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Ability of bioenergy and biofuels to reduce GHG emissions in NZ

Brian Cox Executive Officer, 24 October 2018

The opportunities

- Biomass energy for process heat
  - Wood harvest residues
  - Wood processing residues
  - Agricultural residues
- Use of waste to reduce methane
  - Create value from municipal and food waste
  - A resource we produce every day
- Use of biofuels for heavy transport
  - Marine, heavy road vehicles, rail, aviation

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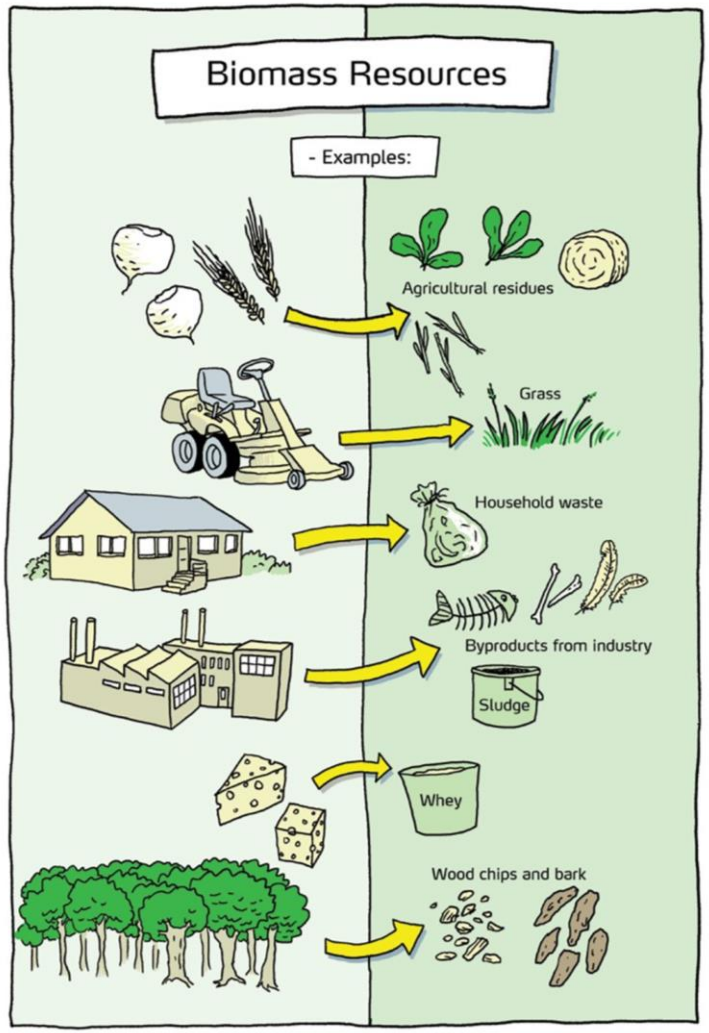
Utilisation of renewable natural resources



