



Knowledge Transfer Networks  
Accelerating business innovation;  
a Technology Strategy Board programme

# ENERGY FROM WASTE - ADVANCED THERMAL TECHNOLOGIES

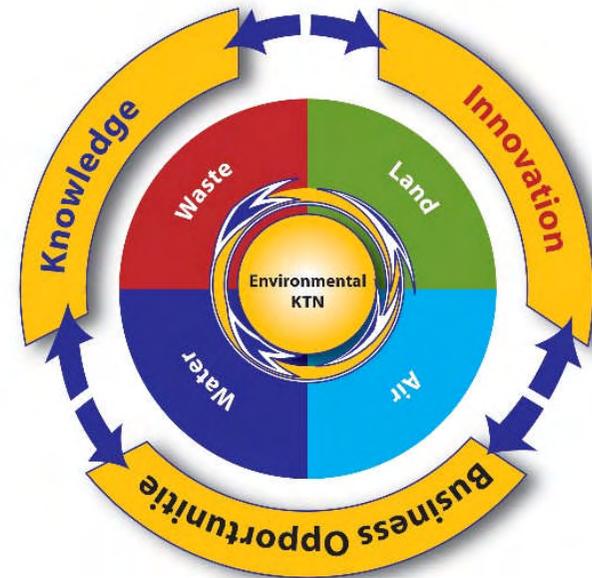
Lancaster Environment Centre  
18 June 2009



## BARRIERS AND ISSUES

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## Environmental KTN

- ➔ A business-led network, comprising over 2000 members from industry, government and academia.
- ➔ Funded by the Technology Strategy Board (TSB), an arms-length body which is supported by the Department for Innovation, Universities and Skills (now BIS), and other Government Departments.
- ➔ Collaborates with over 100 other networks and business support bodies.



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## Our Objective

To improve the competitiveness of UK environmental industries in key priority areas by:

➔ **Catalysing innovation**

*Identifying market needs; facilitating R&D and demonstration projects; enabling funding to drive innovation*

➔ **Enhancing the uptake of technologies**

*Building confidence in innovative technologies; tackling barriers and hurdles to uptake; enabling access to finance*

➔ **Improving knowledge transfer**

*Highlighting market needs and business drivers; raising awareness of innovations; creating opportunities and partnerships*

➔ **Informing government policy**

*Communicating issues affecting technology development and uptake; providing evidence base to support policy development; assisting government to deliver policy objectives*

