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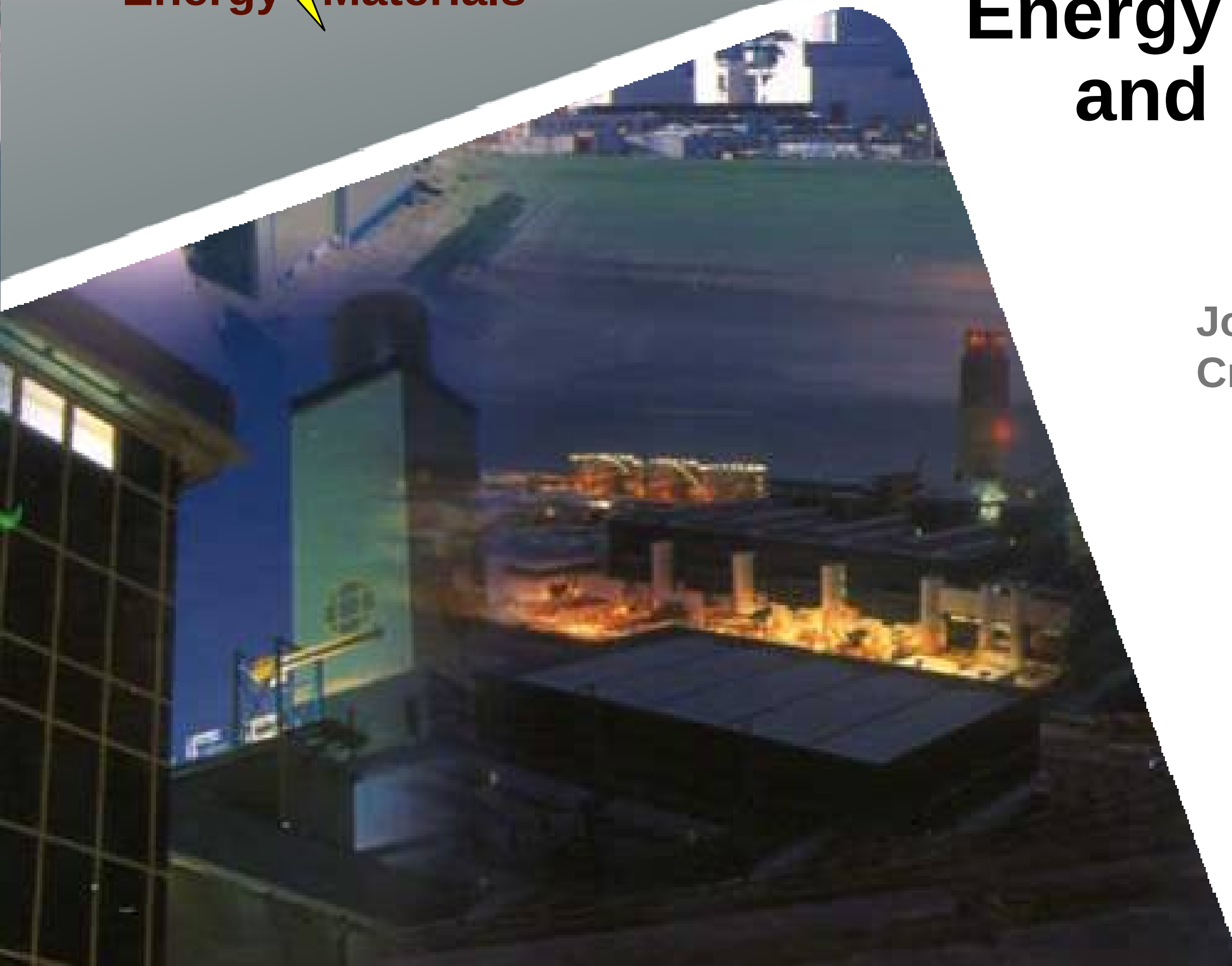
Energy from Waste and Biomass



