Industrial Symbiosis: Connecting Industry, Creating Opportunity

Progetto “Green Simbiosi”

7th March 2014

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International Synergies Limited

NISP
NATIONAL INDUSTRIAL SYMBIOSIS PROGRAMME

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Demand-Led Industrial Symbiosis from an Industry Perspective

- Problems
- Costs
- Risks
- Context

Business Opportunity

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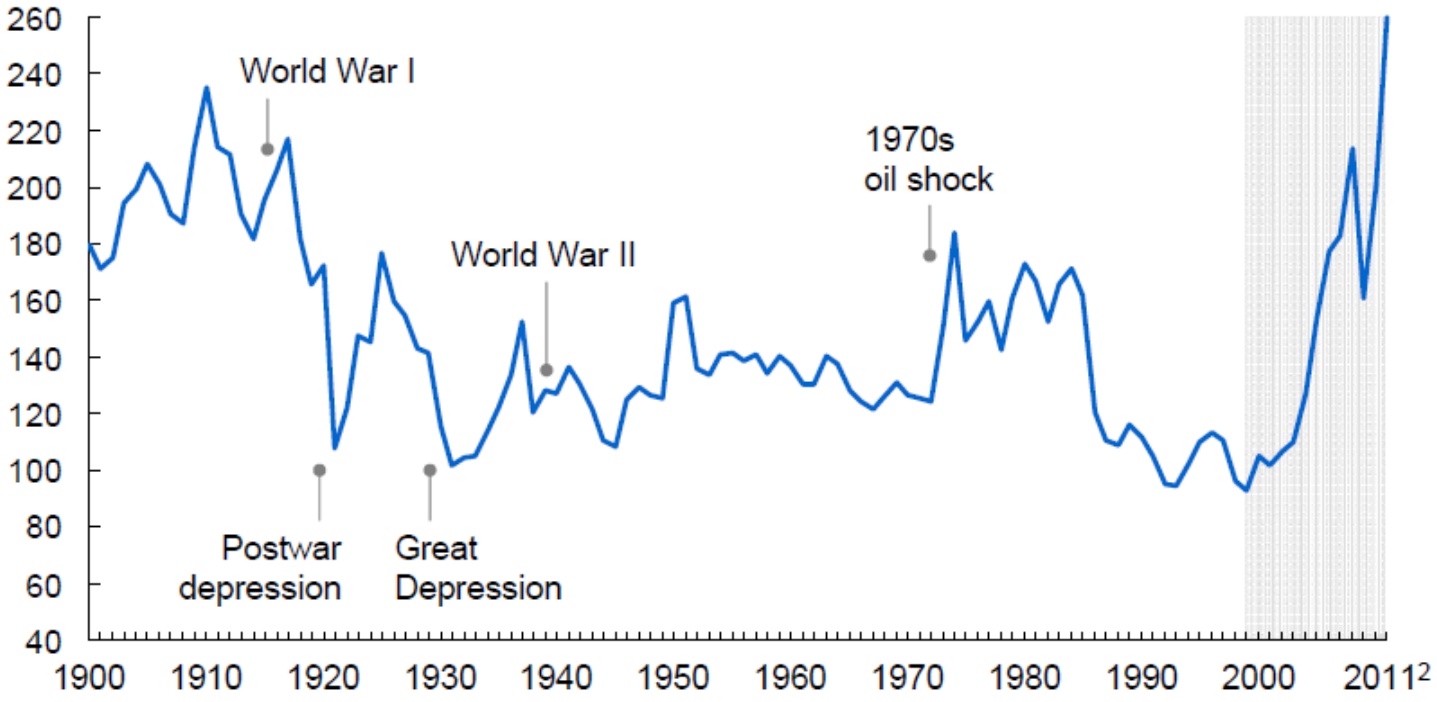
The Challenge: Price Volatility
McKinsey & Co., Resource Revolution (2011)

Exhibit E1

Commodity prices have increased sharply since 2000, erasing all the declines of the 20th century

MGI Commodity Price Index (years 1999–2001 = 100)[1]



1 See the methodology appendix for details of the MGI Commodity Price Index.
2 2011 prices are based on average of the first eight months of 2011.
SOURCE: Grilli and Yang; Stephan Pfaffenzeller; World Bank; International Monetary Fund (IMF); Organisation for Economic Co-operation and Development (OECD); UN Food and Agriculture Organization (FAO); UN Comtrade; McKinsey analysis

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Economic Drivers for Industrial Symbiosis in Europe

- Volatility of resource pricing (McKinsey report)
- 14 At-risk critical raw materials identified by EU
- Rising awareness of sustainability issues
- Carbon Trading to include Scope 3 emissions (DG Climate Action)
- EU policies incorporating IS across Directorate Generals

Imperative for practical approaches to create growth

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Che c'osé la Simbiosi Industriale?

- Varie definizioni accademiche ...

In essenza:

- La simbiosi Industriale é un approccio sistematico ad un'economia sostenibile attraveso l'integrazione industriale che identifica opportunitá per l'ottimizzazione dell'utilizzo delle risorse (risorse naturale, energia, acqua, capacitá produttiva, know-how, etc)

Lombardi and Laybourn (2012) Journal of Industrial Ecology 16(1)

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Elements of Industrial Symbiosis

- Network of diverse organisations
- Expert facilitation
- Fostering eco-innovation and long-term culture change
- Yielding profitable transactions in:
  - Novel sourcing of inputs
  - Value added destinations for non-product outputs
  - Improved business and technical processes