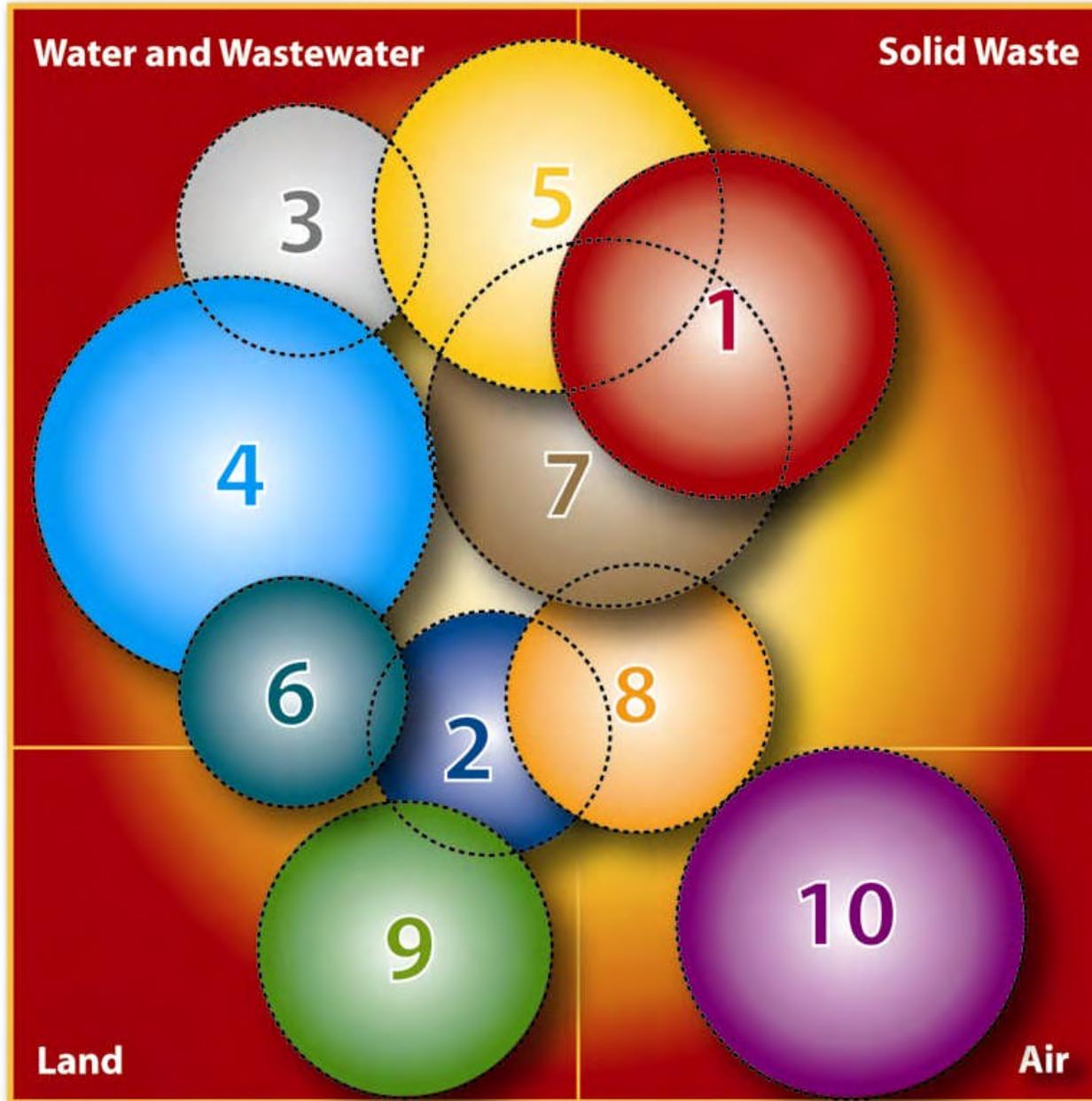


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These technology areas have been scaled in proportion (on a log scale) to the potential market opportunity associated with them.

**Priority Technology Areas INDEX:**

**4**

- 1** Energy from Waste  
£15 Billion + £2 Billion pa
- 2** Rapid Measurement Tools  
£300 Million pa
- 3** Energy Efficient Water & Wastewater Treatment  
>£400 Million pa
- 4** Towards Chemical Free Water & Wastewater Treatment  
£10 Billion pa
- 5** On-Site Treatment Technologies for Industrial Waste & Wastewater  
£2.3 Billion pa
- 6** Treatment of Diffuse & Urban Drainage Pollution  
> £250 Million pa
- 7** Micro & Community Scale Domestic Waste & Wastewater Treatment Technologies  
£2-5 Billion pa
- 8** Environmental Monitoring & Forensics  
> £400 Million pa
- 9** In-Situ Land Remediation  
Max. £800 Million pa (all con land)
- 10** Carbon Capture & Storage  
>£5 Billion pa



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## Business Case Programme

- ➔ Energy from Waste Complete - published
- ➔ Rapid Measurement Tools Complete - published
- ➔ Energy Efficient Water and Wastewater Treatment Complete - published
- ➔ Chemical Free Water and Wastewater Treatment Complete - published
- ➔ In-situ Land Remediation Complete - published
- ➔ Environmental Monitoring and Forensics Complete - published
- ➔ Micro and Community Scale Domestic Waste and Wastewater Treatment Technologies Complete - published
- ➔ Treatment of Diffuse and Urban Drainage Pollution Partially published as IUWM (with N8 & UKWIR) 2009
- ➔ On-site Treatment Technologies for Industrial Waste and Wastewater 2009
- ➔ Carbon Capture & Storage *Interim draft available as pdf*





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## Activities in Energy From Waste

- Development of Business Cases: Energy from Waste
  - Technology roadmap
  - Systems map
- Events – showcasing good practice
- Facilitating discussion forums and special interest groups e.g. work on paper to BERR on ROCs
- Initiating technology calls e.g. for biogenic carbon measurement in syngas
- Projects
- Assisting in overcoming policy hurdles
- International activities
- Working with UKIPO – joint patent informatics report to identify growth areas
- Working with Standards Bodies - CEN and BSI re RDF /SRF to stimulate the market.





