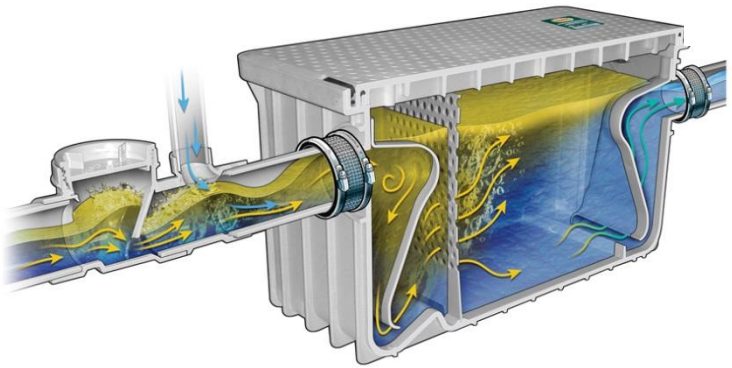
Challenges

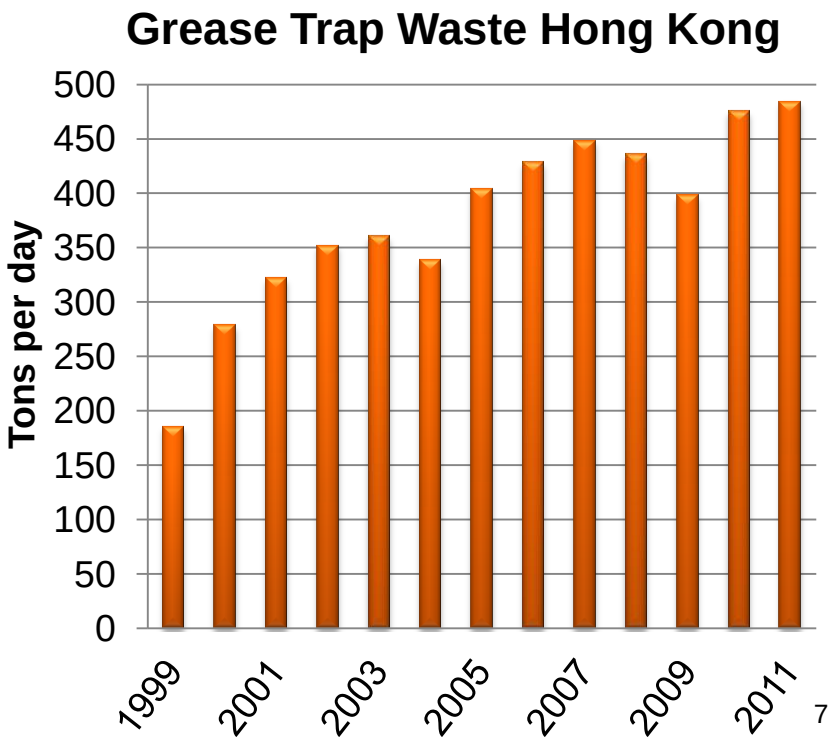
- Hazardous, Basel Convention
- High acidity, high polymerization, high sulphur content.
- Low yield for illegal operation.
- Vehicle, government control: higher entry barrier for service providers
- High technology, waste water treatment and government control: high entry barrier for biodiesel producers

Outlook

- High potential limited by deployment of grease traps and local treatment

Source: http://plasticgreasetrap.com/, EPD: Monitoring of Solid Waste in Hong Kong, 2011.