Lombardi & Laybourn, 2012, Journal of Industrial Ecology 16(1):28-37

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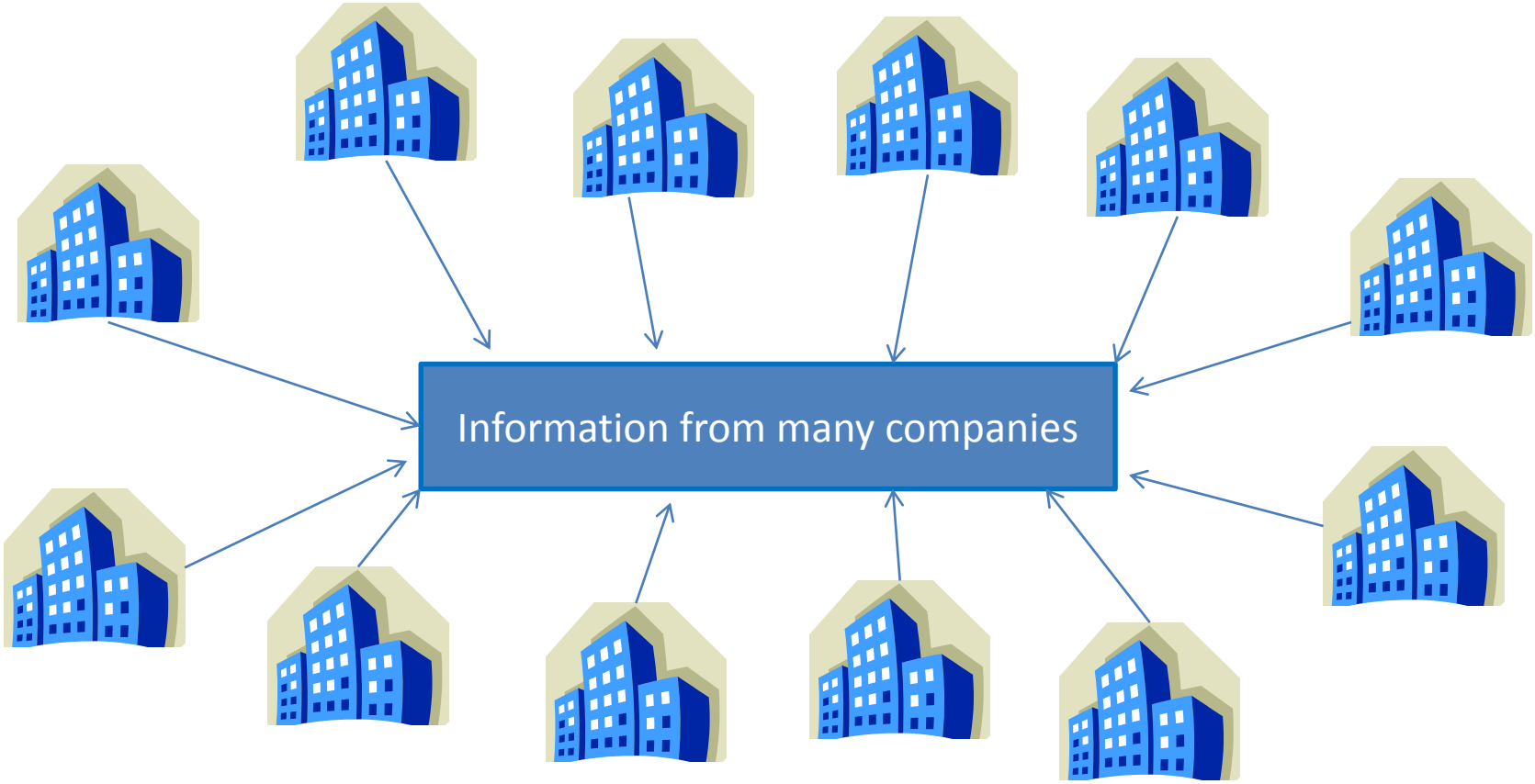
Our Process: Collect business information from companies (costs, problems)



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Our Process: Identify and facilitate opportunities

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Welcome to Michelin

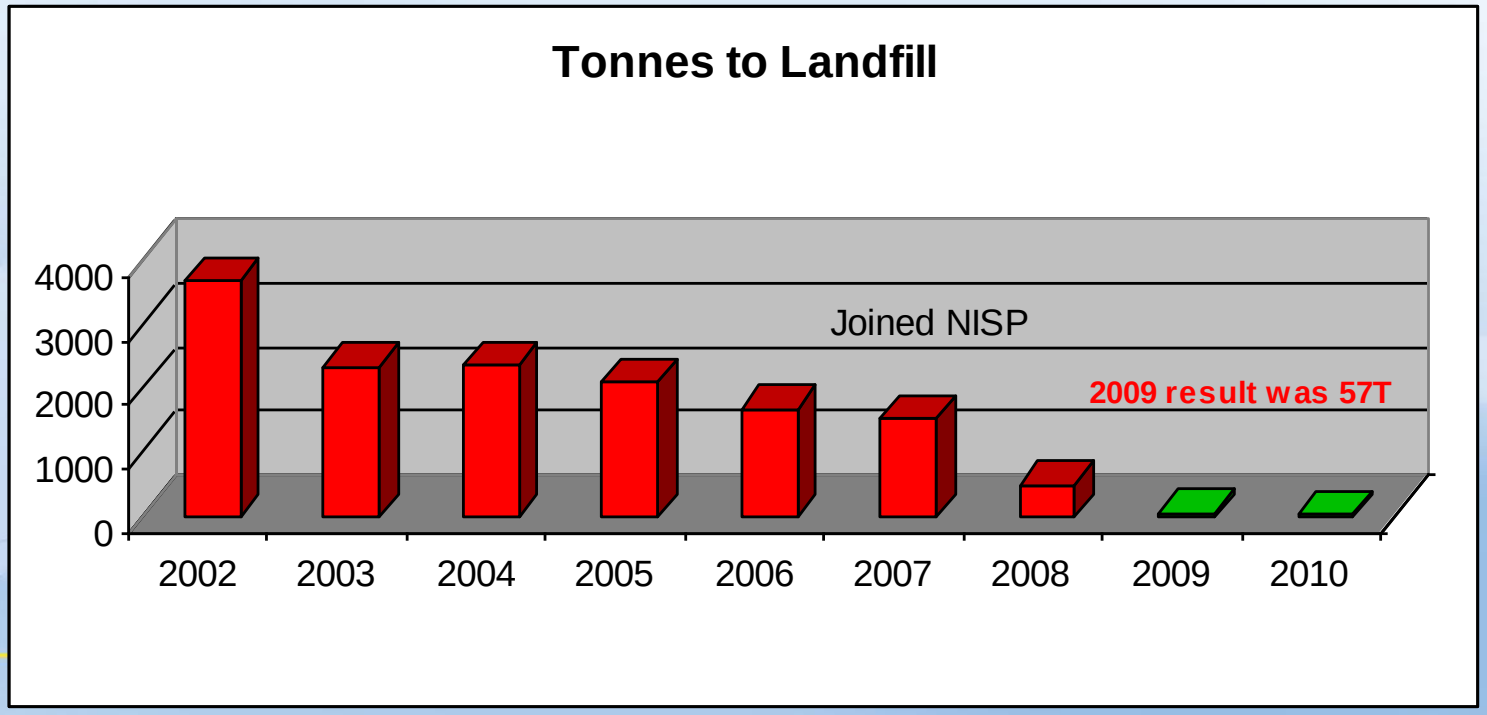
Paul Kinkead
Environment Manager

Reduction in waste to landfill

- Corporate target to eliminate process waste to landfill
- Challenge: difficult materials to recycle
- 36 individual waste streams
- Use of benchmarking within Michelin
- Breakthrough : engagement with NISP to source creative and cost effective solutions
- Access of expert solution providers

Reduction in waste to landfill

- 97% reduction achieved
- Ballymena factory is the corporate benchmark
- Corporate targets achieved 18 months ahead of plan



Diverting Hazardous Waste, capturing Al

Challenge: Hazardous Waste generated from radiator coating process

Solution: Aluminum secondary smelter able to use flux material in manufacturing process