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## Advanced Thermal Treatment Technology Drivers

- **Legislation/Policy**
  - Landfill Directive,
  - Waste strategy review
  - Energy white paper
- **Social / political/ economic**
  - Fiscal incentive - Proposed double ROCs
  - Policy recognizes energy-from-waste (EfW) as an integral part of the waste solution for UK





## EfW Opportunity Statement

The opportunity statement is an ambitious goal derived and agreed during the consultation exercise and it is outlined below.

- **To offset 34 million tonnes of carbon from fossil fuel sources by implementing energy from waste technologies.**





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

- Better technology transfer from Europe and secondary research, on the application of advanced thermal treatments, in particular in other countries, to identify best practice in plant optimisation.
- 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.





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## Technology Issues & Priorities for Innovation (Near market & 2020)

- All advanced thermal technologies would improve from research on waste composition and the development of more rapid sampling tests and techniques to be able to determine this. This detailed waste characterization includes 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. This may be types of facility and or technologies that are able to handle the heterogeneity of more waste streams.





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## Gasification and Pyrolysis Priorities

- Gasification and Pyrolysis for waste treatment and the subsequent energy generation are still in their infancy in UK, research needed includes:
  - More full scale operational plants to demonstrate the uses of the technology to increase confidence.
  - Extracting value products from the synthetic (syn) gas using membrane separation technologies.
  - Real gasification vs. two stage combustion.
  - Developing modular plants; sizing of plants will be challenging in the future.





## Advanced Thermal Treatment Barriers

- Public perception of the health implications of thermal treatments
- Green lobby view on the impact EfW will have on recycling rates
- Planning consent hurdles
- Lack of full scale gasification/pyrolysis 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





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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.