Animal fats

Potential

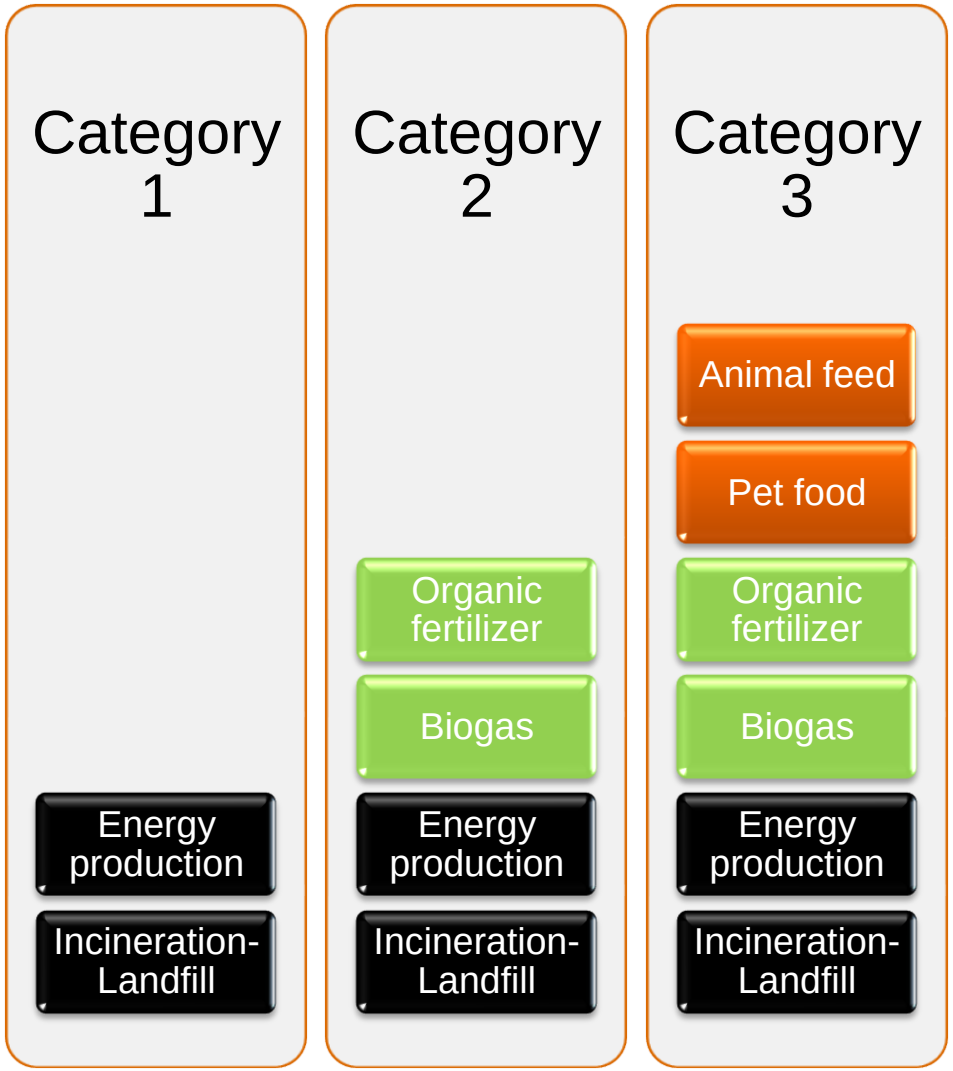
- Non food-feed quality: 1kg/person/year

Challenges

- Categorization
- Distributed generation of bone and meat residue
- Sulphur, polyethylene, protein

Outlook

- Limited potential at competitive price, except in very low quality streams

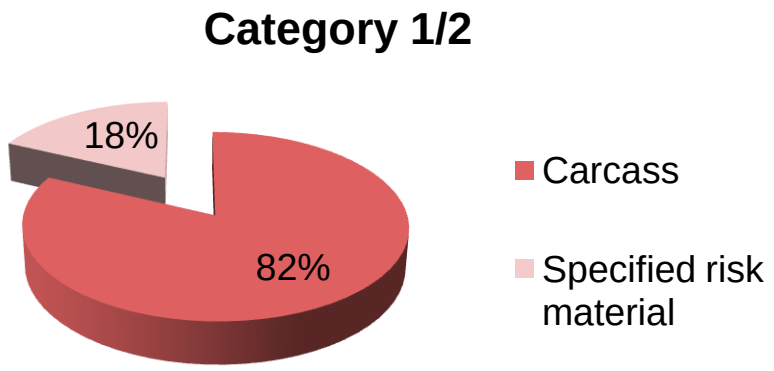


Animal fats: case study Spain (47M Hab)