John Oakey
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Summary

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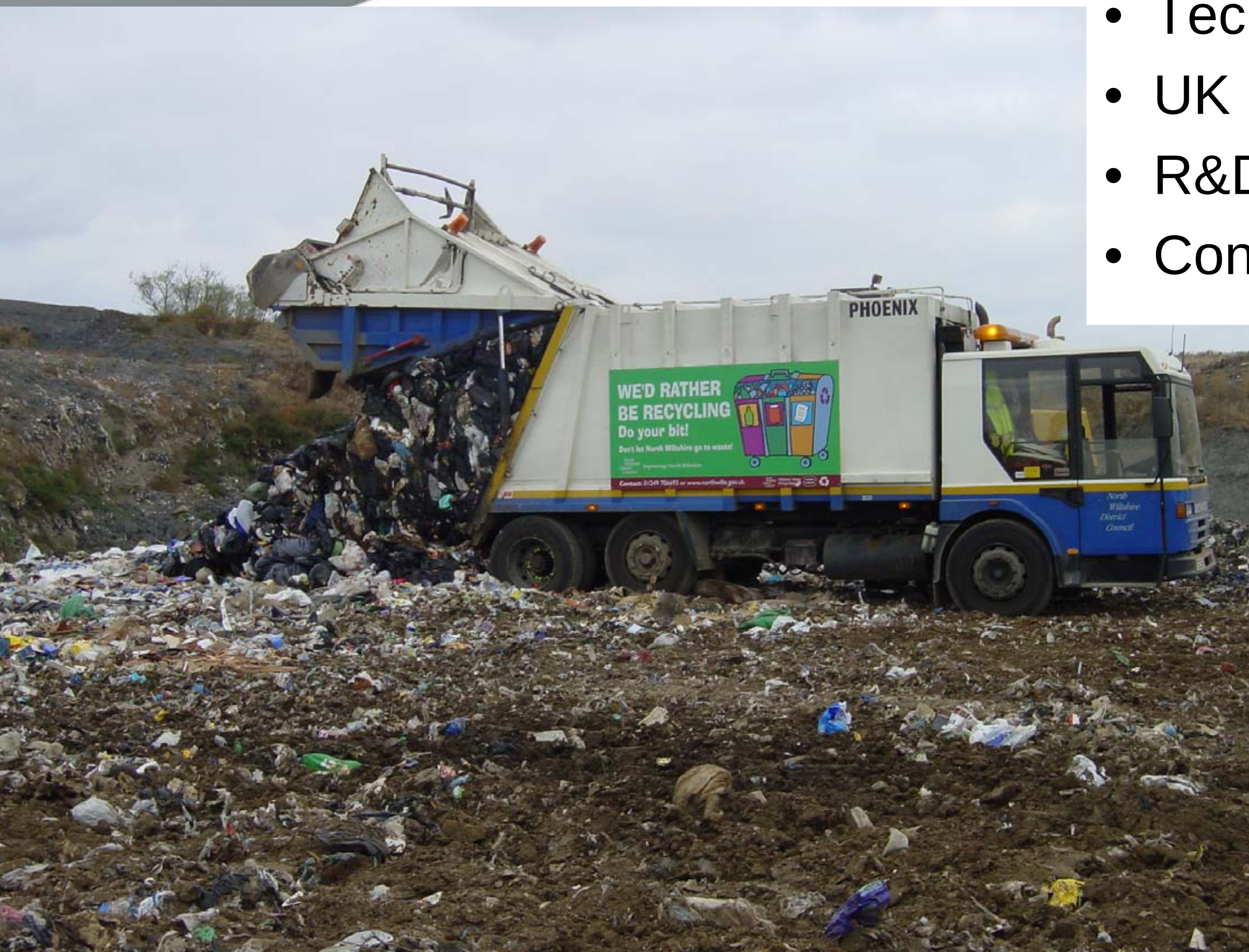
- UK Context
- The Opportunity
- Technology Options
- UK Market
- R&D Challenges
- Conclusions



UK Context

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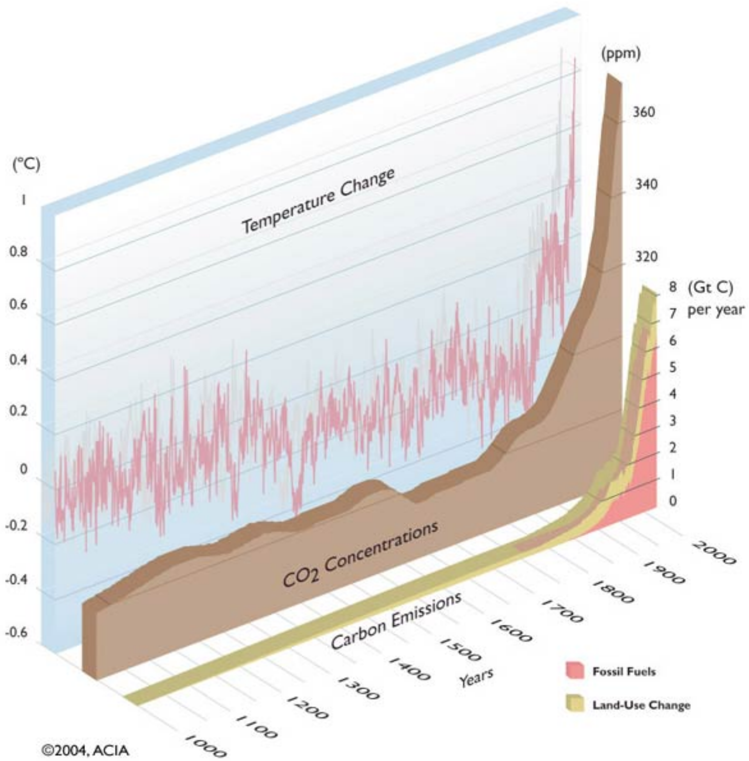