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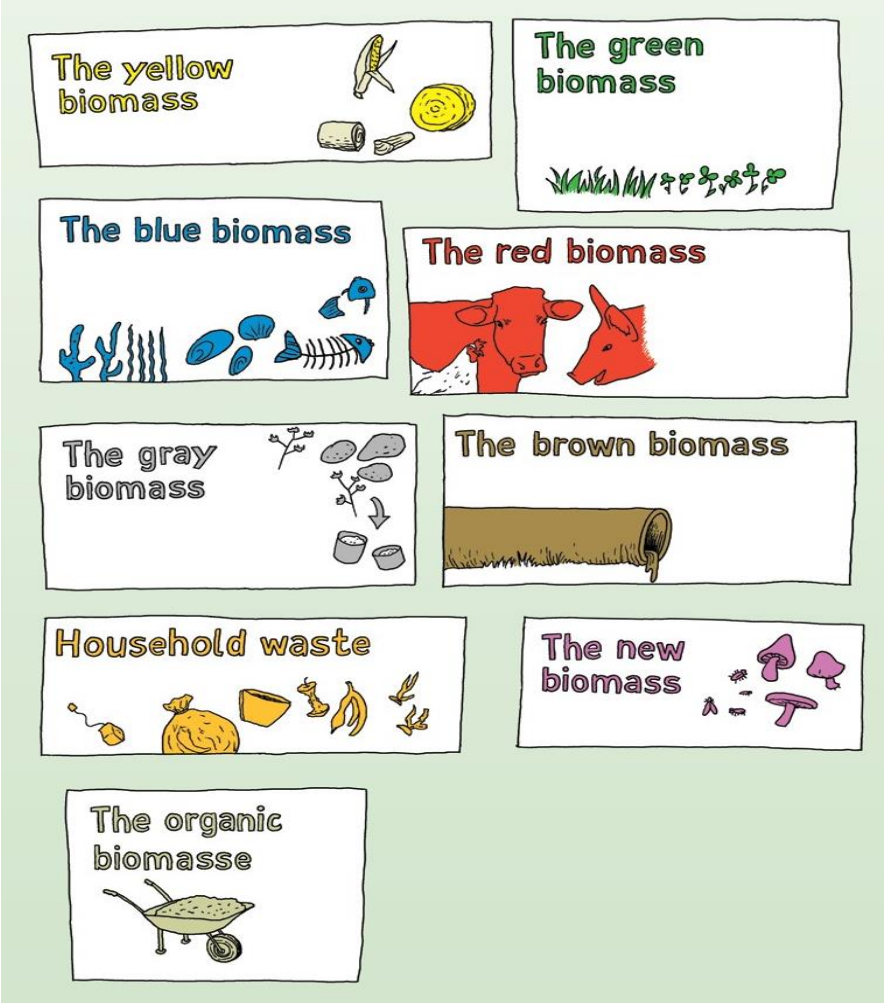
Biomass in many forms



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Key messages

- Bioenergy and biofuels provide opportunities and are not fixing a problem
- We have large quantities of biomass and waste which can be used in the transformation to a low-emissions economy
- Based on proven technologies
- Under developed markets
- Complex biomass supply chain is manageable.

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Is this a problem or an opportunity

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What can be achieved

- ***Currently 11% of consumer energy is supplied from biomass.***
- ***Including only process heat and use of waste this could increase to 15% by 2050 and reduce net greenhouse gas emissions by 3-4%. ,***

but

- ***with biofuels use by heavy transport this could increase to 26% energy with 13% reduced greenhouse gas emissions.***

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Energy increase above 2017 levels

	Reduction of use of fossil fuels in process heat[1, 5] (PJ)			**Methane reduction from waste to energy[2] (PJ)**			**Emissions reduction from use of biofuels in transport (PJ)**		
Year	BAU	Transition[3]	Transformation[4]	BAU	Transition[3]	Transformation[4]	BAU	Transition[3]	Transformation[4]
2030	2	4	8	0	1.1	1.8	3	3	20
2040	5	11	17	0.05	1.5	2.5	6	6	48
2050	7	15	20	0.1	1.8	3.3	12	12	68

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Greenhouse gas emission reduction below 2017 levels

	Reduction of use of fossil fuels in process heat[1, 5] (kt CO2-e pa)			**Methane reduction from waste to energy[2] (kt CO2-e pa)**			**Emissions reduction from use of biofuels in transport (kt CO2-e pa)**		
Year	BAU	Transition[3]	Transformation[4]	BAU	Transition[3]	Transformation[4]	BAU	Transition[3]	Transformation[4]
2030	200	400	700	0	180	320	200	200	1500
2040	500	1000	1500	+20	210	410	400	400	3500
2050	700	1300	1800	+40	320	515	800	800	5000

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BAU or transformation

- BAU
  - Left alone a slow growth to 19PJ energy switching
  - Occurs as coal plant requires replacement
  - Infrequent investment decisions
- Transition
  - Implement NZEECS
  - Increases to only 29PJ
  - A useful step to provide a platform for transormation
- Transformation
  - Can go to 91PJ and reduce 13% of GHG emissions
  - Available if we want to grab the opportunity

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Replacing existing serviceable equipment

- Use the coal existing plant
  - Cofiring biomass with coal
    - blending wood pellets
    - Torrifaction to make green coal
    - Process low grade biomass into industrial fuel
- Gradually upgrade existing WWTP
  - Anaerobic treatment
  - Accept trade waste
- Use existing transport fleet and infrastructure
  - Transition to drop in biofuels

