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# ***Towards an Integrated Waste Management System***

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# Background

- 434 million tonnes of waste produced each year in the UK<sup>1</sup>
- >70% of waste to Landfill sites<sup>2</sup>



- Problems with landfill – unsustainable, pollution
- Landfill tax and Government campaigns

There must be an increase in the use of alternative waste management technologies

<sup>1</sup>Waste online, 2004 <sup>2</sup>Environmental Agency, 2008



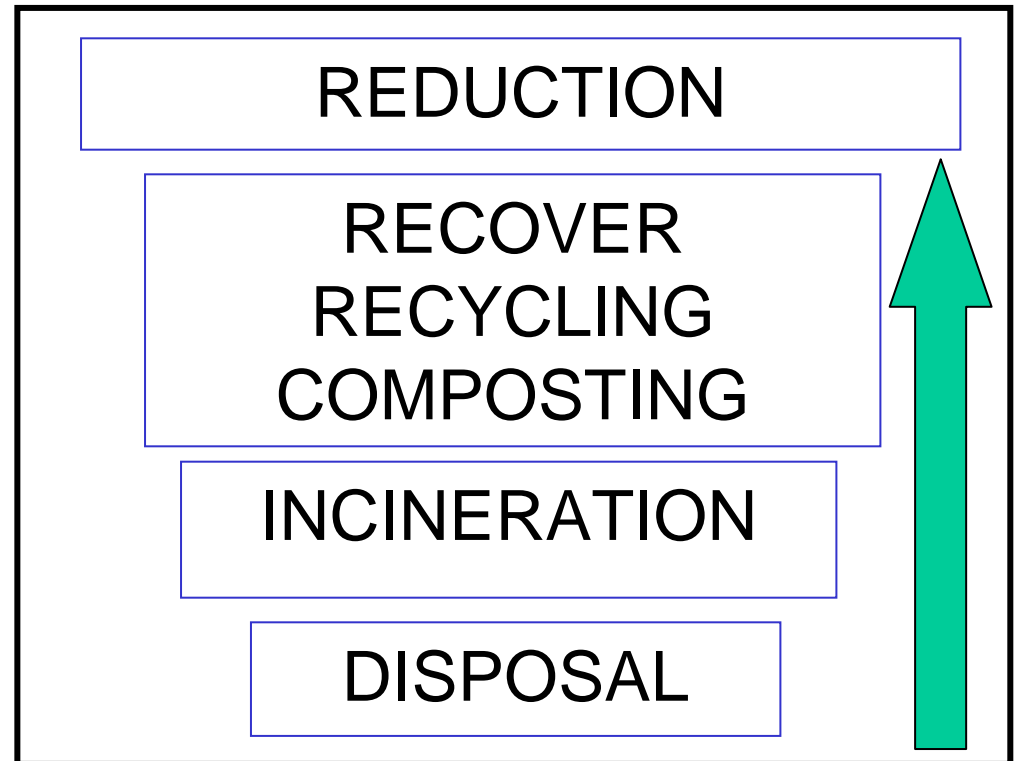
# Waste Management Technology (MSW/food waste)

- Existing Technology

- Landfill
- Animal Feed
- Recycling
- Composting
- Incineration

- Current status:

- New technologies
- Waste to energy
- Waste to bioFuel



The Waste Hierarchy<sup>1</sup>

<sup>1</sup>DETR 2001



# MSW-to-bioethanol

## **MSW Stream**

consists of three main fractions: 1) Dry recyclables, 2) Biodegradable waste, 3) Residual waste

## **BMSW Residual Fractions**

consists of 3 main fractions: 1) Paper & Card, 2) Food Organics, 3) Green Organics