Results:

- Cost Saving £38,000 (£89k)
- Hazardous waste diverted from landfill: 15 (37) tonnes
- Carbon emissions reduced by: 240 (600) tonnes

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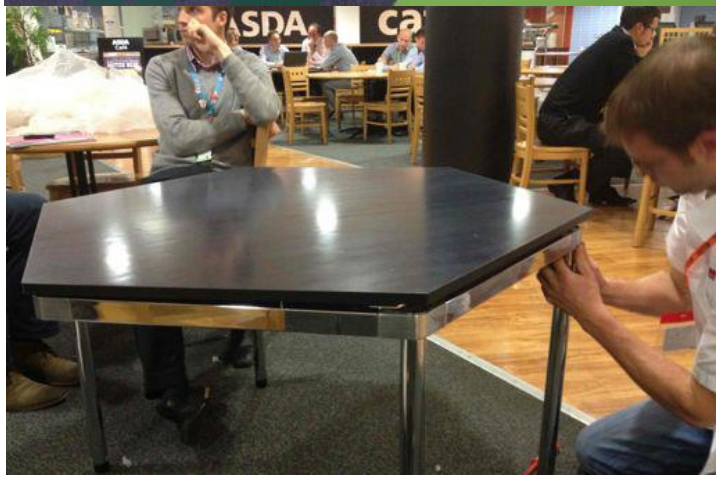
Eco-innovation in products

Challenge: Using mixed waste and carpet waste

- Solution: convert mixed wastes into light mechanically-stable plastic panels

- ASDA plastic hangers and coffee waste converted into coffee room tables.

- Panels reusable and recyclable into new panels at end of use



proto max plastics ltd.

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Generate revenue through new processes

Challenge: Recovering Silver from X-Ray films

- Solution: Engage with University innovation providers to change to process

- CO_2-eq reduction (**24** kt)
- Eco-Innovation and Green Growth
- Materials security
- Regional Economic Development (**11** jobs)

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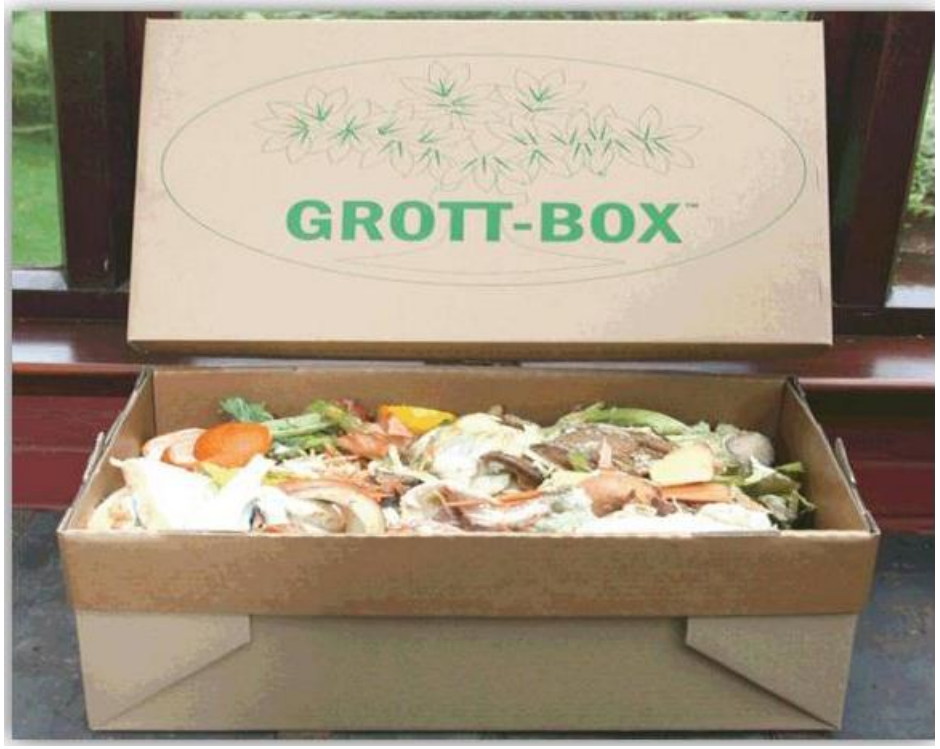
Eco-innovation in products

Challenge: food waste going to landfill

- Solution: “Grott Box”, waterproof cardboard box with wax layer and snug lid, entirely biodegradable, used to collect food waste from schools

- Potentially 50-75,000 tonnes per year



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Opportunities bring Successes

NISP

A fruitful collaboration

ORGANISATIONS INVOLVED

Terra Nitrogen (UK) Limited
John Baarda Ltd

SUMMARY

NISP North East is working with members Terra Nitrogen (UK) Limited and John Baarda Ltd in a fruitful collaboration which sees a record breaking 38 acre greenhouse in Billingham growing tomatoes all year round, creating 65 new jobs and diverting 12,000 tonnes of Carbon dioxide emissions.

BACKGROUND

Terra Nitrogen is part of Terra Industries Inc, a leading international producer of nitrogen products and methanol. Looking for alternative ways to use its by-products, the company teamed up with Humberside fruit and vegetable grower John Baarda Ltd to provide the infrastructure to supply and deliver utilities to the 38 acre site.

The £12 million greenhouse, the largest in the UK, will grow over 300,000 tomatoes a year to be sold on to retailers such as Somerfield and Sainsbury. The site will use more than 12,500 tonnes of CO_2, a by-product of Terra's nearby manufacturing site, significantly reducing the company's emissions. Steam from the plant will also be used to heat the greenhouses. In addition, Terra Nitrogen will supply electricity to the greenhouses, ensuring Baarda benefits from specially agreed low rates, enabling them to produce tomatoes throughout the winter, providing a real boost for British agriculture as tomatoes would normally be imported from Spain during the colder months.

THE NISP CONNECTION

- NISP worked with Terra Nitrogen to identify alternative ways to use by-products of the company's manufacturing plant.
- Tees Valley Regeneration liaised with the two companies, both members of the NISP North East Programme, to ensure the project's feasibility in terms of development of technology and implementation of infrastructure. NISP assisted this process and ensured continued promotion of this symbiotic relationship.

ACHIEVEMENTS

- 65 new jobs created
- Reduction of 12,500 tonnes of CO_2 emissions
- Successful reuse of waste heat
- £15 million private investment in region

CONTACT DETAILS

Dave Sterrill, National Programme Manager, NISP – 0121 766 4560
Christine Parry, Regional Co-ordinator, NISP North East – 01624 342409

www.nisp.org.uk

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Alternative uses for waste beer.