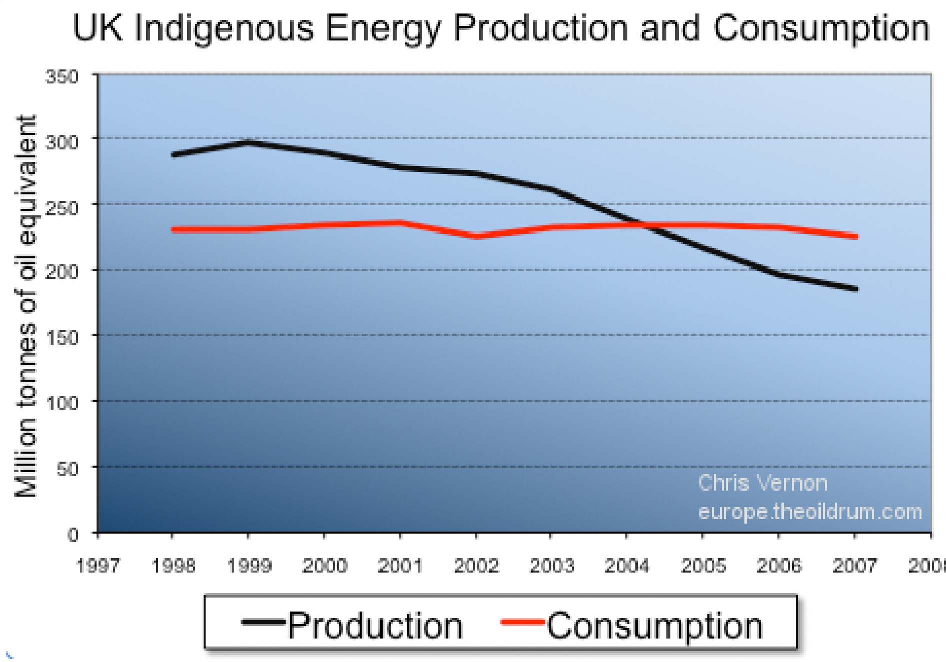

- Energy security
- Cost efficient waste disposal
- Climate change

- "…we now face two immense challenges as a country – energy security and climate change…"
- we will soon be net importers of oil [and] …gas at a time when global demand and prices are increasing
- [more importantly] …is the impact that our sources and use of energy are having on our planet.

(BERR, 2006)