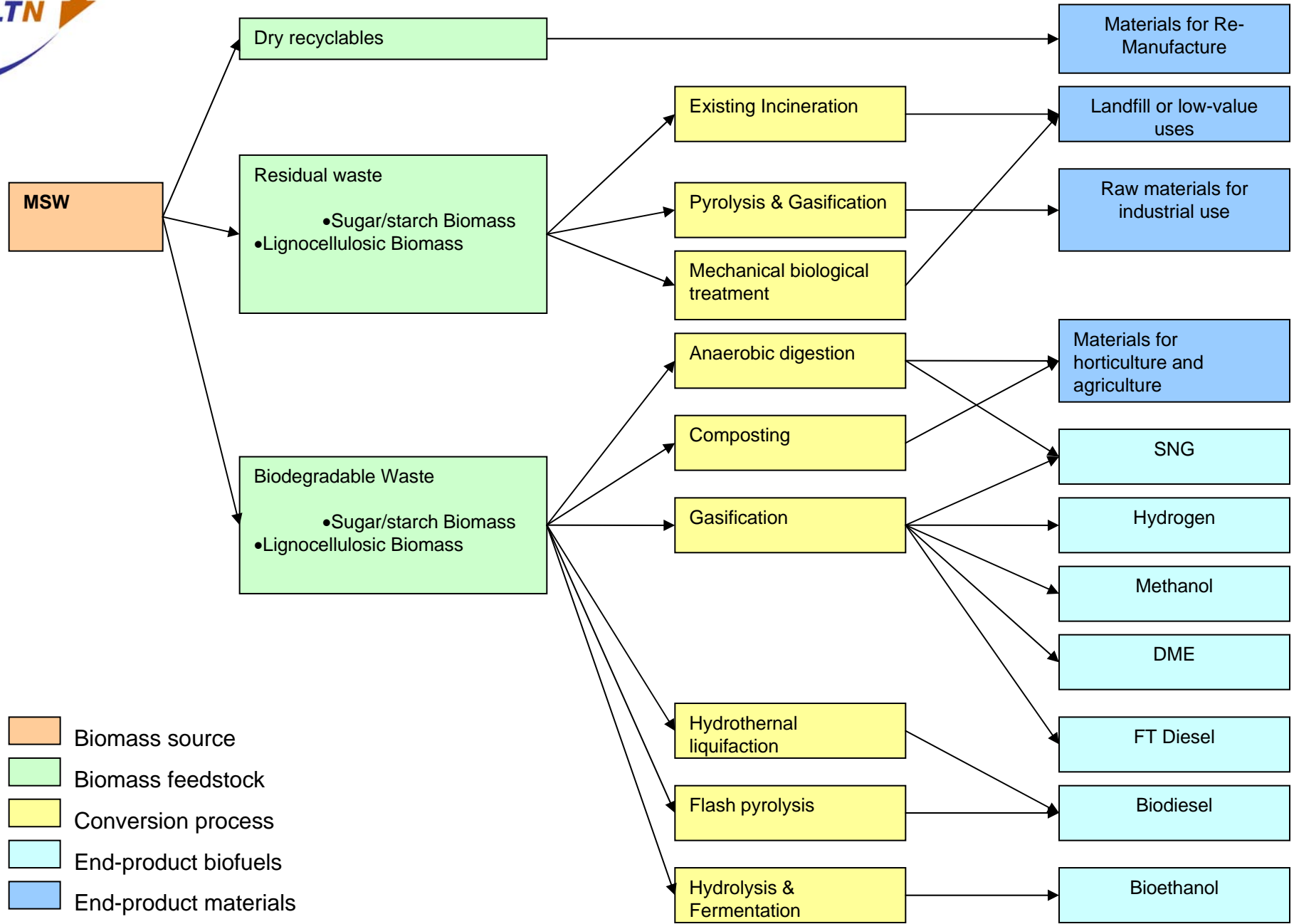
## **BMSW Fraction Materials**

Paper & Card consists of many individual and composite materials.

## **Material Biomass**

Paper is made from softwoods and hardwoods which have different biochemical properties.

**An understanding of MSW at four different scales is required in order to understand its availability and quality as a feedstock**





# Waste-to-Bioethanol

- Assess the potential of waste-to-bioethanol system as an alternative waste management solution.
- Assess the system specification and technical performance requirement if this waste-to-bioethanol process is to be applied
- For a bio-ethanol conversion facility to be successful is to require an available low-cost feedstock which has a reliable high-quality.
- Assess the potential for MSW in meeting these requirements.
- An understanding of MSW at different scales is required in order to understand its availability, quality and reliability as a bioethanol feedstock.
- It is important that the feedstock is available on a continuous basis and of sufficient quantity for a bioethanol facility to be economically feasible.
- Consider the resource availability of MSW for a facility located within London.