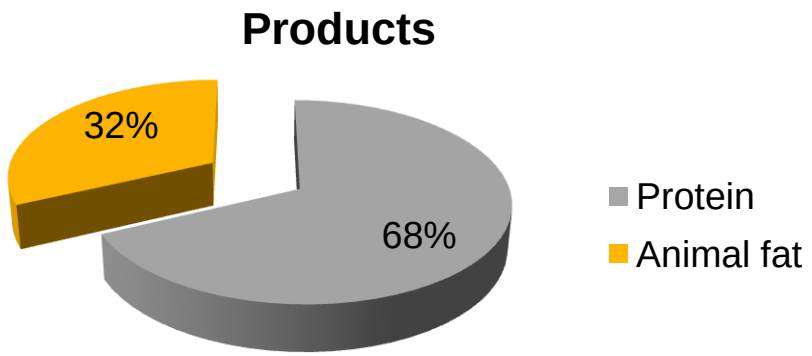
Animal fat category 3: 385,000 tpy

Animal fat category ½: 52,500 tpy (12%)

Raw Material (1/2)	Ton
Carcass	385,000
SRM	83,800
Total	468,000



Products	Ton
Protein	107,000
Animal fat (cat 1/2)	52,500 (11%)
Total	158,500



Sludges

Potential

- Mill effluent: 50-100 tons/month of recoverable oil

Challenges

- Existing collector network, some with shore tank (bulk delivery), but generally distributed
- High PFAD price has driven other high FFA material cost up
- High technology requirements: FFA, sulphur and oxidized/polymerized

Outlook

- High potential, if supply chain is rationalized

Sources in Hong Kong

Potential

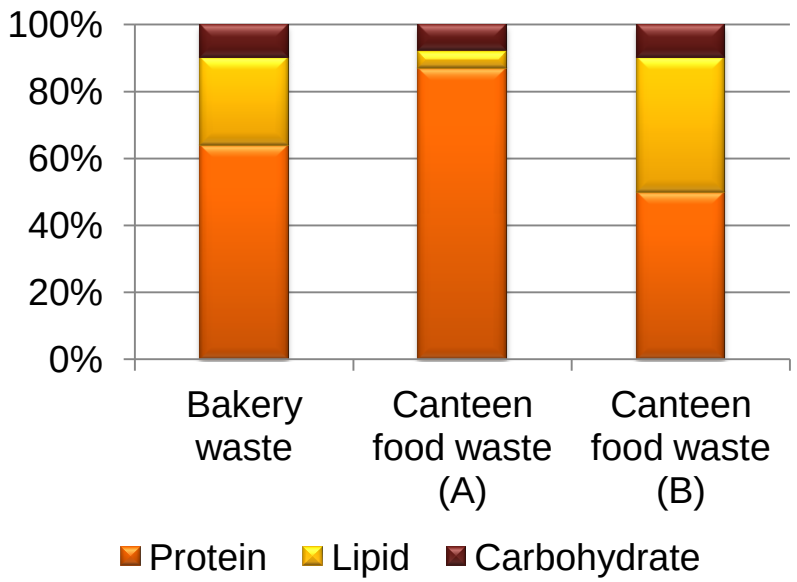
- 3,600 TPD food waste in Hong Kong

Challenges

- Technology development
- Efficient segregated sourcing
- Variable lipid conent
- Valorization of protein and carbohydrate

