



Industrial Symbiosis: Brief Overview

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#EUCircularTalks

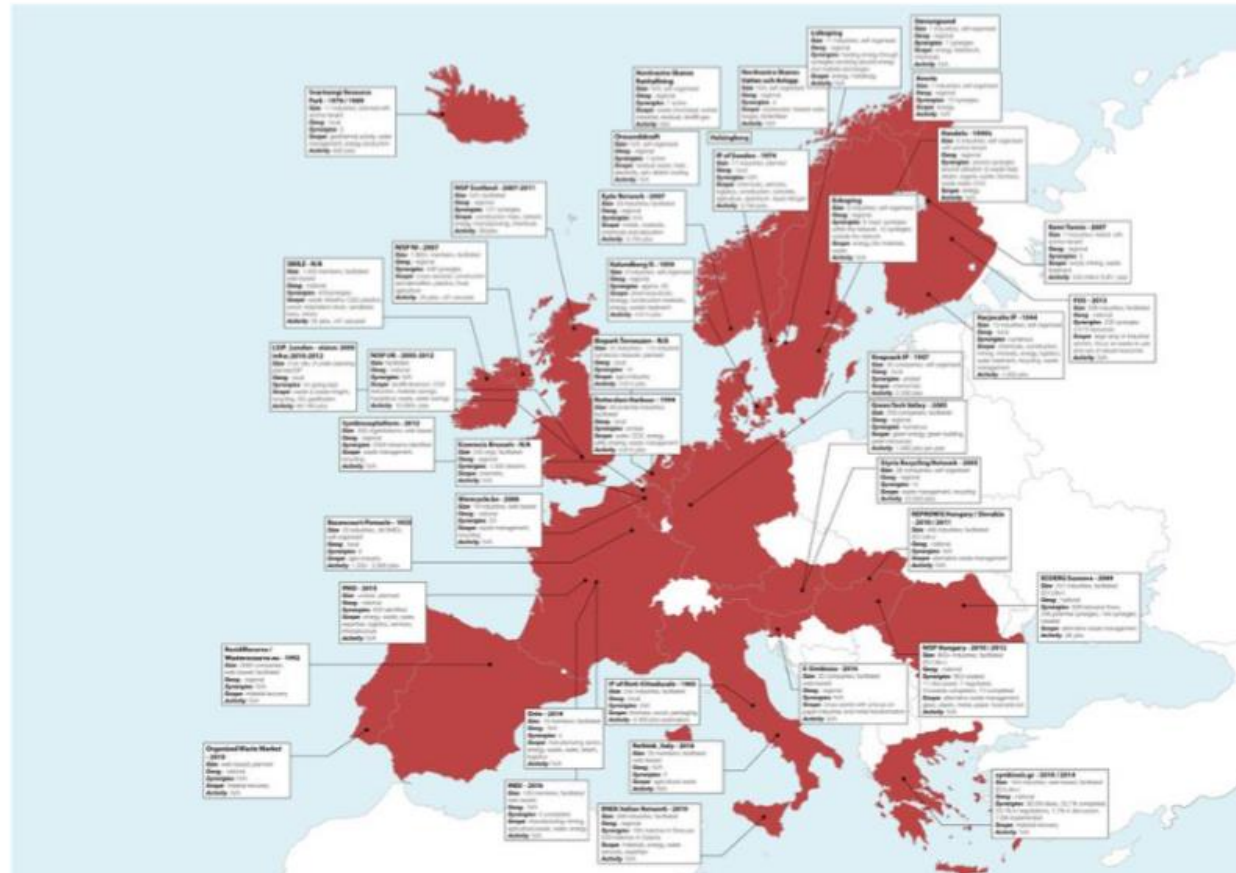
Industrial symbiosis: A tool for the Green Deal