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Biomass supply chain reliability

- Develop non traditional biomass fuels
  - Pelletising waste
  - Revise consenting rules to remove fuel limitations
  - Torrifaction to make green coal
- Maximise value from existing biomass sources
  - Strengthen domestic use of wood
    - Strong forestry and wood processing strategy
  - 1 billion trees
    - not just trees in the ground. A great opportunity for biomass supply
- Farms produce food plus fuel
  - Use of agricultural wastes
  - Offset biological emissions
  - Shelter belts, riparian planting, woodlots

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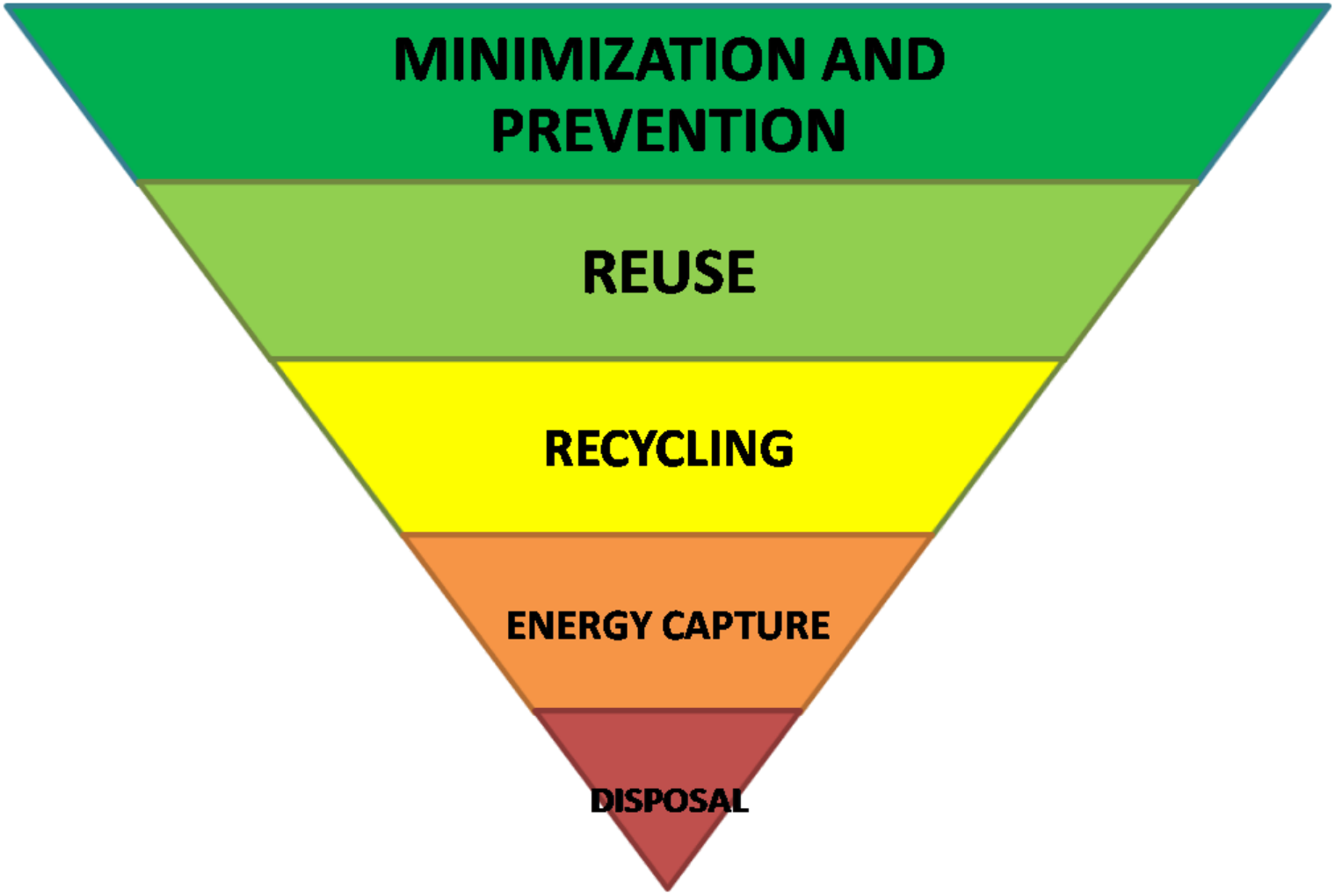
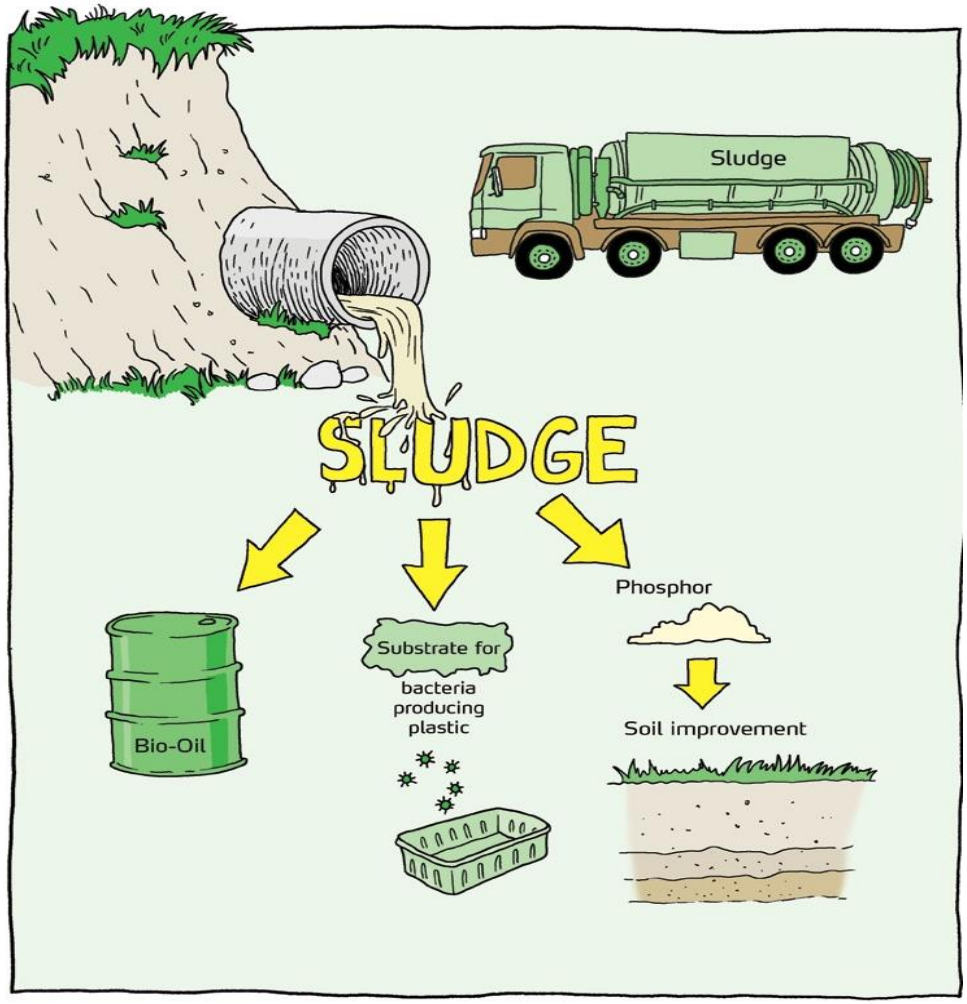
Hierarchy of waste pyramid



There is money in muck



Economics

- BAU is positive – shows economics not an absolute barrier
- Use govt facilities to demonstrate economics
  - 52% of heat plant are owned by government
  - Government investment based on life cycle
- Focus on life cycle and not least capital cost
- Support local government investments
  - Potholes not efficiency are the priority for capital expenditure
- Perception of supply chain affects risk analysis

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Waste to energy


City waste water treatment plant


Food waste


Milk processing plant waste water


Piggery

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Actions – process heat

- Focus on improving the efficacy of the supply of biomass fuel
  - from plantation forestry, wood processing, and farm forestry
  - use the One billion trees programme to produce future biomass fuel.
- Assist farmers to offset biological emissions by use of bioenergy based activities
  - farm forestry to produce woody biomass fuel,
  - treatment of waste to reduce nutrient runoff to waterways.
- R & D into the treatment and use of non traditional biomass fuels
  - Agricultural biomass eg stover, and their use
  - co-firing with coal as a transition for existing coal plant.
  - Investigate torrifaction of biomass to make green coal.
- Improve regulations and best practice for consenting heat plant
- Guidance on the comparative benefits of alternative process heat technologies.