Outlook

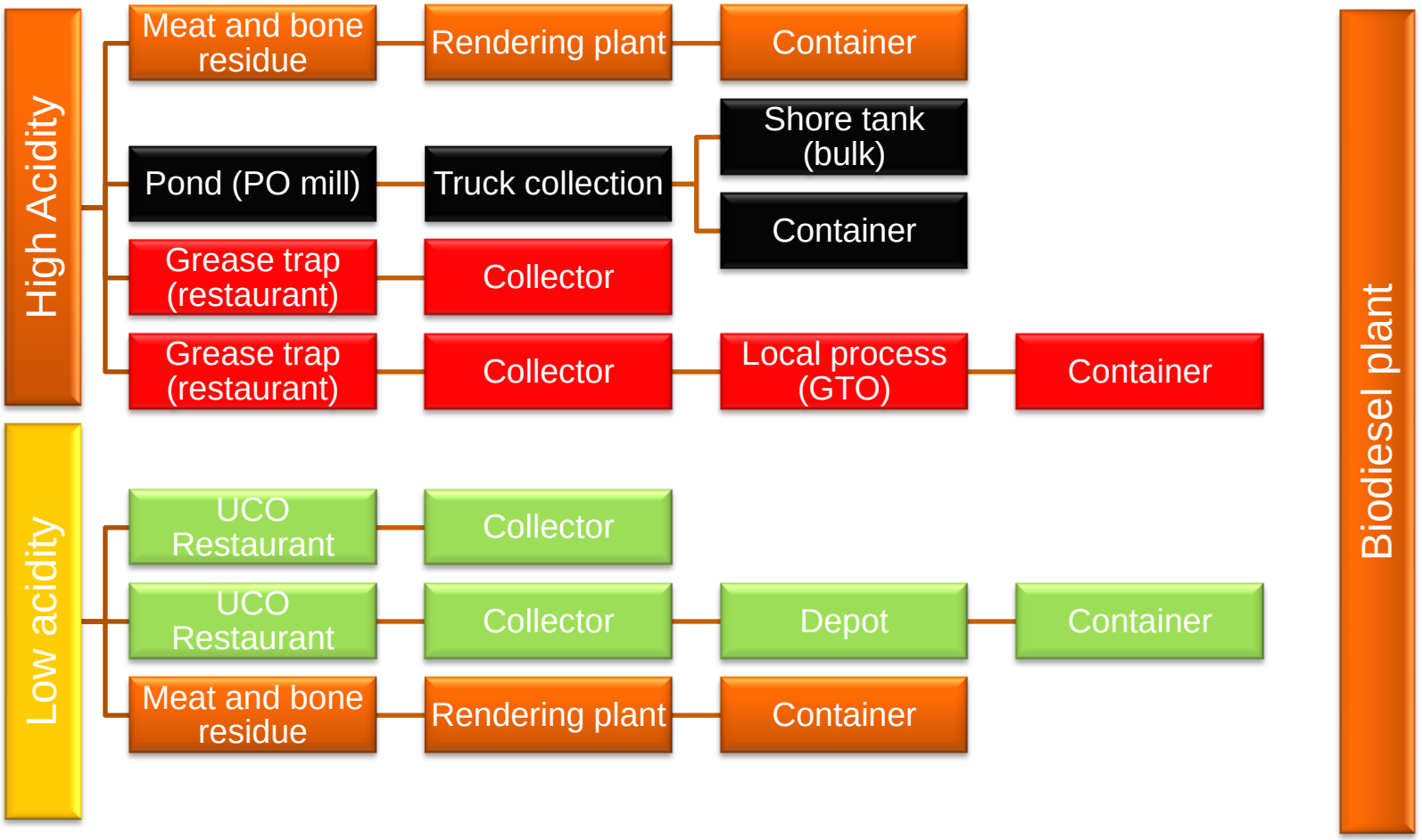
- High potential, with sufficient scale



Source: Lipids from food waste as feedstock for biodiesel production: Case Hong Kong
Sanjib Kumar Karmee and Carol Sze Ki Lin, lipid technology September 2014, Vol. 26, No. 9