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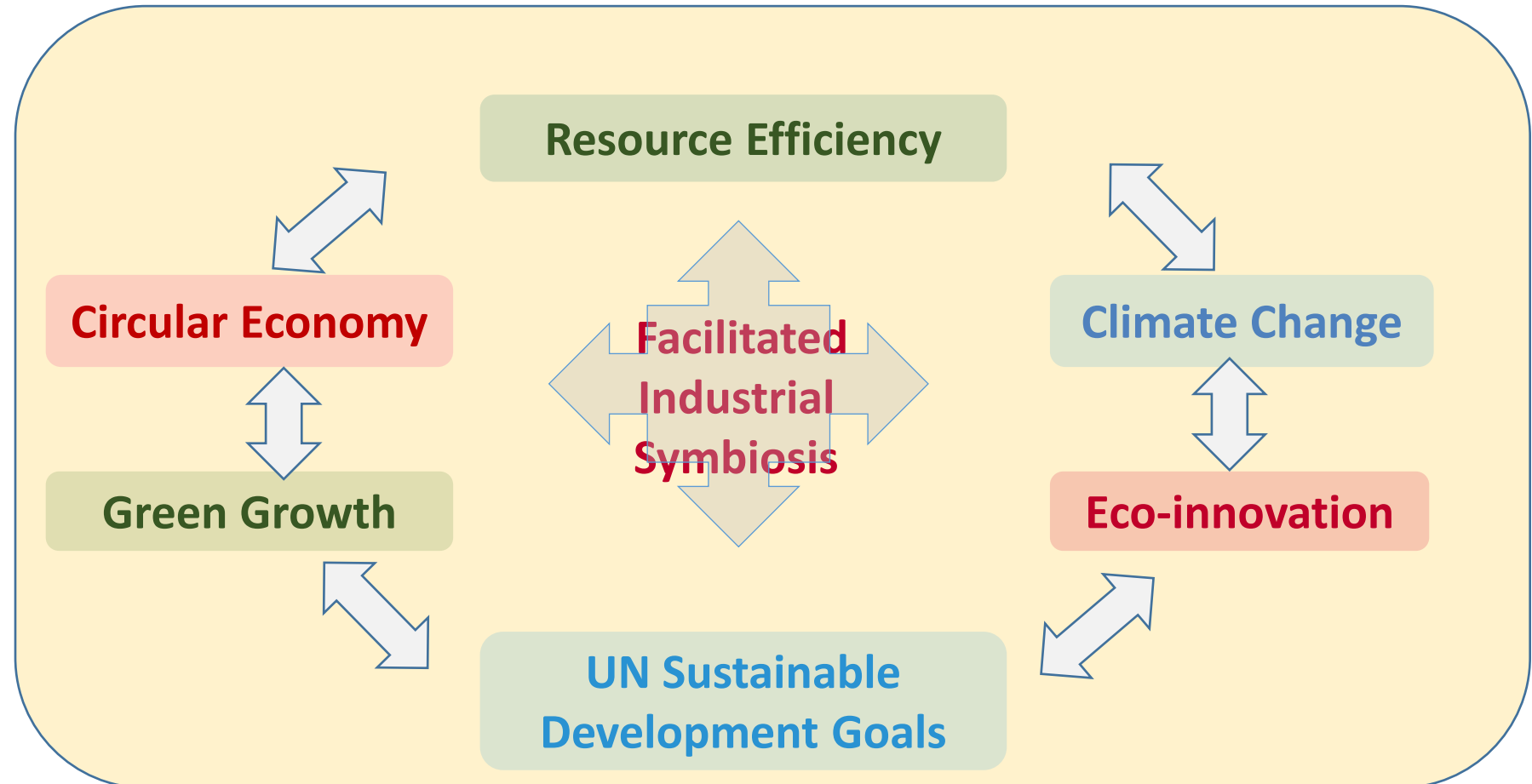
“To lead the world in innovative industrial ecology solutions for a low carbon, sustainable economy”

| Map of IS initiatives in Europe (2018)



Domenech et al (2018) Cooperation fostering industrial symbiosis market potential, good practice and policy actions. Report for DG GROW