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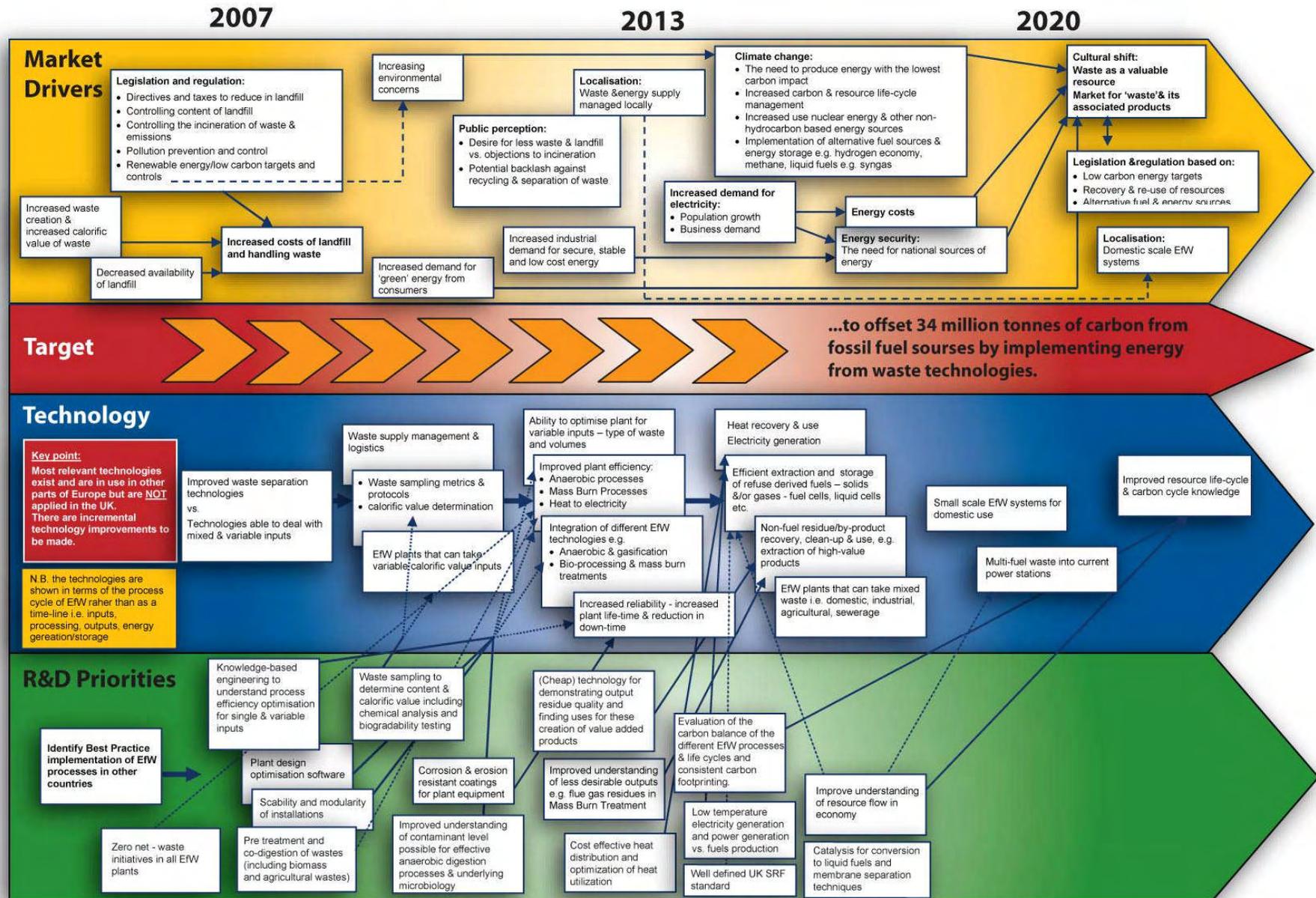
## Energy From Waste Potential Market

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