Actions - Reducing methane emissions from waste

- Establish a National Policy Statement setting a policy of Zero organic waste to landfill by 2040
- Provide guidance, demonstration and assistance to territorial authorities for upgrading and optimising WWTP
  - beneficial treatment of trade wastes providing reduction of emissions and operating costs.
- Provide guidance, demonstration and assistance for use of food waste
  - multi-stream treatment of food and organic waste to produce energy.
- R&D into the high value uses of biogas digestate/biosolids
  - Use of biomethane as a vehicle fuel
  - Biogas as a feedstock for the manufacture of bio-based materials.
  - Validation of the use of anaerobic digestion digestate as a fertiliser
  - Use of WWTP biosolids as a combustion fuel.

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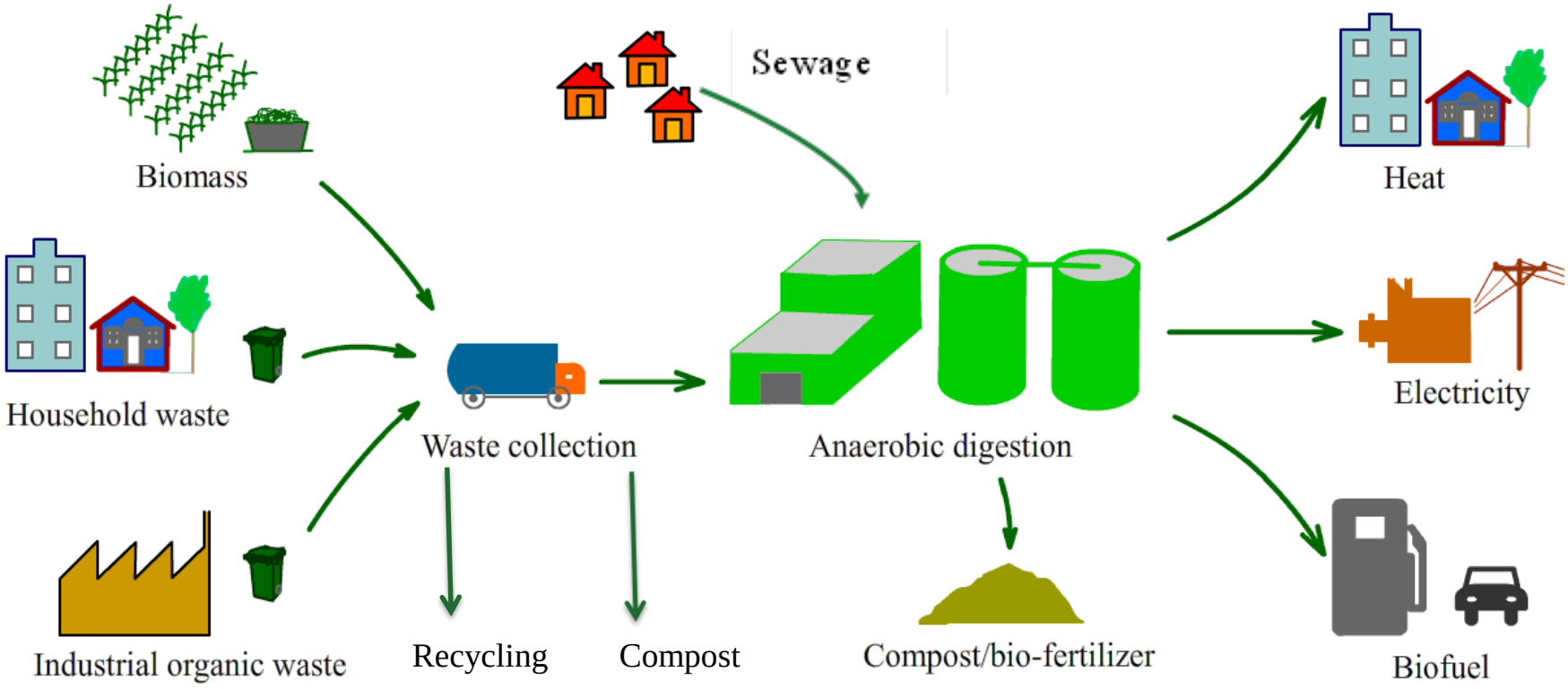
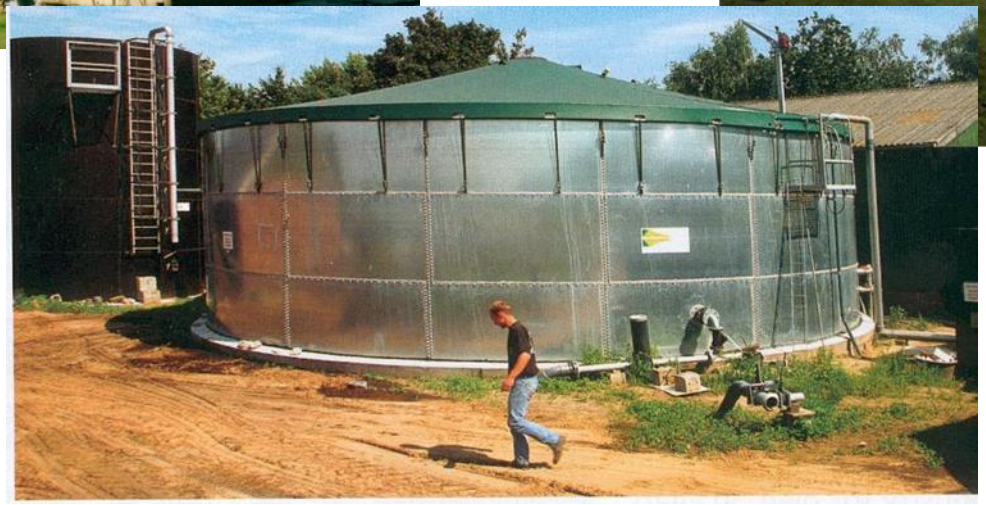
Residues to energy value stream