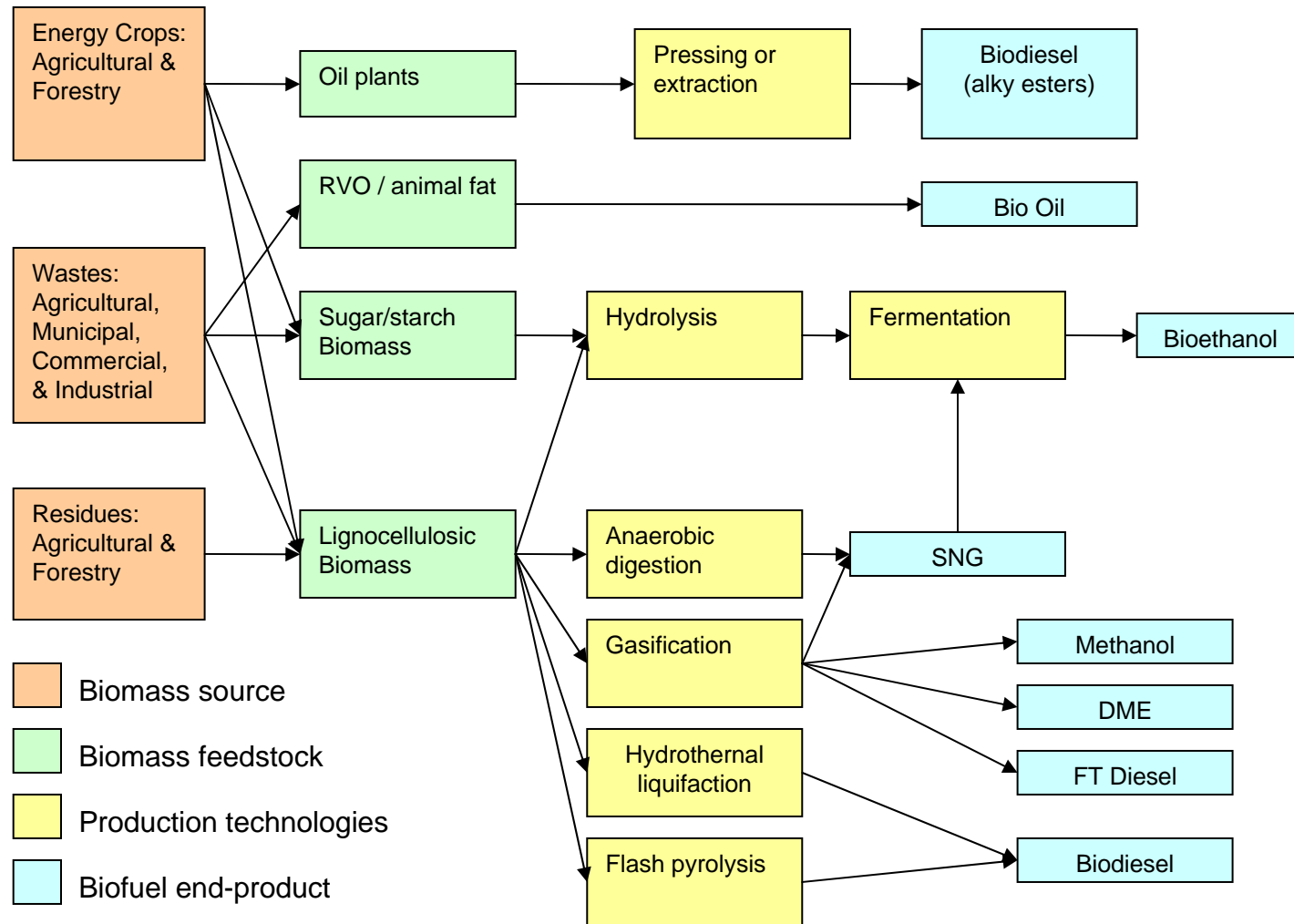


# The reliability of the feedstock

- Defined as the consistency with which it meets certain quality requirements (or tolerances).
- The quality of a feedstock can be measured by its maximum theoretical ethanol yield and the efficiency of the conversion process.
- The maximum theoretical yield is dependent on the proportion of key structural components of the biomass (mainly cellulose and hemicellulose).
- The efficiency and performance of the conversion process is influenced by a variety of physical and chemical feedstock properties. The level of influence these have depends on the sensitivity of chosen technology.