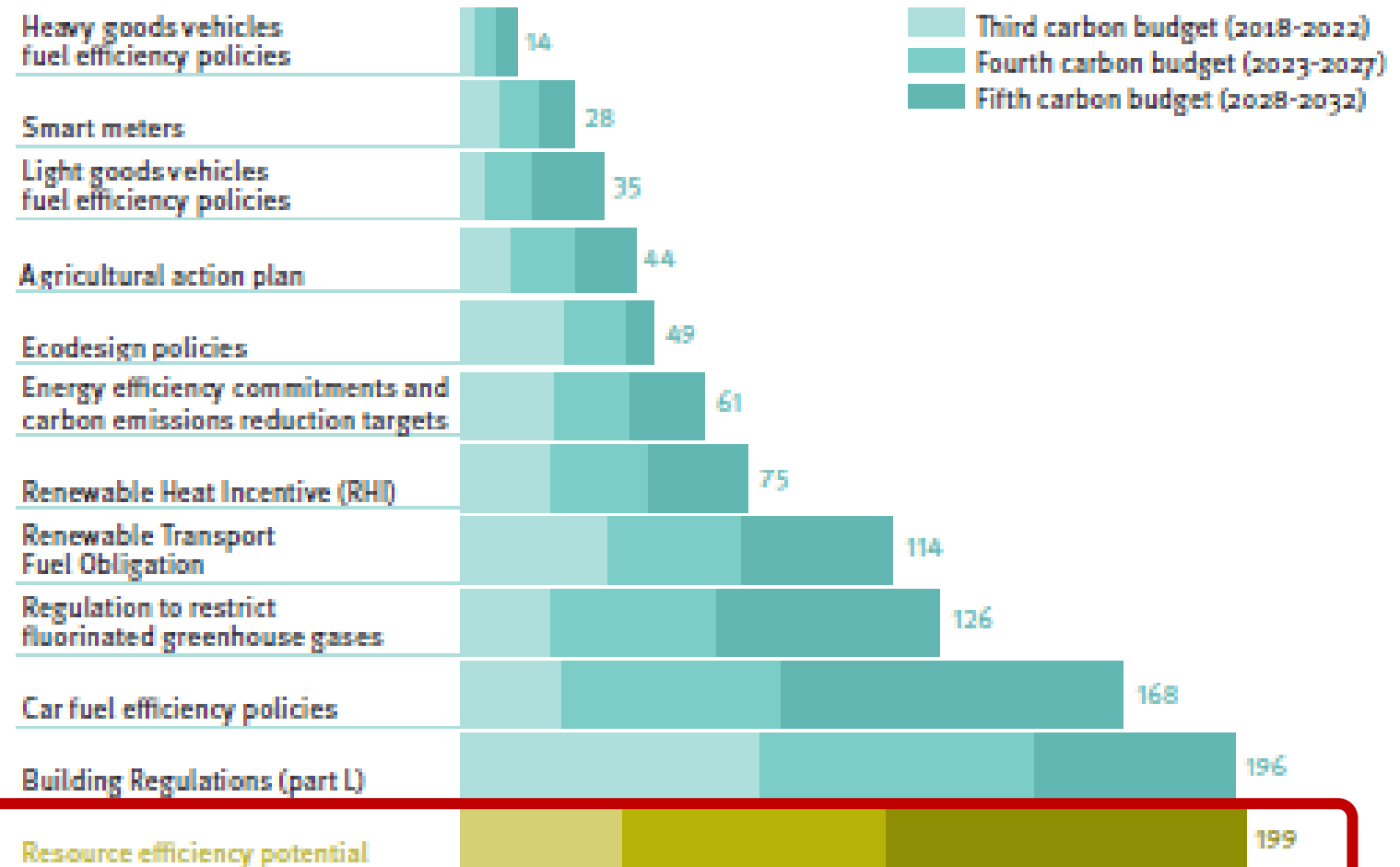
| IS: Adding value to global agendas



| Carbon link to materials

“Emissions from the production of materials increased from **5 gigatons (Gt) of CO₂-equivalent in 1995 to 11 Gt in 2015**, with their share of global emissions rising from **15 per cent to 23 per cent**. This corresponds to the share of GHG emissions from agriculture, forestry and land-use change, yet these have received much less attention.”

Mitigation potential of resource efficiency



Source: Oxford University
Centre for Research into
Energy Demand Solutions
(CREDS) 2019

| 2018 CWA “Industrial Symbiosis”

“Industrial symbiosis is the use by one company or sector of underutilised resources broadly defined (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials) from another, with the result of **keeping resources in productive use for longer.**”




Facilitated industrial symbiosis: Delivering impact



Delivered impact

Waste avoided 516 kt
Virgin resources saved 636 kt
CO2 saved 1.38 Mt
Add'l sales €53.85 M
Cost svgs €14.12 M
Jobs 74
Private invest €4.45 M

4 years, 2015-2019
3 demo sites

Delivered impact

Landfill Diversion 47 Mt
Virgin resources saved 60 Mt
CO2 saved 42 Mt
Add'l sales €1.17 B
Cost svgs €1.21 B
Jobs 10,000+
Private invest €374M