ORGANISATIONS INVOLVED

Diageo UK Ltd,

SUMMARY

Diageo, are the owners and producers of the world famous beer Guinness. As part of the production process this beer undergoes very strict quality control procedures. The result is some waste beer is produced and gets disposed of in a secure manner in Sheffield. NISP were asked to examine the viability of using secure disposal points nearer to the production facility in Runcorn, Cheshire

BACKGROUND

Diageo produce this beer and have very keen duty of care procedures that not only have to satisfy the Environment Agency but also HM Customs & Revenue. They take steps to ensure that this beer does not fall into the wrong hands and therefore protect the quality of their products. As a NISP member, they asked for our help in finding a more financially and environmentally viable option for their liquid wastes.

THE NISP CONNECTION

NISP identified key solution providers with the potential to help Diageo in their quest for more financially and environmentally sustainable solutions to the treatment of the beer. The beer went through a strict waste acceptance criterion involving various lab tests to assess suitability and Diageo performed audits on the solution providers involved to ensure that their security procedures were of the correct standard for the waste to be treated and disposed of properly. As a result, the beer has gone to uses ranging from benefiting agricultural land to the provision of power through anaerobic digestion, and Diageo have managed to secure a definite environmental and financial win for this waste beer.

ACHIEVEMENTS

- Reduction in CO2 of 9084 tonnes per year
- Diversion from waste disposal of 2600 tonnes per year

CONTACT DETAILS

Stuart Smith, NISP North West – 07920 861947

www.nisp.org.uk

www.nisp.org.uk

Case Study

Fab savings met in the UK for Michelin

Organisations involved: Michelin, Waste End Strategy (WES)

The Challenge

Michelin manufactures and sells tyres for all kinds of vehicles, publishes maps and guides and operates a number of digital services in more than 170 countries. For Michelin Ballymena, which celebrates its 40th anniversary in 2009, the disposal of 'Meftab', the metallic reinforcing with its own unique nature used in heavyweight tyres, was increasing overall production costs and also needed to be diverted from landfill to achieve local environmental targets set by the Ballymena plant. Each year the plant, which is the only truck tyre producing plant in the UK, produces 1.4 million heavyweight tyres for trucks and buses.

WES offers solutions for the production and management of waste that are both cost-effective and in compliance with relevant legislation and policy.

Above: Fab savings met in the UK for Michelin, Ballymena

The Solution

Management at the Ballymena plant needed to source an alternative disposal route to achieve their landfill diversion targets. 'Meftab', owing to its unique nature and structure, requires specialist outlets to recover the steel content and the rubber. Waste End Strategy sought to maximise the cost effectiveness of an alternative outlet for the 'Meftab' and saw the NISP methodology as a means of providing a sustainable solution. Through collaboration with an established partnership, WES was able to provide a different outlet for the 'Meftab' in London and now also in Cardiff. This represents a two phased solution that helps divert the material from landfill to a number of outlets for the Ballymena site. WES is currently testing additional outlets with spare capacity to process the output from another Michelin plant in Dundee and later in the year the French plants. The diversion from landfill, of 'Meftab', to satisfy stringent local targets at the Michelin Ballymena plant was a solution delivered by Waste End Strategy with the end results documented below.

The Results

- Additional Sales: £54,891
- Businesses Assisted: 4
- CO2 Reduction: 381 T
- Training Outcomes: 4
- Landfill Diversion: 501 T
- Virgin Materials: 501 T

"The Michelin team at Ballymena and in GB are grateful to NISP for identifying and helping to implement economically viable and innovative recovery solutions."

Paul Kinkead
Quality Assurance & Environmental Systems Manager
Michelin Ballymena: 028 2509 3600

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Case Study

Befesa, a new home for Waste Foundry Sand

Organisations involved: Befesa Salt Slags Limited, Various Foundries

The Challenge

Through links with the Cast Metal Federation, numerous local foundries contacted NISP West Midlands for assistance in identifying alternative and sustainable ways to reuse spent foundry sand, a waste product of their process.
Befesa Salt Slags operate a purpose built facility to treat waste streams produced by the primary, secondary and associated aluminium and iron industry sectors. Over the last few years as the capacity of the plant increased the decision was made to look at other waste streams that were being generated within the foundry industries on the basis of offering an alternative to landfill.

BEFESA

Above: The waste treatment facility at Befesa

The Solution

NISP have facilitated the relationship between Befesa Salt Slags Limited and numerous foundries within the West Midlands region.
The Befesa factory was commissioned in 1998 and is recovering on a annual basis 4000 tonnes of aluminium concentrate with a liquid metal yield of 3-3500t, the re crystallisation of up to 18000t of salt, which is a mixture of potassium and sodium chloride for reuse within the industry and also as a fertilizer, and the remainder of the mass balance being made up of alumina / aluminium oxide suitable for the aggregate, cement and brick industries. Prior to 1998 the vast majority of these valuable materials were being disposed of to landfill.
By way of NISP introducing the foundries to Befesa, deals have been agreed which has resulted in over 10,000 tonnes of material being diverted away from landfill, and into alternative outlets.

The Results

- Additional Sales: £200,000.00
- Businesses Assisted: 4
- CO2 Reduction: 1,020
- Cost Savings: £300,000.00
- Landfill Diverted: 10,000
- Virgin Materials: 10,000

"The assistance from NISP in introducing Befesa to potential customers, and the technical backup, especially connected to environmental issues since then has been vital."

Ben Arrowsmith
Commercial Director, Befesa Salt Slags Limited
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NISP® (England) Delivered Outcomes: Economic, Environmental, Social

METRICS	In-Year Benefits*	Lifetime Impact (Max 5 year)	Value for Money Lifetime Spend
Landfill diversion	9 M tonnes	45 M tonnes	€0.130
CO_2 reduction	8 M tonnes	39 M tonnes	€0.150
Virgin material savings	12 M tonnes	58 M tonnes	€0.100
Hazardous waste eliminated	0.4 M tonnes	2 M tonnes	€2.740
Water savings	14 M tonnes	71 M tonnes	€0.080
Cost savings	€243 M	€1.21 billion	€0.005
Additional sales	€234 M	€1.71 billion	€0.005
Jobs	10,000+		
Private investment	€374 M		

Rate Euro £1 = €1.18

€40 million investment 2005-2012

*all outputs independently verified

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Proactive Industrial Symbiosis Applies Data Analysis