Waste – a key loss of resource & cost to the UK

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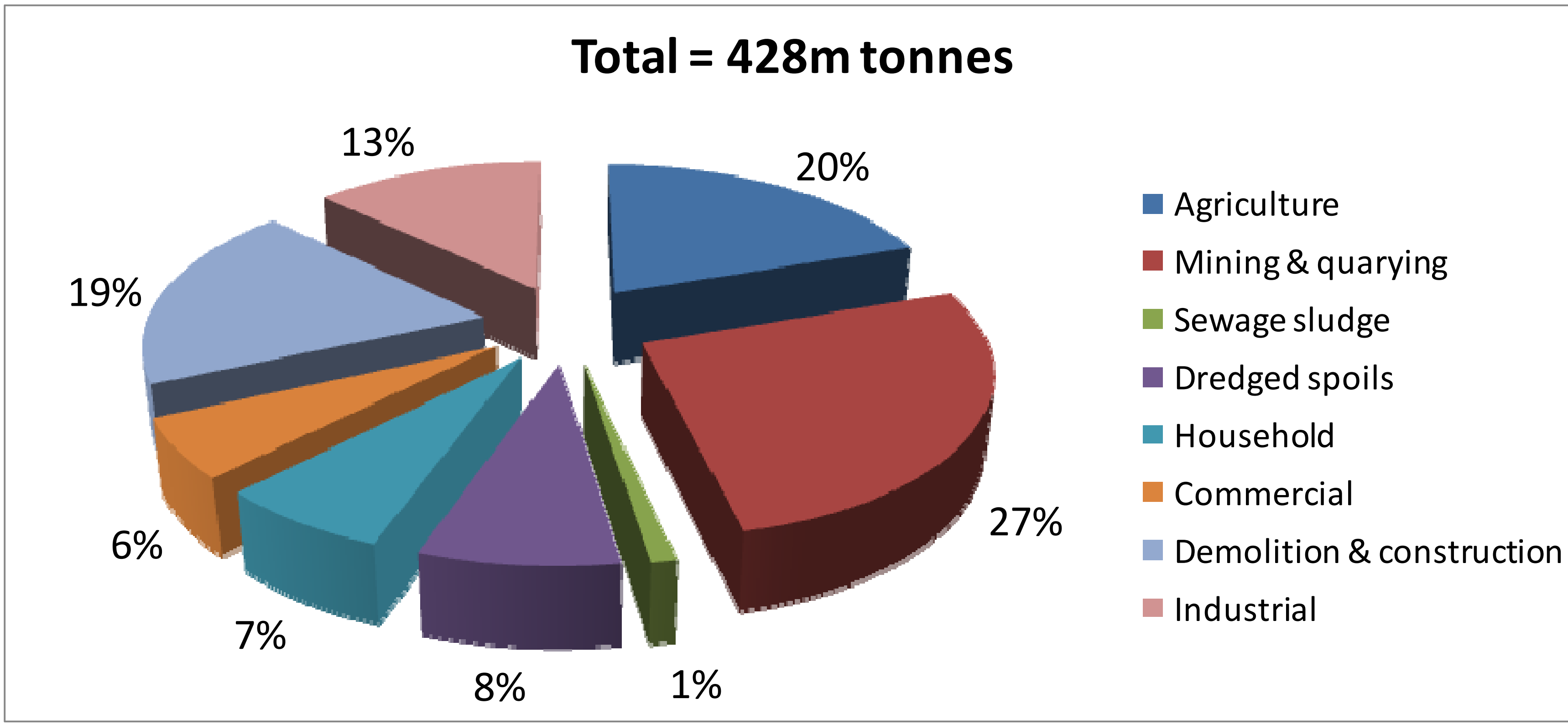
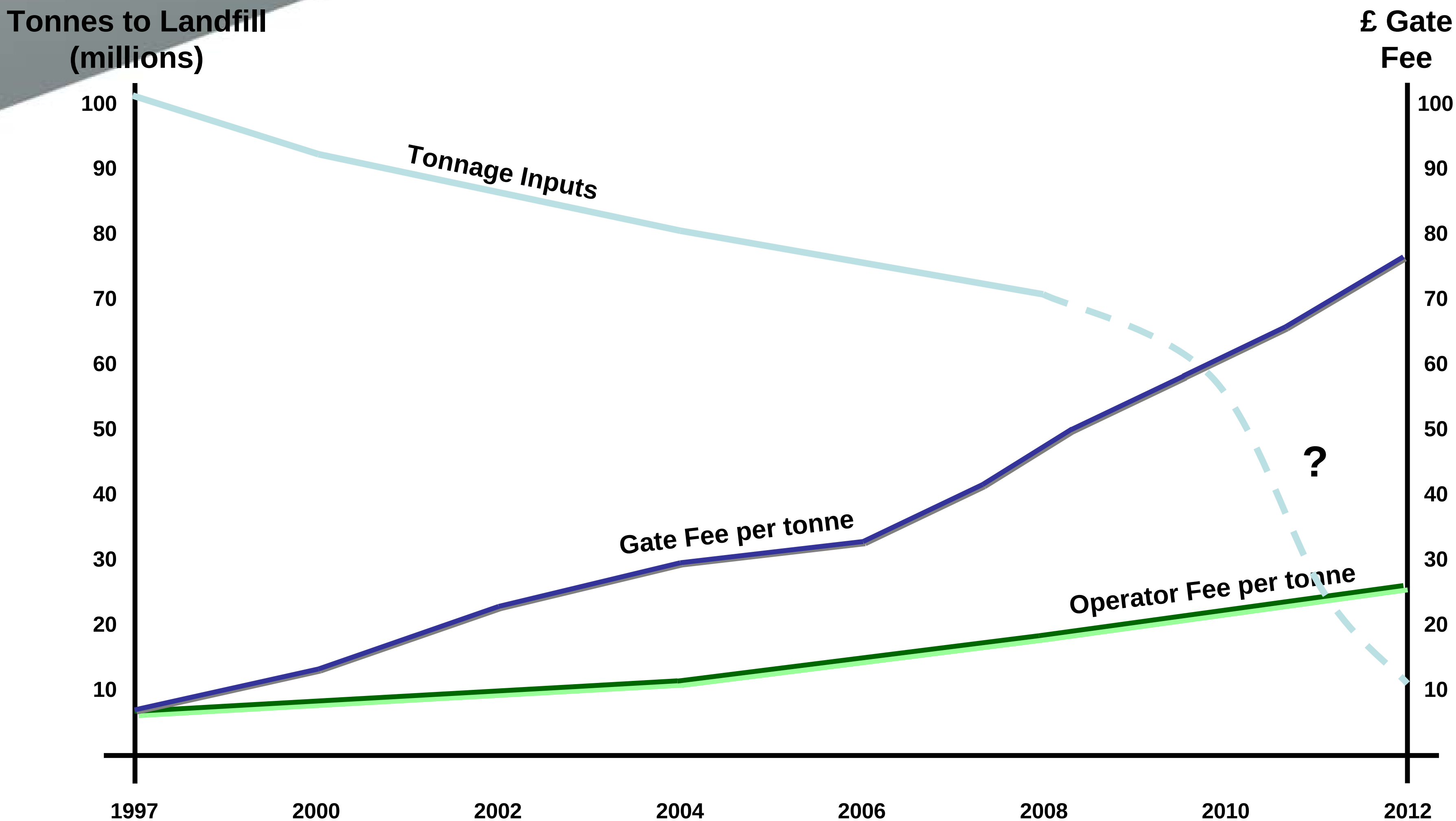