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



# Energy from Waste Technology Roadmap





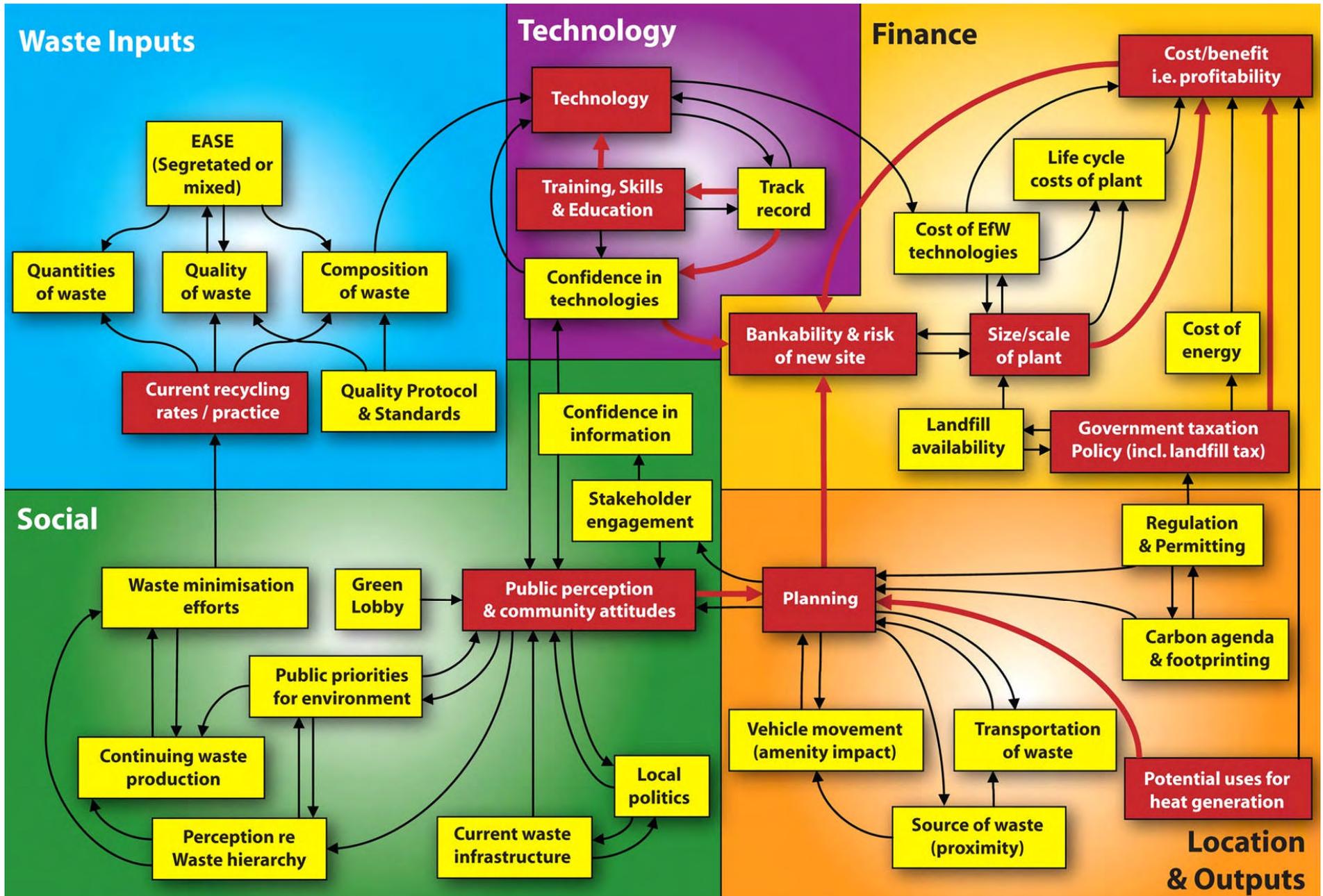
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## Systems Map - Process