- Regional Context
- Economic Strategy
- Resources
- Data

Development Opportunity

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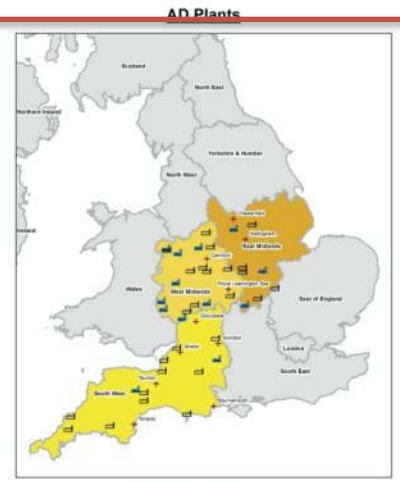
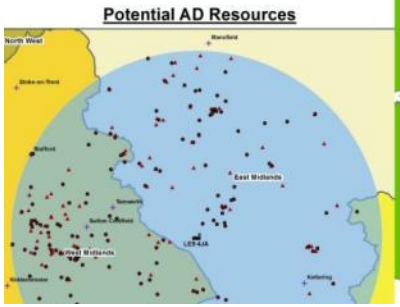
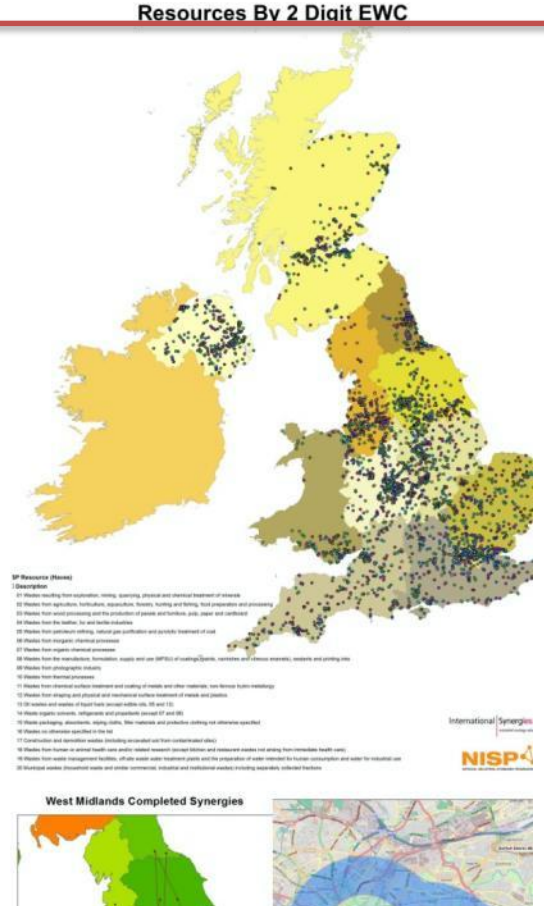
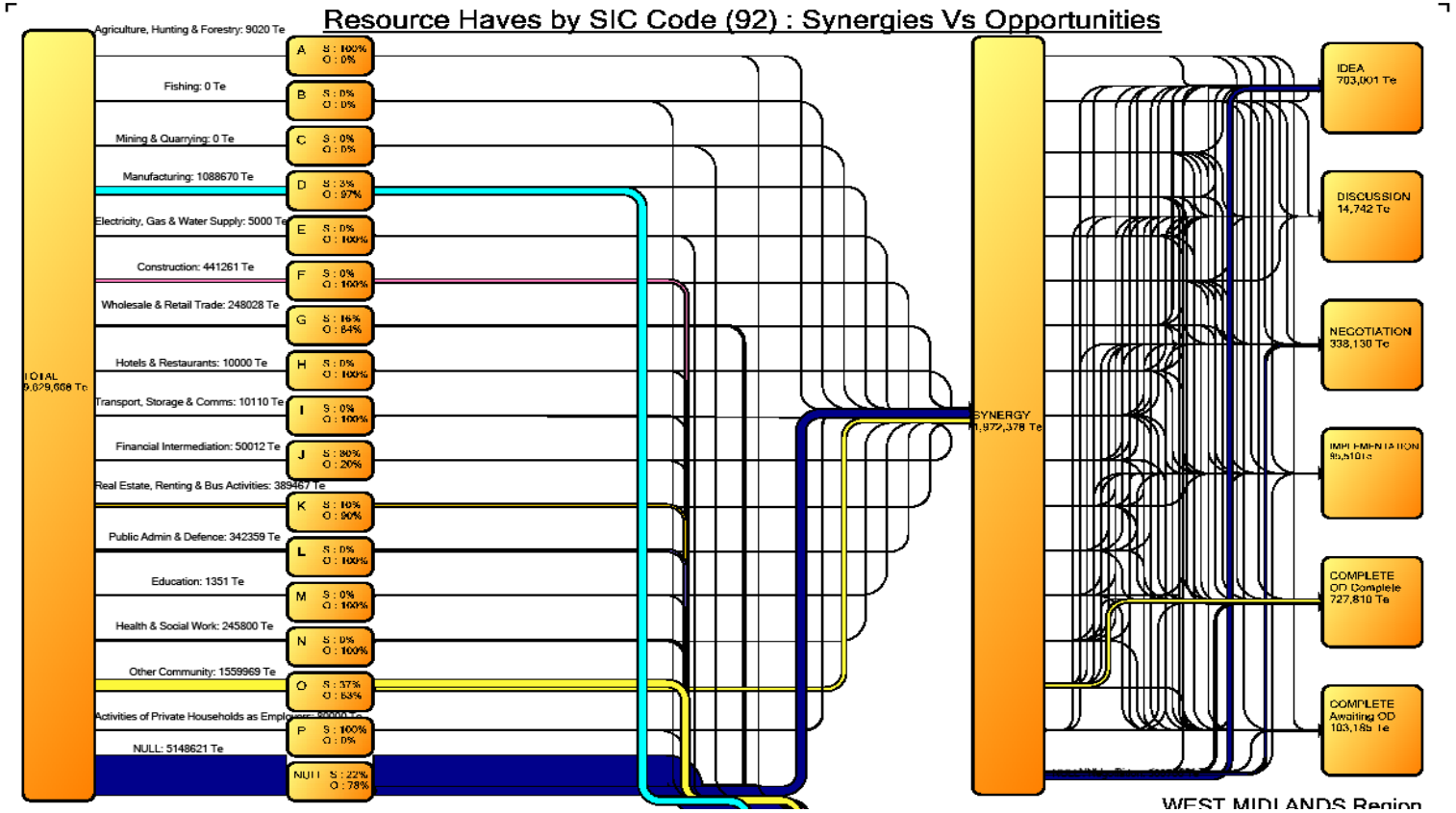
Resource Mapping