2nd generation biodiesel Supply Chain

Supply chain



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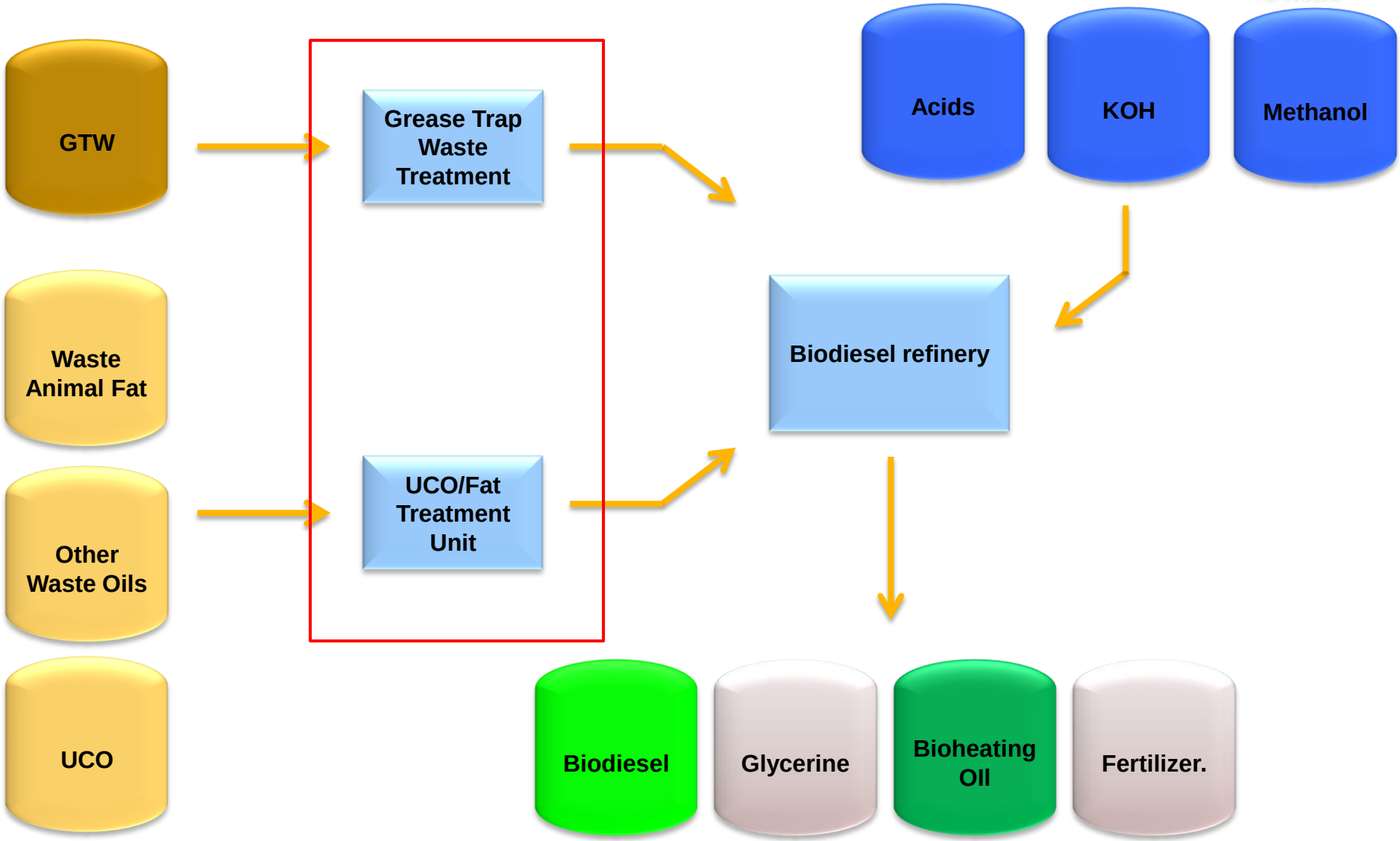
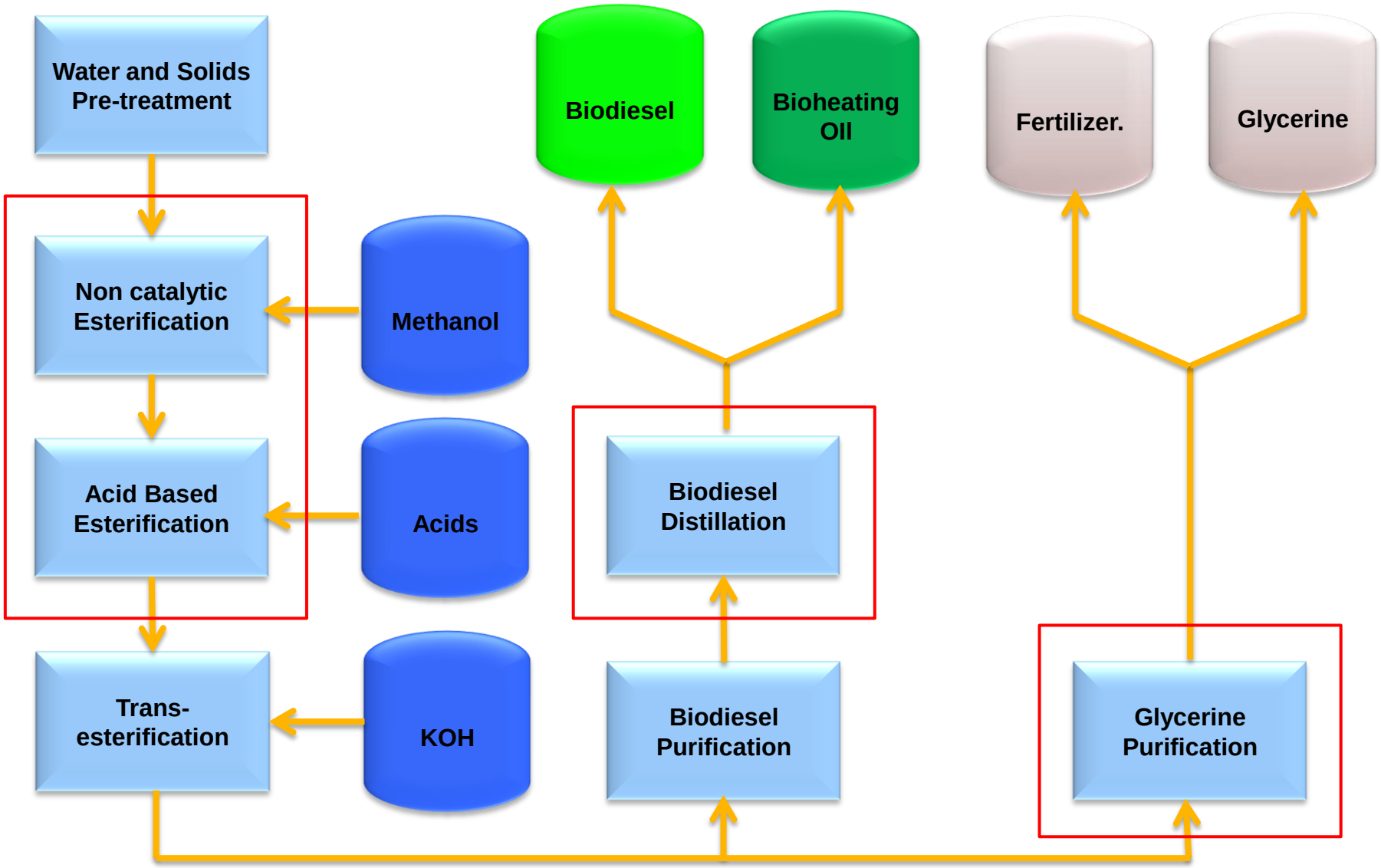
2nd generation biodiesel