Range of technology options

Tank systems



Covered pond systems

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Liquid biofuels

Biodiesel from tallow

Bioethanol and biodiesel produced from:

- Dairy processing residues (whey)
- Used cooking oil
- Canola
- Tallow

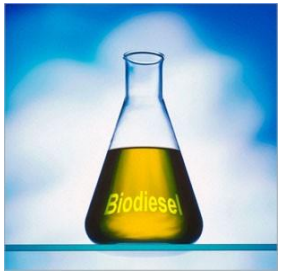
Biogas from:

- Landfill gas,
- Waste water treatment plant

Future advanced liquid biofuel production from:

- Lignocellulosic material
- Municipal waste

Landfill gas collection



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Actions-Use of biofuels by heavy transport

- Provide guidance on the use of biomethane as a vehicle fuel.
- Use imported biofuels as a transition pathway to provide an incentive for domestic manufacture
- Establish specific programmes for marine, heavy road vehicles, rail and aviation so that R&D is demand driven.
- Include production of biofuels within a wider transition to the manufacture of bio-based products within a low emissions economy based on wise use of renewable natural resources.

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High value bio-based products

Xylose

$1.5 Billion Market

- Food Additives
- Xylitol
- Personal Care Products
- Pharmaceuticals

Lignin

$64 Billion Market

- PVC Additive
- Adhesive & Epoxy Resins
- Polyurethane
- Carbon Fiber

Cellulose/Ethanol

$35 Billion Market

- Transportation Fuels
- Fuel Additives
- Solvents
- More Economical Feedstock for Pulp & Paper plants

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What is required

- A desire to do more than BAU
- Focus on the opportunities
- Have transformational policies and programmes
- Use current programmes as transition pathways
- Act collectively

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