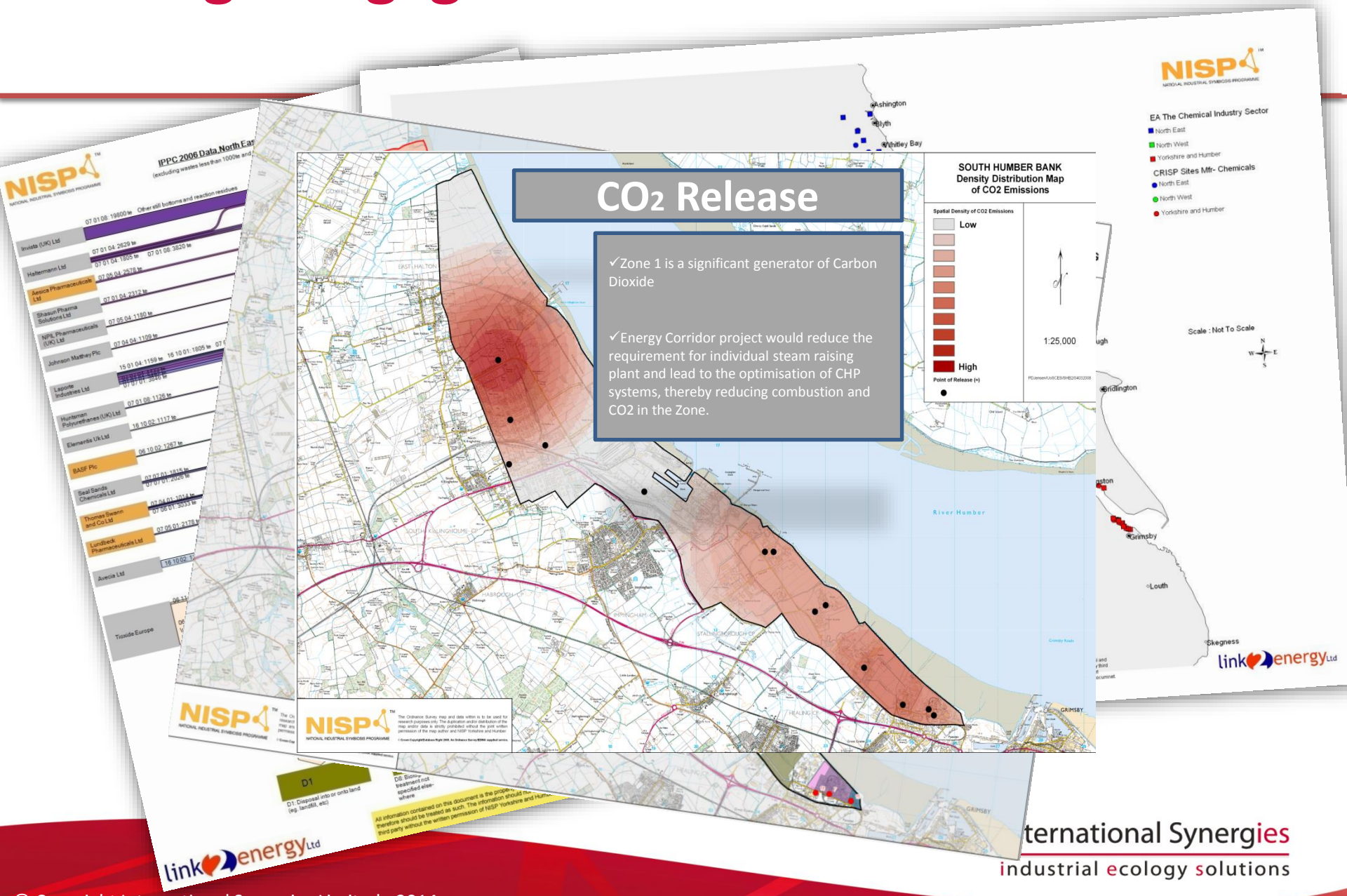




Resource flows



Strategic engagement



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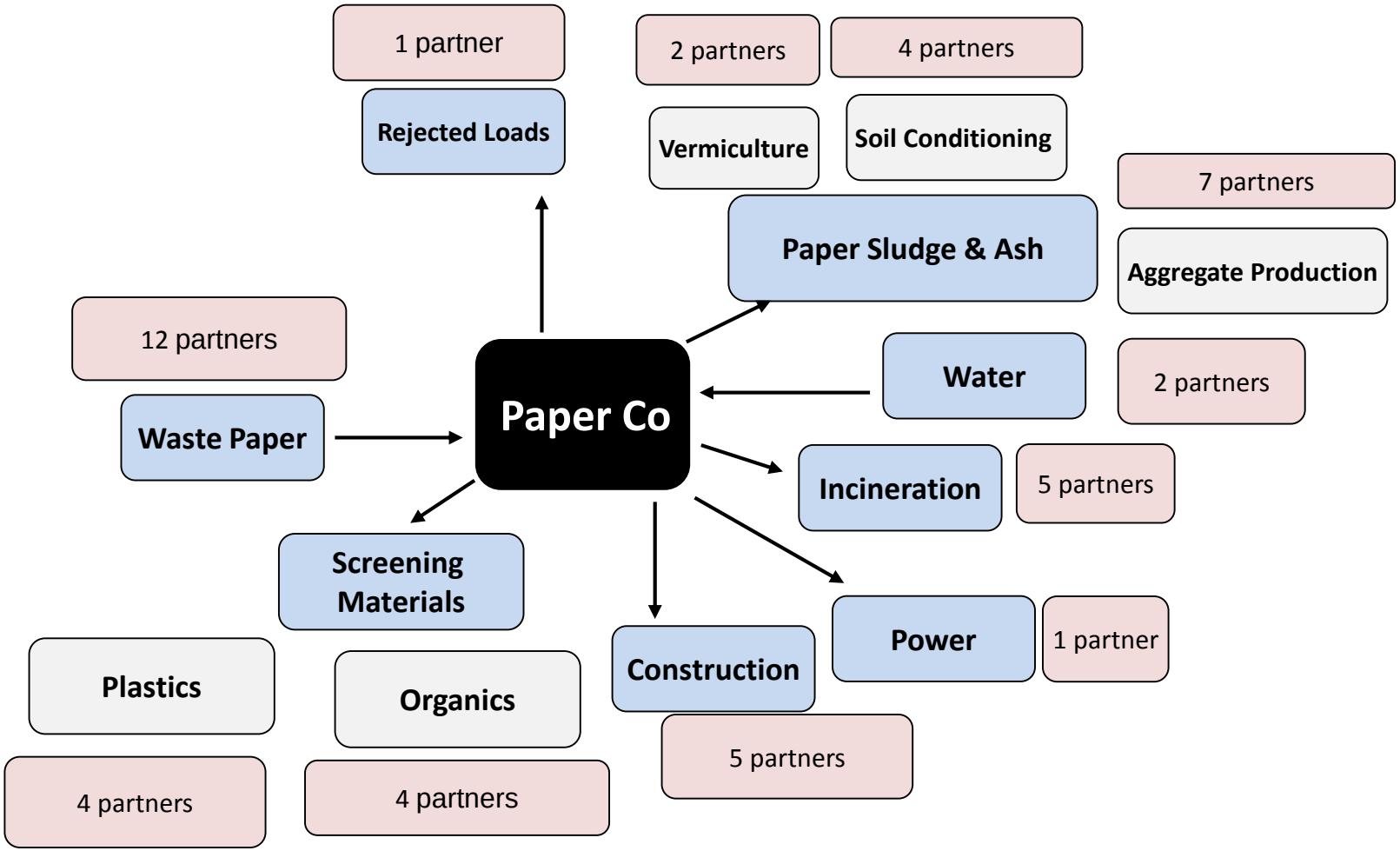
Industrial Symbiosis Opportunities: Attracting Inward Investment