Process Design

Production Process Overview (1) – Input and Outputs



Production Process Overview (2) – Input and Outputs



Production Process Overview (3) - Re-use of By-products for energy

Waste Oil

Grease Trap Waste Treatment

UCO/Fat Treatment Unit

Oil

Biodiesel refinery

Waste Water

Waste Water Treatment Plant

Bioheating Oil

Biodiesel

Biogas

Energy for biodiesel manufacturing process

Environmental and social impacts of 2nd generation biodiesel

Food safety

At best, poured down the **drains** or dumped in the trash for **already-packed landfills**.

At worst reprocessed, and are channeled **back into the food supply**.

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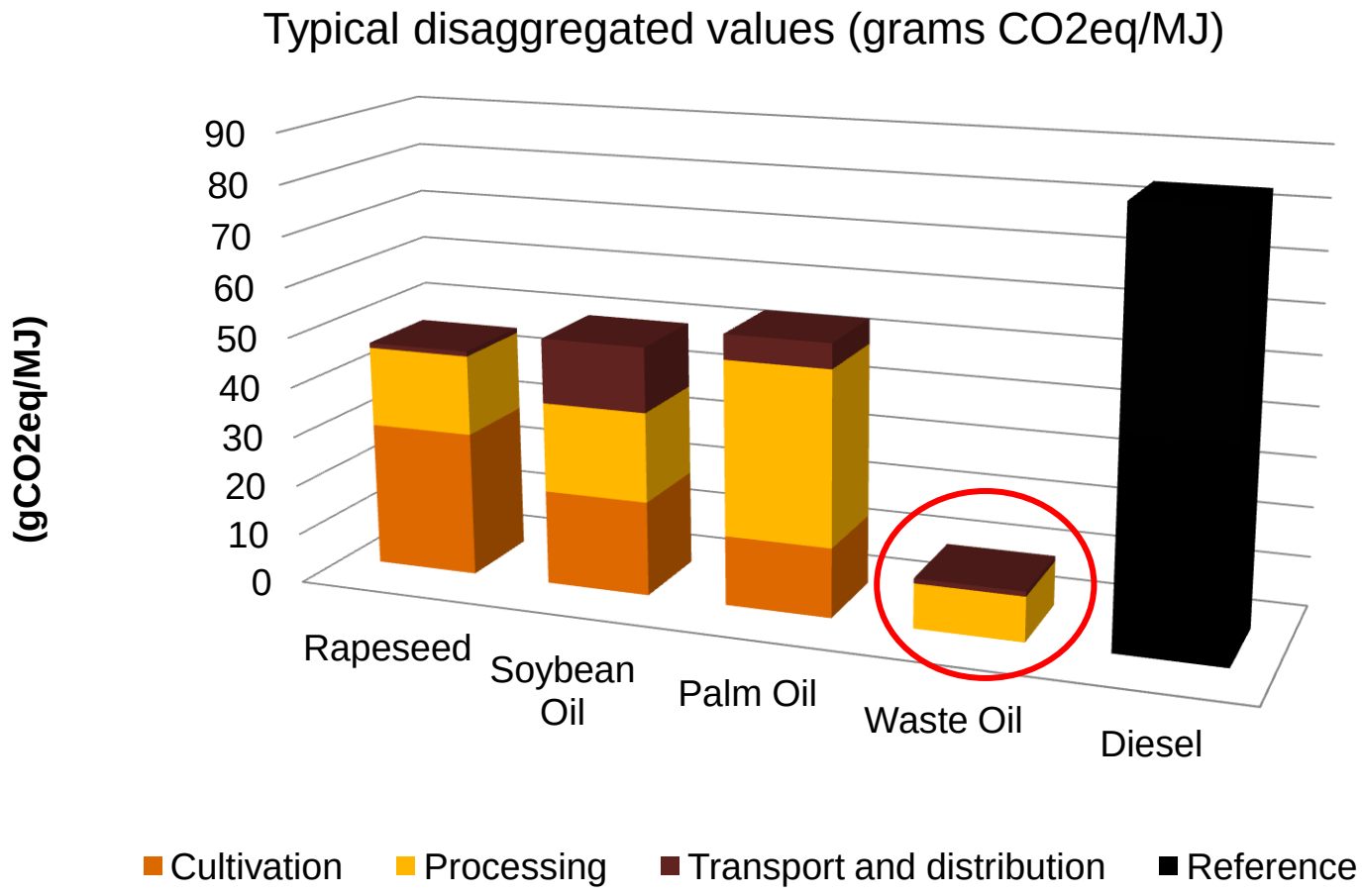
- **December 2012:**, **a dozen Hong Kong restaurants** were found to be using cooking oil made from “gutter oil” containing carcinogen **benzo(a)pyrene**.
- **September 2014:** Another gutter oil scandal: **non edible lard** from Hong Kong into **bakery** that was subsequently distributed in Taiwan and Hong Kong.

Reprocessed cooking oil can increase changes of heart disease and diabetes, has implications for Alzheimer Disease and can have adverse impacts on children development.

Biodiesel from waste has low GHG compared to biodiesel from crop oils due to reduced emissions from cultivation, processing



Source: EU Renewable Energy Directive Annex V

Sustainability management system

ASB has a sophisticated sustainability management system:

- Keeps trace of the kind of waste and the country of origin
- Allows actual calculations of carbon footprint based on real feedstock/transport/conversion inputs
- Strict mass balance
- Externally audited
- Recognized in Europe (Renewable Energy Directive) by all oil companies

Biodiesel from Waste - Towards a Circular Economy

Recovered

Converted to high value product

Re-used as Biodiesel

Reduced emissions
(roadside and GHG)

Waste

2nd generation biodiesel

Economic Development

Biodiesel and economic development

Since the 2010-2011 policy address of former Chief Executive Donald Tsang Yam-kuen, **New Energy Technology** has been a **target** for development.