- Interview members of supply chain
- Utilise knowledge and experience to list influences
- Headline themes
  - Finance
  - Location and outputs
  - Technology
  - Social
  - Waste inputs
- Cluster all of the influencing factors
- Generate systems map for all of the subsets
- Produce summary of the subsets i.e. overall systems map
- Review systems map with members of the supply chain



# Energy from Waste Systems Map





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## 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.



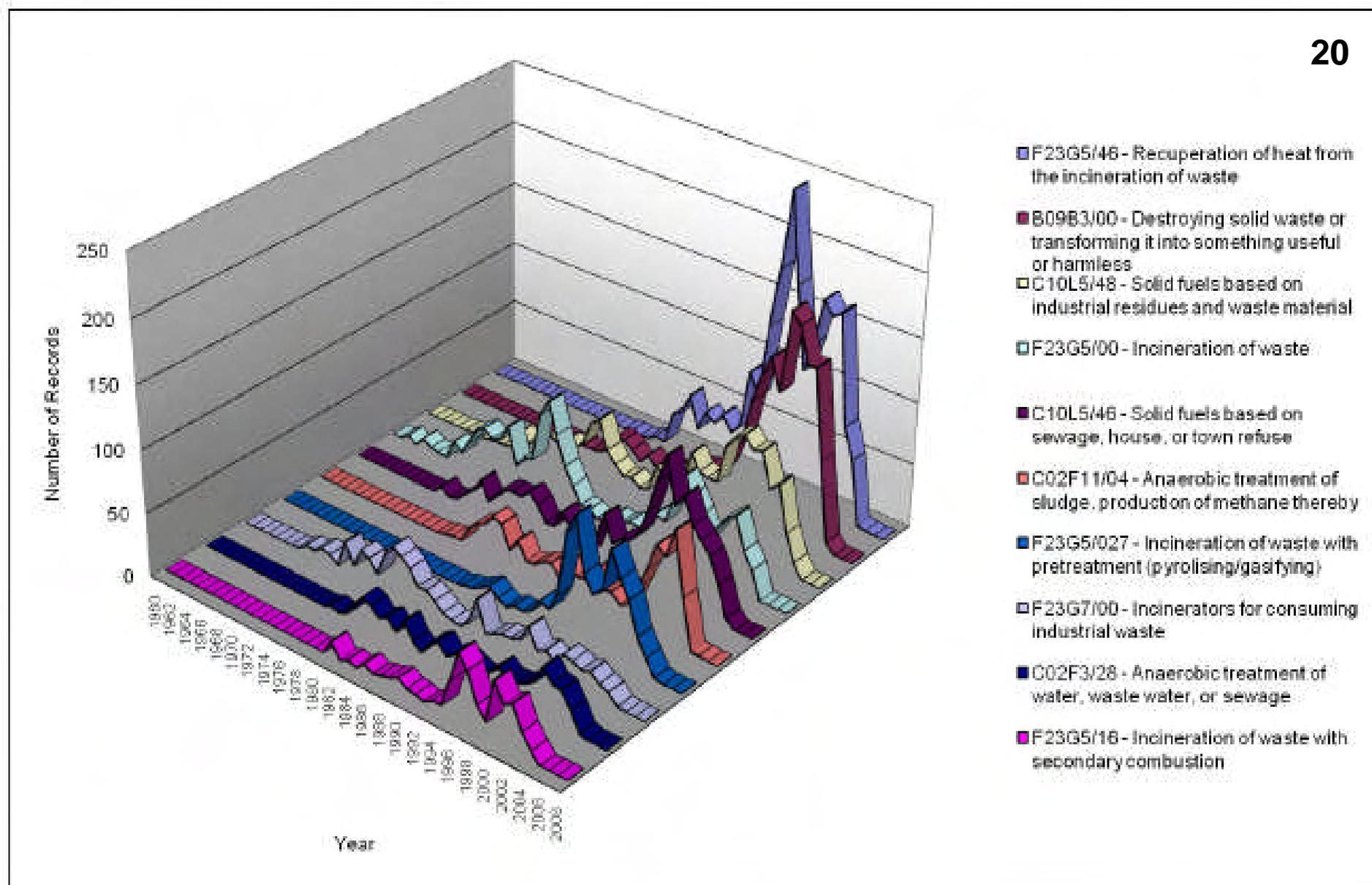


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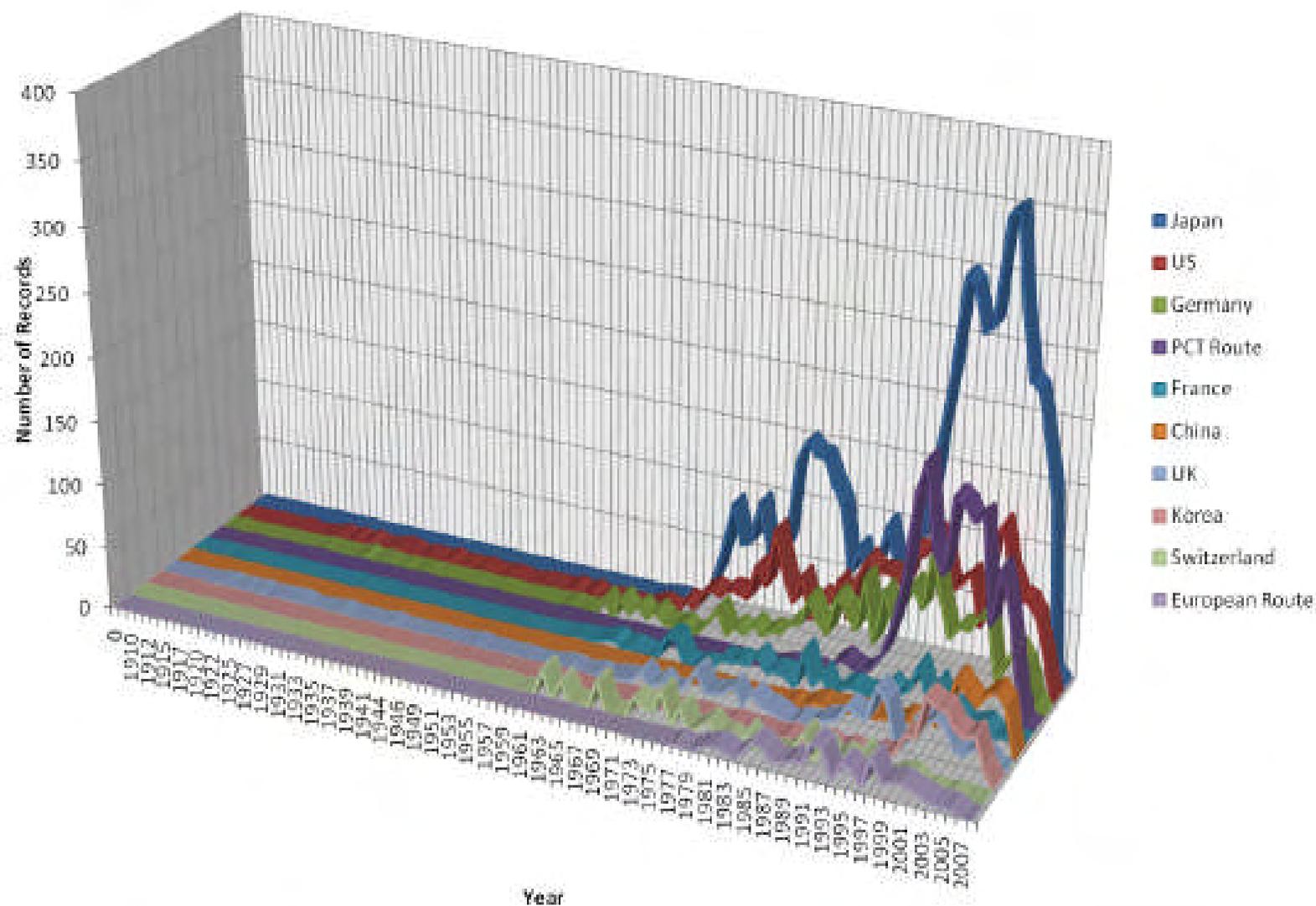
## Working with UK IPO – Patent Informatics