Adapted from Jones, P. (2009); Source: Defra, EA, Water UK

Timing the Landfill Transition 2007



Options for Waste – the runners

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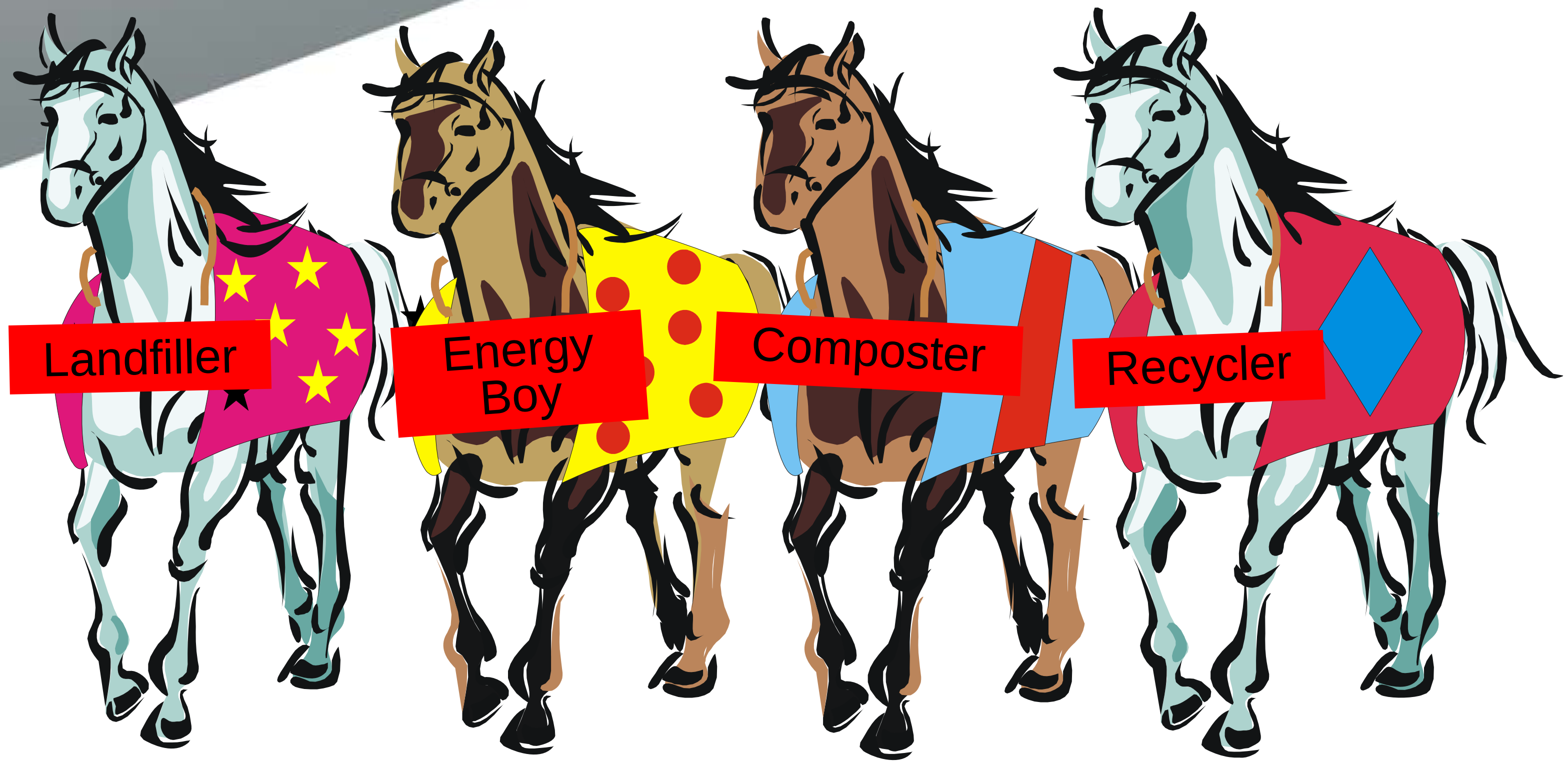

Form

Landfiller

Long term
- Handicaps
- Planning Consents
- Taxes
- Better odds elsewhere

Early Faller

Energy Boy

- Traded Permits
- Renewable targets
- Import dependency on rivals
- Rising logistics costs
- High value prizes
- Improving technology

Expensive Thoroughbred Regular Winner

Composter

- Low value prizes
- Staying power
- Plenty of local runners
- Cheap setup
- Soils directive
- Low distribution costs

Stayer

Recycler

- EU targets
- Energy trends
- High value prizes
- Traded Permits
- Producer reuse

Good Value All Rounder

Adapted from Jones, P. (2009)

The Opportunity

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To offset 34 million tonnes of carbon from fossil fuel sources by implementing advanced energy from waste/biomass technologies.

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Technology Options - examples