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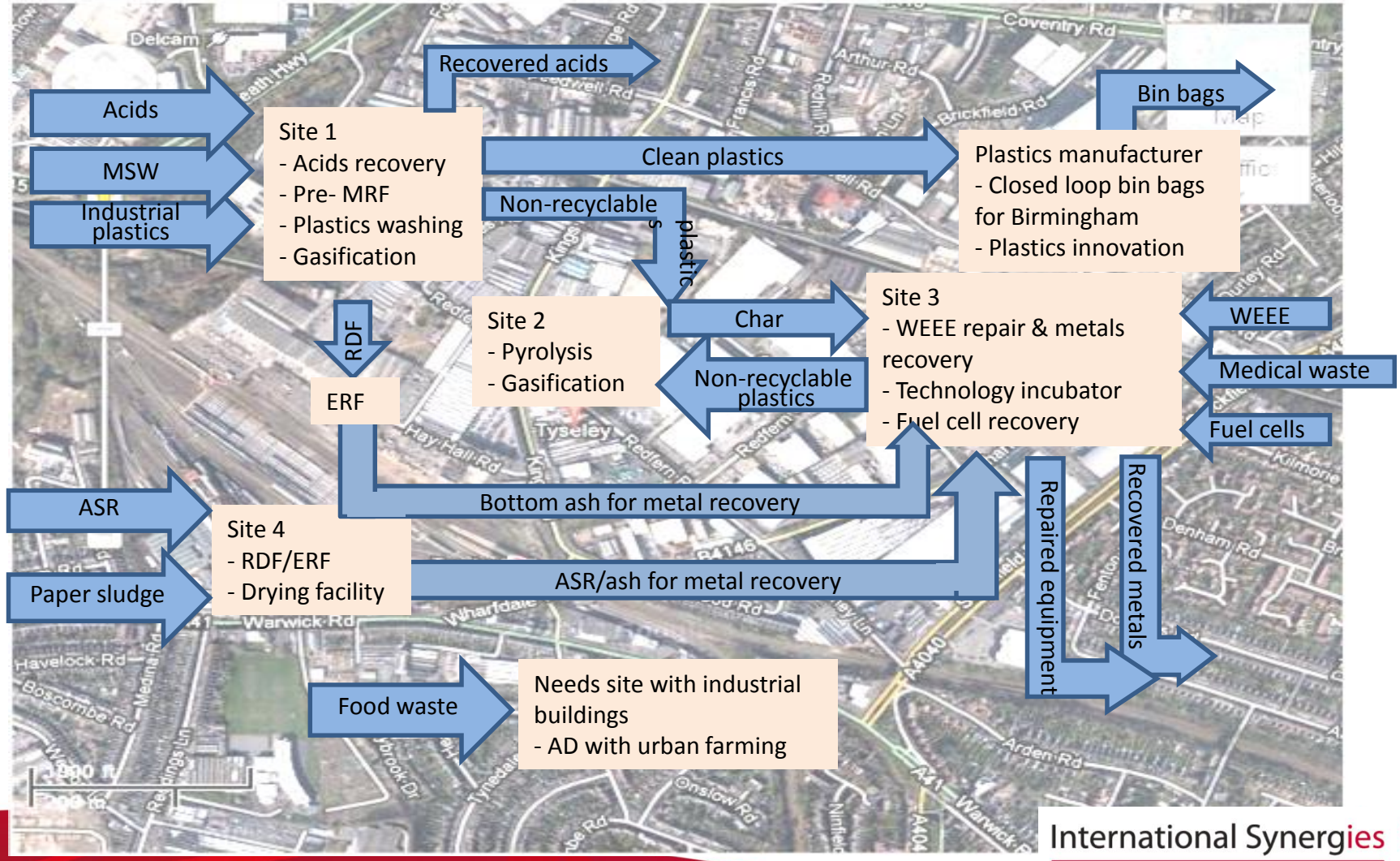
Specific Regeneration Opportunities based on Local Resources



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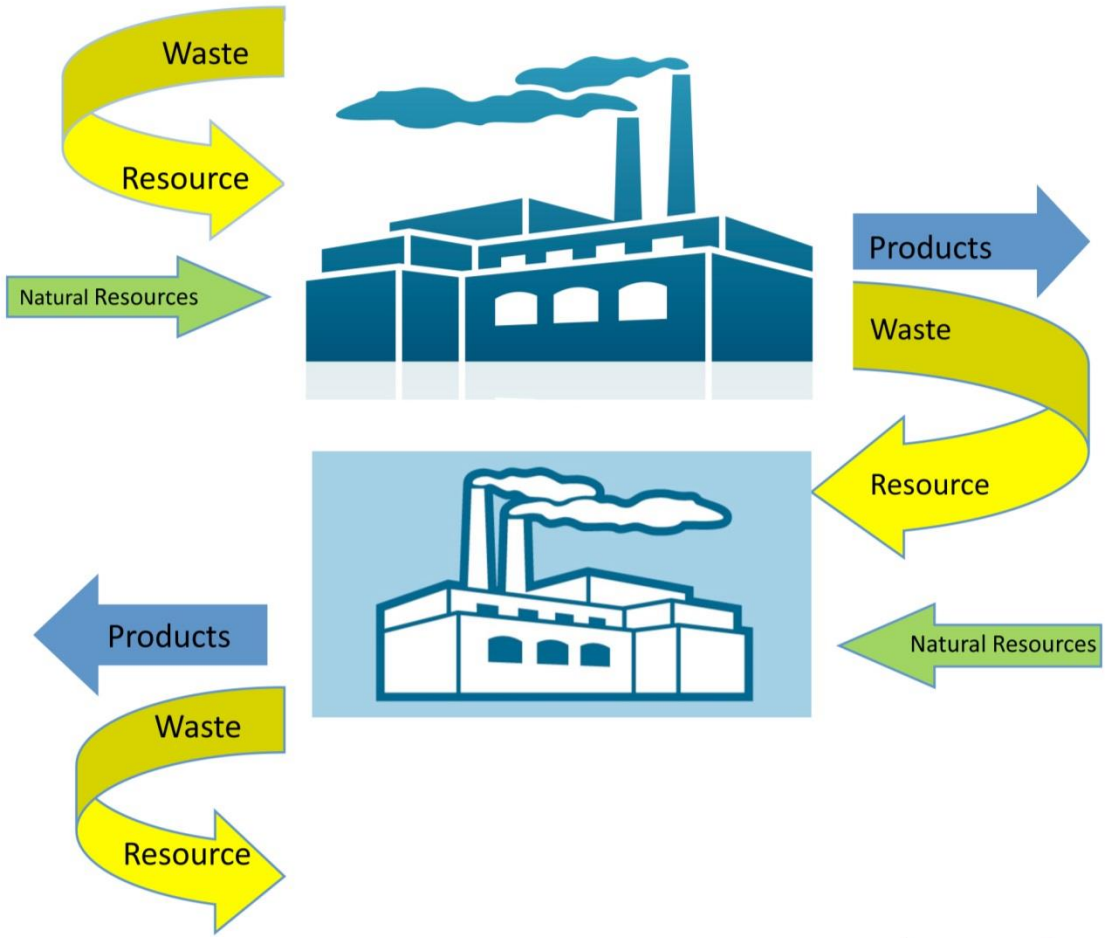
Industrial Symbiosis: Connecting Industry – Creating Opportunity