- Analysis of Energy from Waste Technologies
  - Provide an overall patent landscape analysis in the technology area
  - Provide analysis of the level of UK research in comparison to rest of Europe and World
  - Identify key active companies and patent applications
    - Significant increase in activity from the 1960s
    - Little activity in Japan until 1970s but now highest activity of any country
    - Highest activity in “recuperation of heat from incineration of waste”
    - Patent activity in UK differs from other countries – technologies relating to advanced thermal treatments under-represented but anaerobic digestion well represented

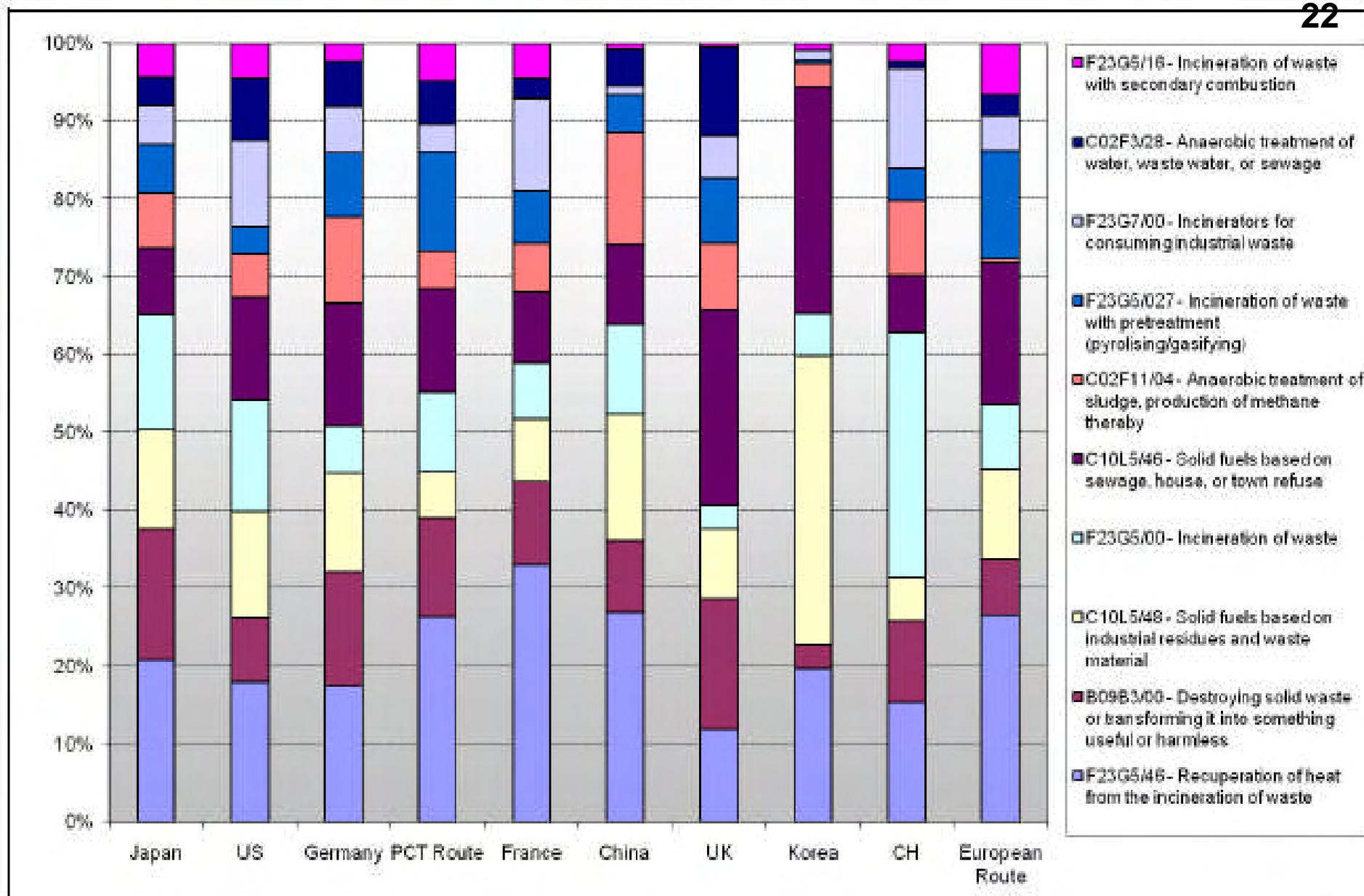




**Figure 2** Worldwide patent filings by technology and priority year 1960-2008



**Figure 4** Patent filings by priority country and year



**Figure 7** Percentage of technologies by country



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## Working With Standards

- **Standards in Energy from Waste**  
Stimulates the market and encourages technology uptake
- **Solid Recovered Fuel**
  - CEN/TS 15359 - to provide unambiguous and clear classification and specification principles for solid recovered fuel (SRF).
  - Defra concerned that under this standard untreated MSW could masquerade as SRF.





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## Working with Government

- Defra
  - Input to strategies
  - Membership of Waste and Resources Research Action Group (WRRAG)
  - Working with waste team on PFIs
  - Working with water team on anaerobic digestion
- Environment Agency
  - Input to innovation activities, including roadmapping
- UK Forum for Environmental Industries (UKFEI) secretariat





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## International activities

- Chairmanship and Secretariat for Euroenviron
  - Environmental umbrella of the Eureka funding mechanism
- Working with WSSTP
  - Sustainable sludge management working group
- Working with UKTI on international opportunities





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## What we can offer

- The KTN can:
  - Disseminate project outputs and share best practice/knowledge transfer through their networks (including at a European level through EuroEnviron and ETAP), via newsletters, workshops, case studies;
  - Broker/Partner finding and help to identify potential sources of funding. The KTN has good links with research funding bodies (including NERC, EPSRC, TSB Technology Programme, KTP programme) and links to European funding (Eureka, Eurostars, FP7)
  - Identify and help develop potential markets, including building confidence/ explaining benefits of new technologies (domestic and overseas through UKTI)





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## How to get involved?

**Become a member (it's free):**



### Environmental KTN

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### Associated Knowledge Transfer Network



### Resource Efficiency KTN

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**Thank you for listening**

**Any questions?**

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