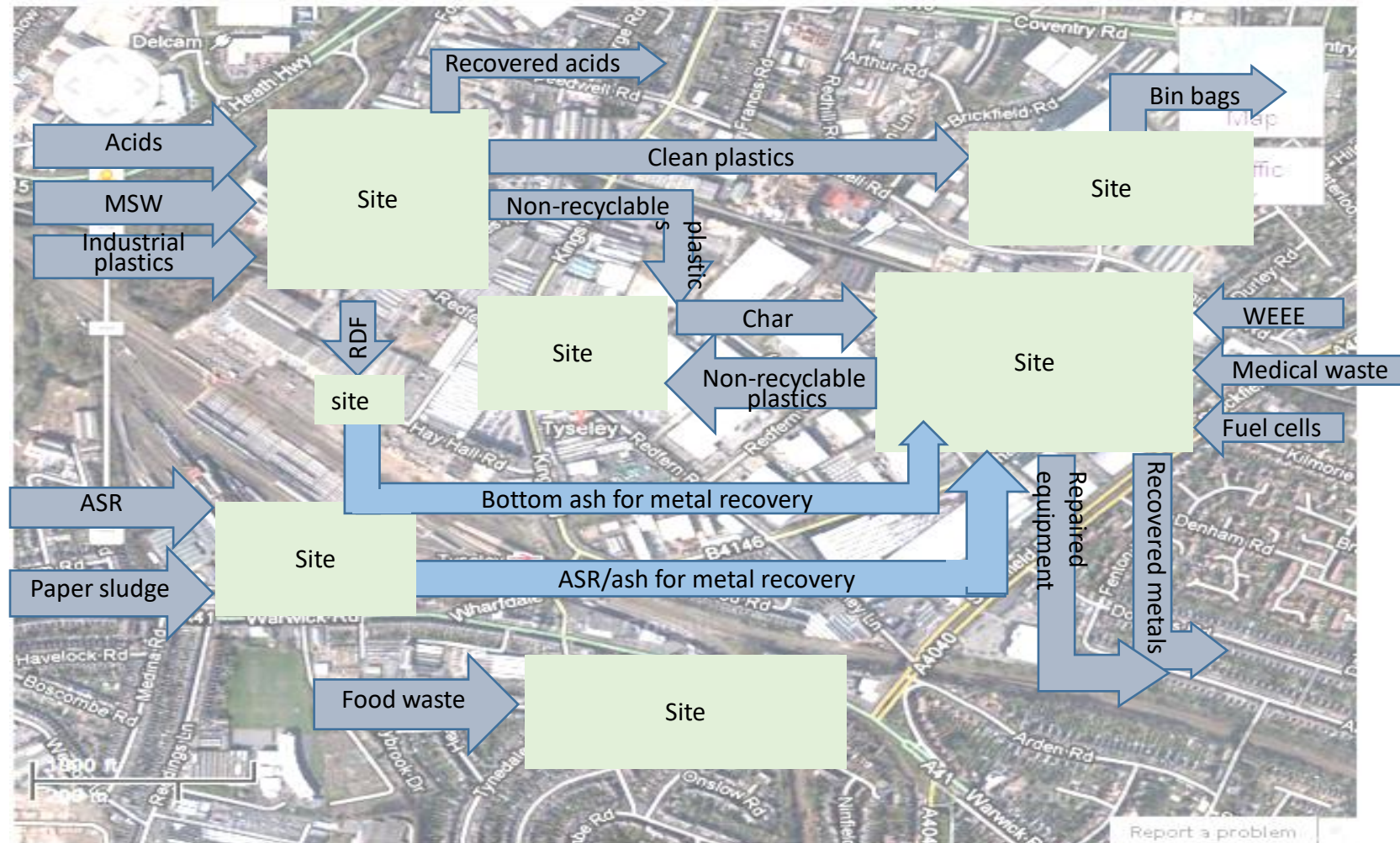
8 years, 2005-2013
England

Delivered impact


Waste diverted 109 kt
CO2 saved 148 kt
Sales, Svgs, Investment USD \$7M
Jobs 218

8 years, 2013-2020
Western Cape Province

| Pro-active IS for Regional Economic Development



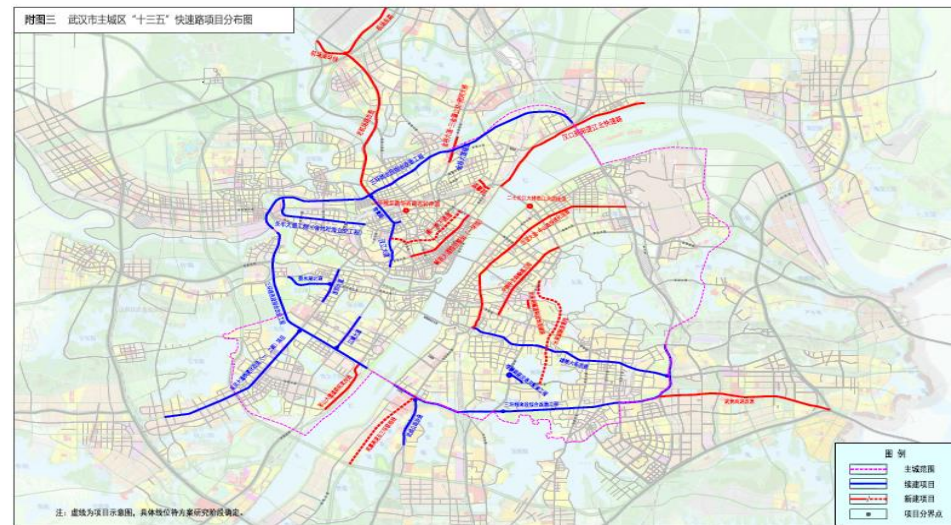
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| Industrial (Urban) symbiosis: Low carbon infrastructure

Five-year “Strategic Plan for Integrated Urban Development”

Wuhan, Hubei Province, China

- 25 new metro lines with associated stations
- Road expansion to a total of 3130km in the Wuhan urban area.
- Airport expansion to 45 million passengers per annum.
- 60 million tonnes pa of construction demolition waste generation



| Business challenges (Market failures)

- Information
- Regulation, Policy
- Commercial

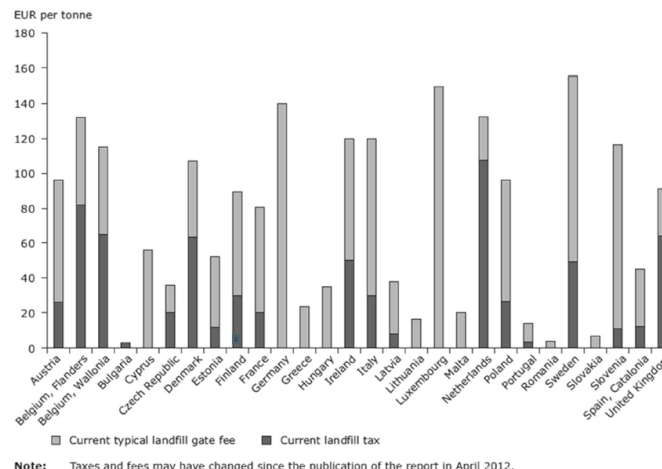
| Business challenge: Cross-sector information

APPLICATIONS AND POTENTIAL MARKETS FOR THE DIFFERENT EGGSHELL COMPONENTS

UNUSED EGGSHELL COMPONENTS	AREA OF ACTIVITY	USE
Type I, V and X collagen	Biomedical	Bandages, surgical implants and cicatrizants
Calcium	Animal food	Food supplement
	Human food	Food supplement
	Pharmaceutical	Osteoporosis prevention Tissue regeneration
Glycosaminoglycans (GAG)	Cosmetic	Anti-aging creams and moisturizers
	Food	Emulsifying agent in dressings and mayonnaise
Proteins specific to eggshells	Biomedical	Antibacterial protein Ovocalyxin-36 (OCX-36)
Powdered eggshells	Industrial	Ceramic and paper industries
	Energy	Capture CO ₂ during hydrogen production
	Water treatment	Ability to absorb metal ions

| Business challenge: Get the prices right

- Financial benefit is “paramount consideration” [Branson, 2011]
- Business goals include: risk or reputation management, diversification, asset utilization
- Fair ≠ Equal
- Market conditions to incentivise
- Conditions vary widely, even across EU MS