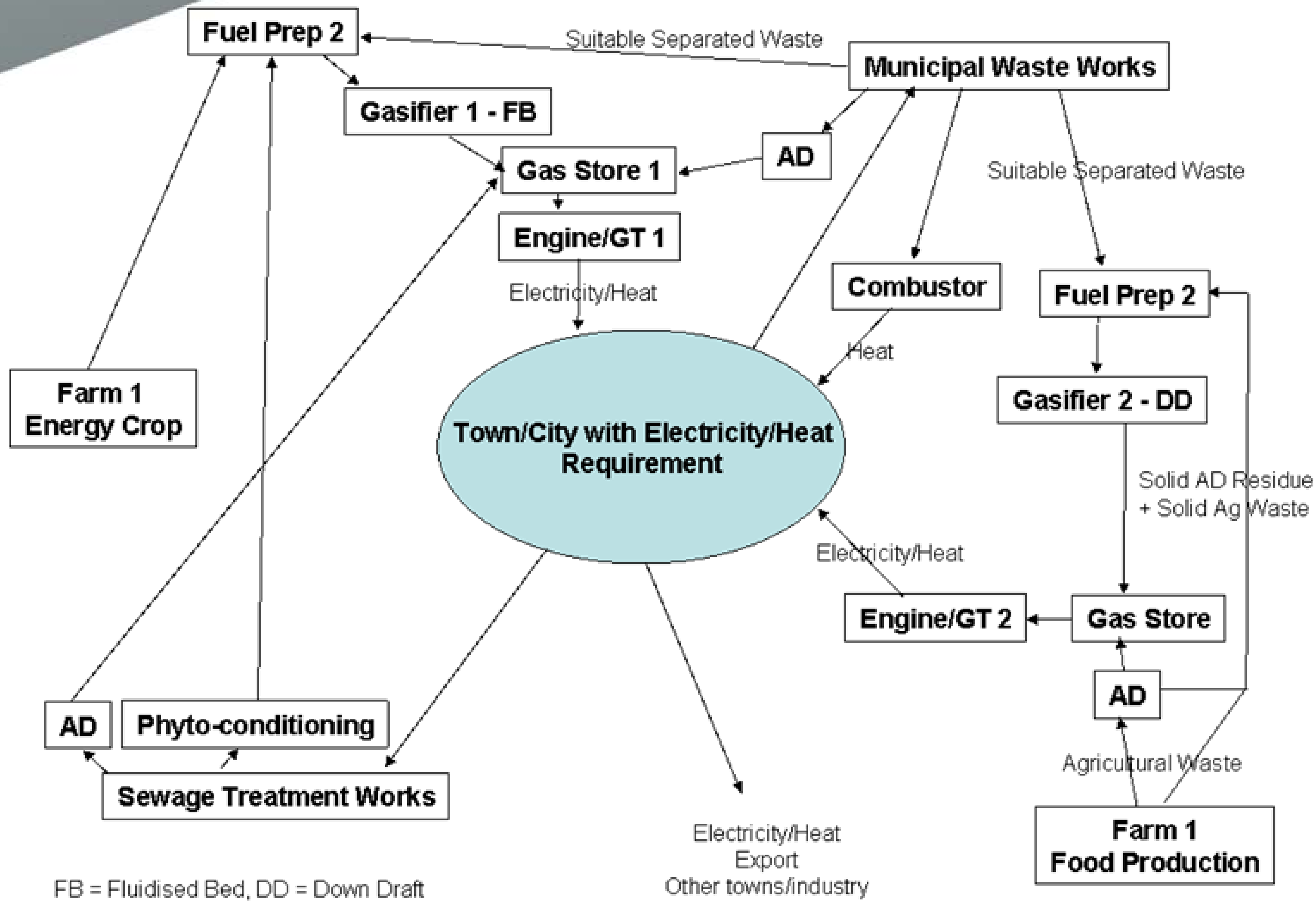
Sheffield Distributed Energy Scheme

Isle of Wight Gasification Waste to Energy Plant

Bedfordia Biogen Plant, Milton Ernest

Typical Sewage Works Digestion Plants

Why hasn't EfW developed? What is needed?



Energy From Waste Potential Market

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Based on the latest available waste arisings data from DEFRA the following table demonstrates the potential EfW market for different technologies in the UK.

	Number Of New Plants Needed	**Potential Annual Market**	**Total Capital Outlay**
Biological Anaerobic Digestion	**288**	**£400M**	**£1.44 Billion**
Gasification/Pyrolysis & Conventional Mass Burn Incineration "Technology Mix".	**180**	**£1.57 Billion**	**£13.6 Billion**
Total Biological & Thermal Treatment	**468**	**£1.97 Billion**	**£15.04 Billion**

Technology Needs & Priorities for Innovation
(Near market & 2020)

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- Adaptability of plants for varying calorific value of inputs – including plant design software
- Easier test to demonstrate to *ofgem* the biomass content of waste used to claim for ROCs
- Carbon foot printing of different waste treatment options
- All technologies would improve from research on waste composition and the development of more rapid sampling tests, including chemical analysis and biodegradability testing.
- More innovative techniques and technologies to break down the artificial divide between MSW and C&I waste treatment, looking at integrated facilities
- Better technology transfer from Europe

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Materials & Manufacturing Requirements

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To deliver higher plant efficiencies, reduced emissions and cost effective plants, improved materials/protective coatings, maintenance & repair strategies and life assessment/modelling methods are needed for the following

- Superheaters and other heat transfer equipment
- Condensing economisers
- Co-firing of waste/biomass-derived gases in existing plants
- Combustion engines & gas turbines