Key infrastructure in HK:

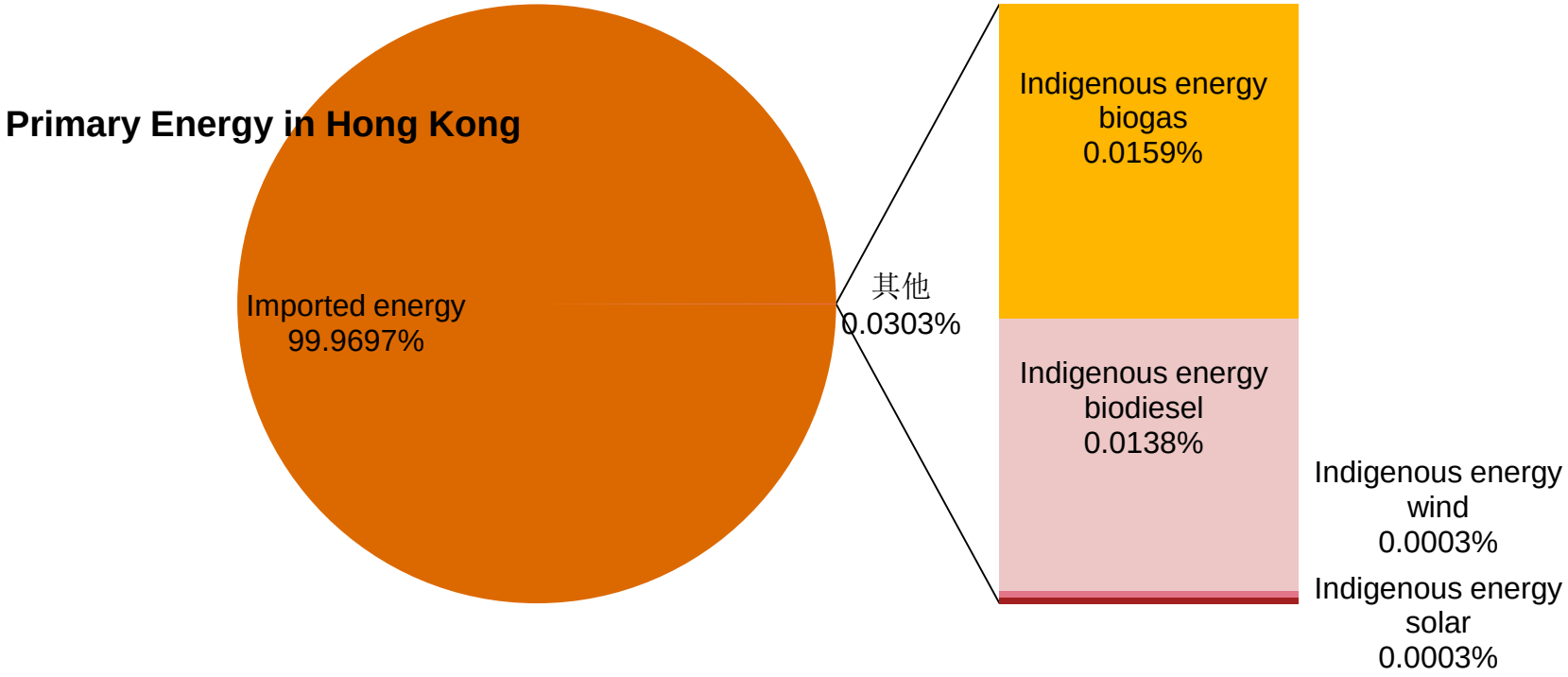
- Sludge Incinerator
- Organic waste treatment facilities
- MSW waste to energy

The biodiesel plants in Hong Kong:

- Are integrated in the community, **with important value remaining in HKSAR through payments to restaurants and collectors**
- **Technology platform for future environmental developments**

Biodiesel and Energy Security

Hong Kong **is particularly subject to fluctuations in the international energy prices:** ranks 99th out of 129 jurisdictions measured by the World Energy Council:



ASB Biodiesel alone can supply every diesel vehicle on Hong Kong's roads with enough biodiesel to replace 10 percent of the fossil diesel used in every diesel vehicle on the roads.

Waste based biodiesel

Conclusions

Profitability