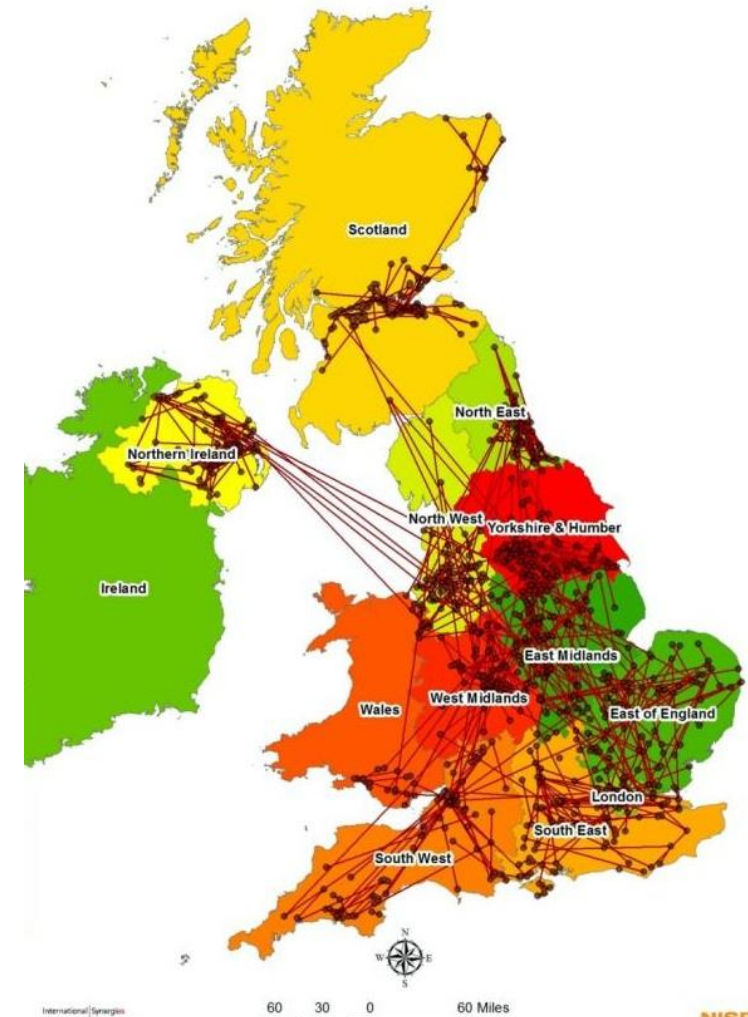
Typical charge (gate fee and landfill tax) for legal landfilling of non-hazardous municipal waste in EU member states and regions.

Source: Bio Intelligence Service 2012,
Cited in EEA 2013, *Managing Municipal Solid Waste*, 2013.

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| Value determines “proximity” – not v.v.

- Half of synergies completed within 21 mile radius
- One-quarter of synergies involved distances greater than 40 miles radius
- Some resources traveling over **200 miles**:
 - Textiles
 - Metals
 - Minerals
 - Paper and card
 - Hazardous waste



| Business challenge: Organisational, governance

- Culture (flexibility, risk taking)
- Innovativeness – First mover *D*/Sadvantage
- Capacity (time as investment)
- Structure (siloes versus coordination/cooperation)
- Storage capacity
- Materials specification, regulation

| Innovation...



- Technological solutions to waste valorisation
Demand-led innovation, continuous learning
- Knowledge base for IS
1000s of case studies in the public domain
- Logistics
Best organised by companies
- Funding
Relevant where market fails to create incentive

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| Market...



- Market potential

€73B cost saving only, anticipate same for revenue generation

- Reporting Procedure



- Market barriers

Standards etc

- Geographic scope

Valorisation determines proximity, not vice versa (Jensen 2011)

- Actions to develop ~~cooperation and trust between industries~~

independent facilitation

| Policy options...

- IS and IED
Continue to build the 'sticks', BREF, EMS
- "End of waste" criteria
Emilia Romagna by-product sheets
- Support to secondary materials
Standards etc
- + Smart Specialisation Strategy, ESF
Get the metrics right
- + National IS plan (DG ENV)

 priority



| Concluding...

- Methodologies well-developed and take-up is increasing
- Continuing need for innovation, policy and market development
- Global competitiveness – EU needs to go mainstream faster



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Thank you! Questions? (time permitting)