A key issue is reliability with variable waste-derived fuels

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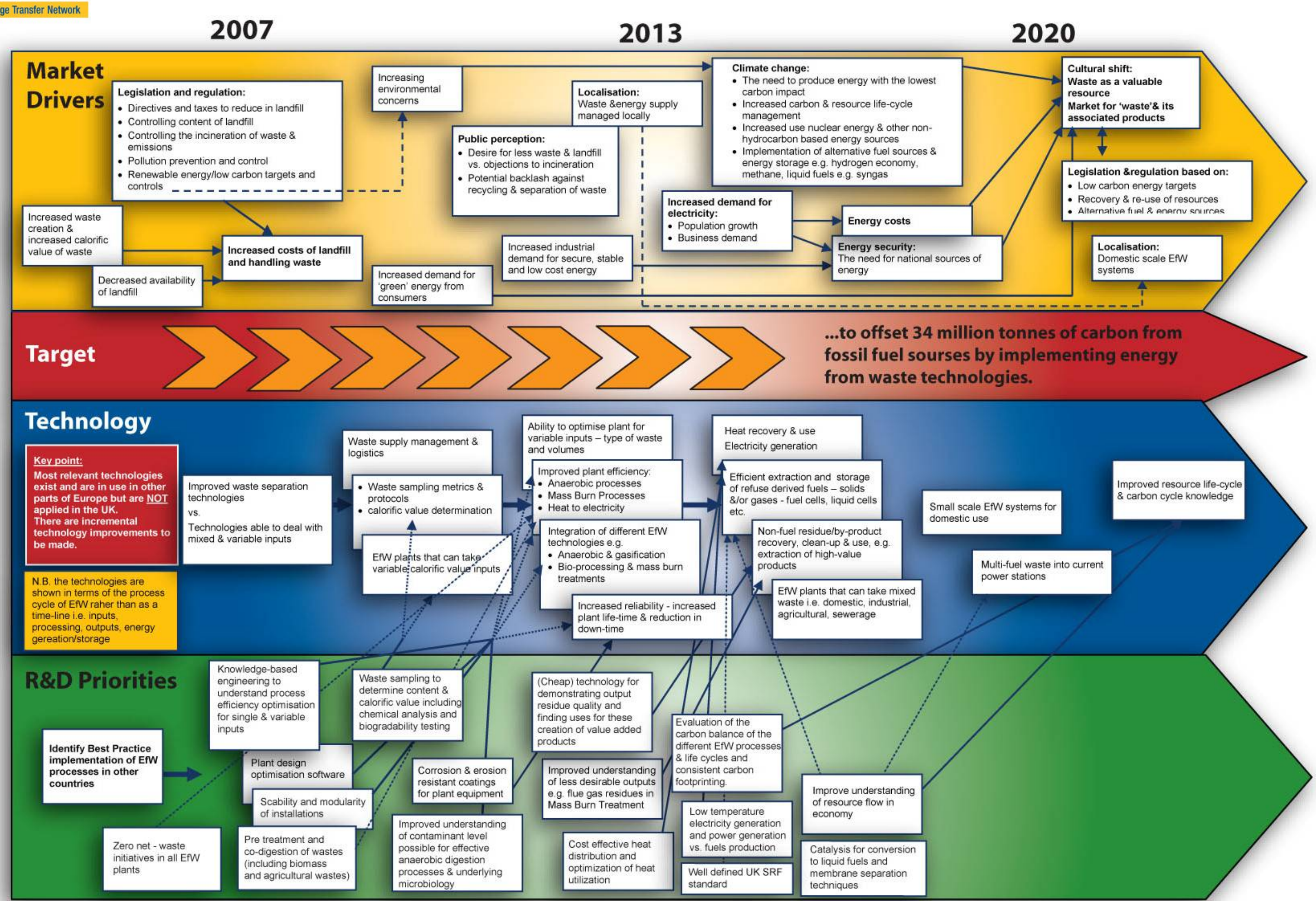
Energy from Waste Technology Roadmap



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Conclusions

- There is a strong national case for the increased development and deployment of sustainable energy from waste/biomass technologies
- The barriers to deployment are understood and are being addressed – but R&D challenges remain to meet the hopes of the stakeholders
- Continued R&D is required in a number of areas to deliver higher plant efficiencies, reduced emissions and cost effective plants including materials and manufacturing
- The UK market is estimated at nearly £2bn per annum, with the potential to offset 34mt Carbon emissions from fossil sources and delivering c. 15% of UK energy needs

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Energy From Waste Potential Market

- Energy from waste market could grow to more than £2Bpa by 2025 with a capital investment over the next 15 years of £15B.
- Figures based on the assumption that 25% of food waste will go to Anaerobic Digestion and 33% of the rest of MSW and C & I waste will go for Thermal Treatment (66% Incineration and 33% Gasification/Pyrolysis).
- Conservative returns per tonne for AD, Incineration and Gasification/Pyrolysis of £70, £50 and £57 are assumed.