- All resources (materials, capacity, expertise)
- Cross-sector opportunities
- Economic, social and environmental metrics
- Transition to a circular economy



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The European Commission's Solution: Policies including Industrial Symbiosis

- European Waste Framework Directive - Best Practice (2009)*
- Roadmap to a Resource Efficient Europe (2011) * – exemplar case study
- DG Enterprise: Sustainable Industry-Going for Growth & Resource Efficiency (2011) * – exemplar case study
- DG Regions: Connecting Smart and Sustainable Growth through Smart Specialisation (2012) * – exemplar case study
- European Resource Efficiency Platform (2013) key recommendation
- DG Environment: Priority for industrial policy in (2013) recommendation
- DG Enterprise: Communique on Green Entrepreneurship (2013)
- Horizon 2020 (2014) included industrial symbiosis to deliver circular economy
- DG Research & Innovation: A short guide to assessing the environmental impacts of research and innovation policy (2014) *

*** Citing NISP®**

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International Synergies Limited and NISP®: Recognition from all sectors

2014	GLOBE 2014	Design Circular Economy Session, invited speaker, at GLOBE 2014
2013	edie.net	Chief Executive awarded Edie.net's Sustainability Leader of the Year Award
2013	3GF	International Synergies organises a Public Private Partnership on industrial symbiosis for the Global Green Growth Forum (**3GF**)
2013	Worldwatch Institute Europe – Vision for a Sustainable World	Worldwatch Institute Europe, Best Practice Business Innovation in a Living Economy features NISP as exemplar
2010	WWF	NISP highlighted as 1 of 20 Worldwide Green Game Changing Innovations in a report commissioned by the World Wide Fund for Nature (**WWF**)
2010	edie.net	International Synergies received the Environmental Excellence Award for Best Carbon Reduction Programme for NISP
2010	Organisation for Economic Co-operation and Development – OECD	OECD declares Industrial Symbiosis "a la NISP" an "excellent example of systemic innovation vital for future green growth"
2009	British Expertise – promoting professional services worldwide	British Expertise International Award for implementing Industrial Symbiosis on a Global Scale
2007	eTAP Environmental Technologies Action Plan	NISP is accredited by the European Commission as an Exemplar of Eco-Innovation through its Environmental Technologies Action Plan

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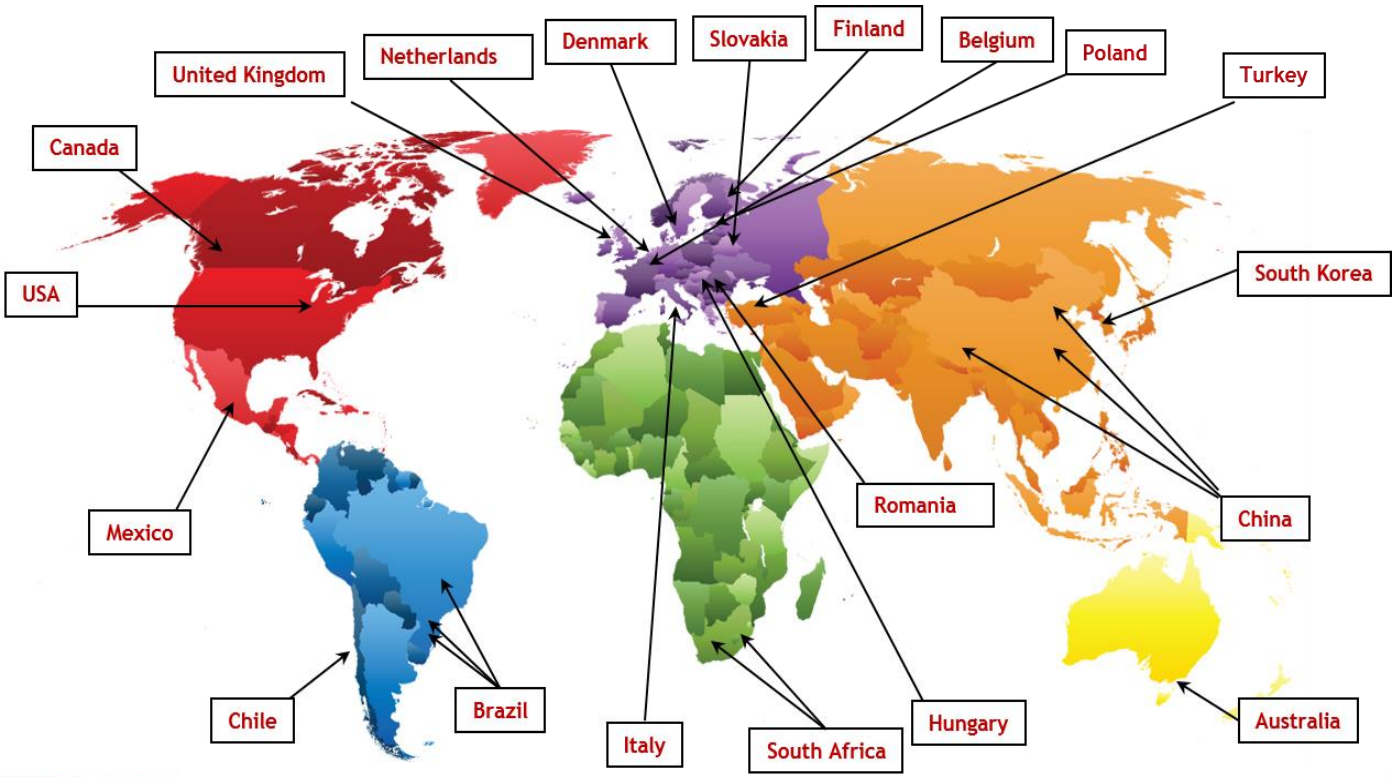
International Synergies Limited

"Striving to lead the world in innovative industrial ecology solutions for a low carbon, sustainable economy"



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Thank you for listening...

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