# An overview of the main routes for biofuel production



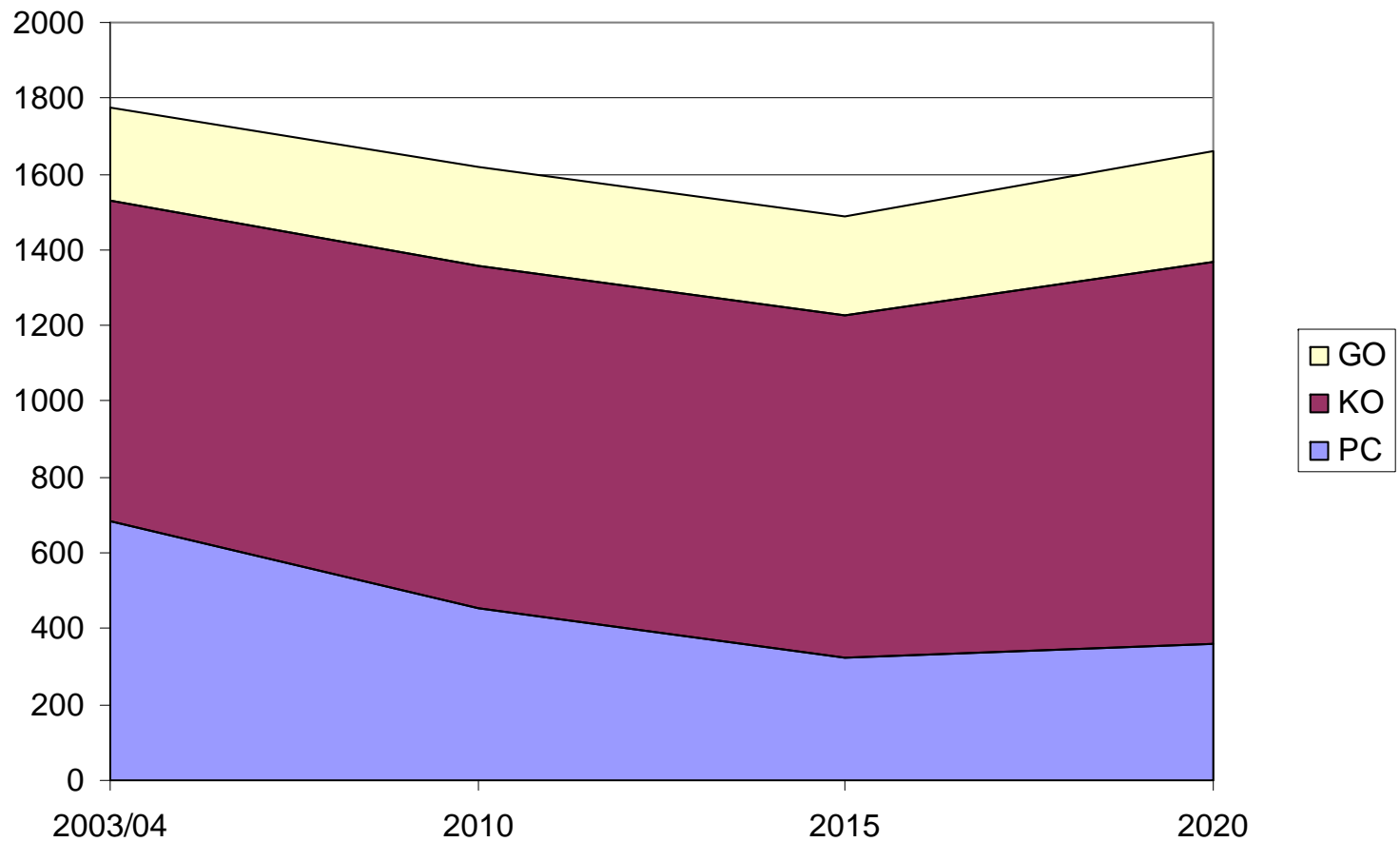


# London BMSW

			London Waste Streams			
Waste Fraction	England Proportion of MSW stream	London 2003/04 MSW	Household waste	All Recycling	Civic amenity sites	Other waste streams
PC	18.1	23.6	27.8	36.0	2.0	24-38
KO	17.2	26.1	26.5 <sup>g</sup>	12.4 <sup>g</sup>	0.0	16-22
GO	19.2	7.7	7.8 <sup>g</sup>	4.2 <sup>g</sup>	8.0	2-16
BMSW	54.5	57.4	62.1	52.0	10.0	-



## Predicted availability of BMSW trends for new recovery technologies







# Summary

- London's waste contains a high proportion of biodegradable material.
- Currently a high proportion of this waste is sent to landfill.
- London's Waste Management Strategy sets ambitious targets for diverting this waste to management options further up the hierarchy



# Summary

- Based on this rough compositional data and projecting forward the Mayor's 'preferred' strategy under a number of assumptions the quantity of biodegradable waste available for new recovery processes can be estimated.
- Approximately 1.6 million tonnes of BMSW could be available for bioethanol production if it was the only new recovery processes established.
- The majority of this waste is Kitchen Organic



# Summary

- For bioethanol production to be successful it will requires integration with a well developed waste management system.
- Increased source segregation and utilisation of materials on the basis of Best Practicable Environmental Option will be critical in establishing a viable market share of the waste resources as the number of competing waste management options increases.