Energy From Waste Drivers

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- Legislation/Policy
  - Landfill Directive,
  - Waste strategy review
  - Energy white paper

- Social / political/ economic
  - Fiscal incentive - Proposed double ROCs
  - Policy recognises energy-from-waste (EfW) as an integral part of the waste solution for UK

Energy From Waste Barriers

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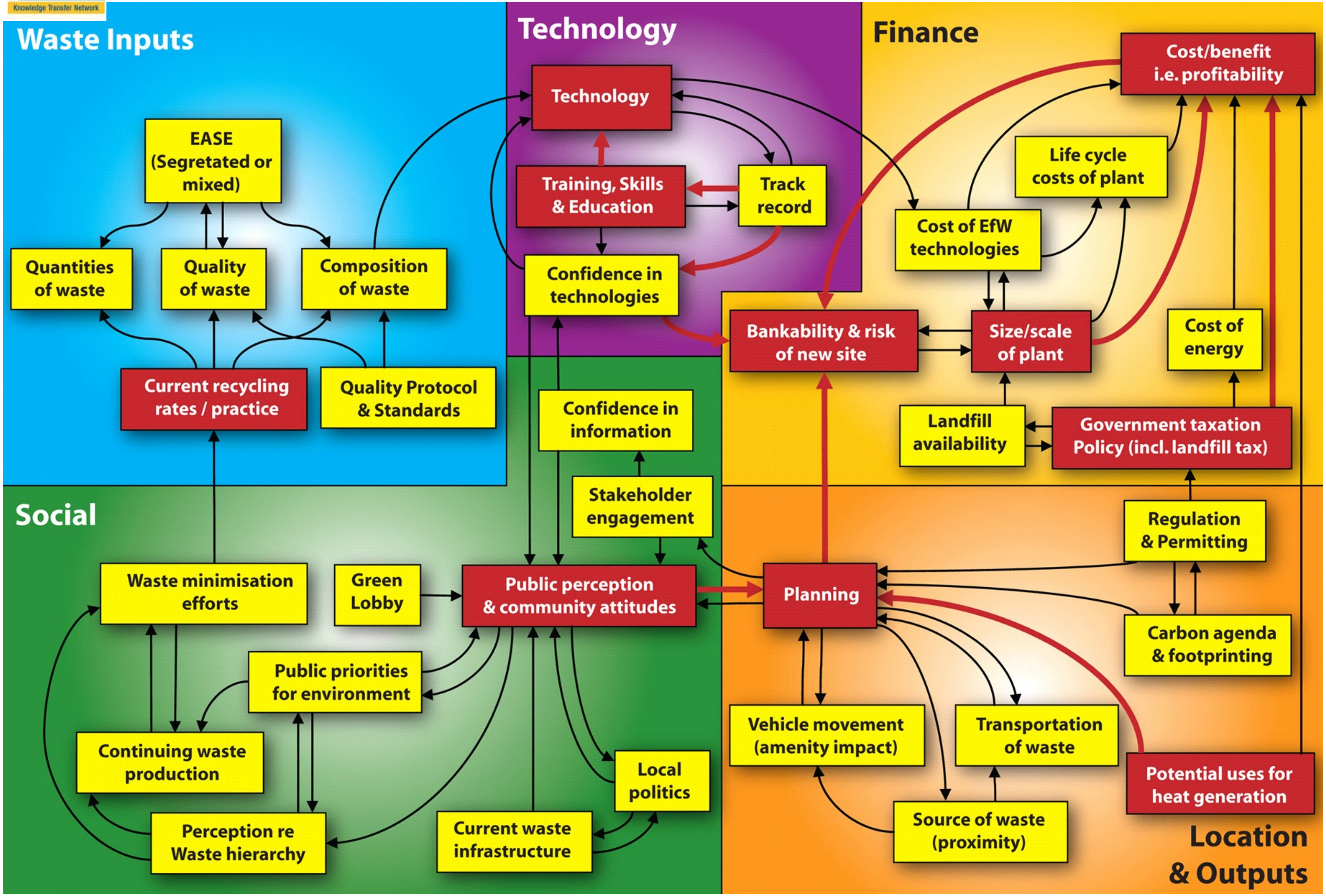
- Public perception of the health implications of mass burn incineration
- Green lobby view on the impact EfW will have on recycling rates
- Planning consent hurdles
- Lack of full scale gasification/pyrolysis and AD demonstration plants in UK
- Waste contracts – MSW vs. Industrial and Commercial i.e. long vs. short
- Public perception and acceptance of recycling schemes
- Skill shortage in waste technology
- Transportation of waste – vehicle movements

Energy from Waste Systems Map



Key ROCs Recommendations from stakeholders

- Any guidance/standards must be clear, appropriate, achievable and not disproportionate (in time, effort and cost);
- Ofgem should work with stakeholders to establish acceptable and cost effective approaches to direct and indirect measurement. Evidence requirements must be reasonable and not overly onerous;
- An independent evaluation of the potential for existing and future direct and indirect measurement techniques would significantly benefit the community.
- An R&D programme for the development and evaluation of near-market, innovative advancements for direct and indirect measurement.
- If cost effective solutions to indirect measurement can be found and prove robust, then BERR/Ofgem should consider the evidence for extending indirect measurement beyond the 50% deeming level.
- Deeming 100% for AD, as long as no digestible fossil fuel derived substances are used, should act as an incentive for technology uptake.