
INDUSTRIAL SYMBIOSIS

Delivering the Circular Economy

Peter Laybourn
Chief Executive
International Synergies Limited

Seeding the BioEconomy 12th March 2015 Edmonton

Content

- International Synergies Limited
- Circular economy and strategies
- Industrial symbiosis - circular economy in action - delivering productivity, innovation, jobs and other economic benefits
- Industrial symbiosis enhances the bio-economy
- Some takeaways

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International Synergies – Our Vision

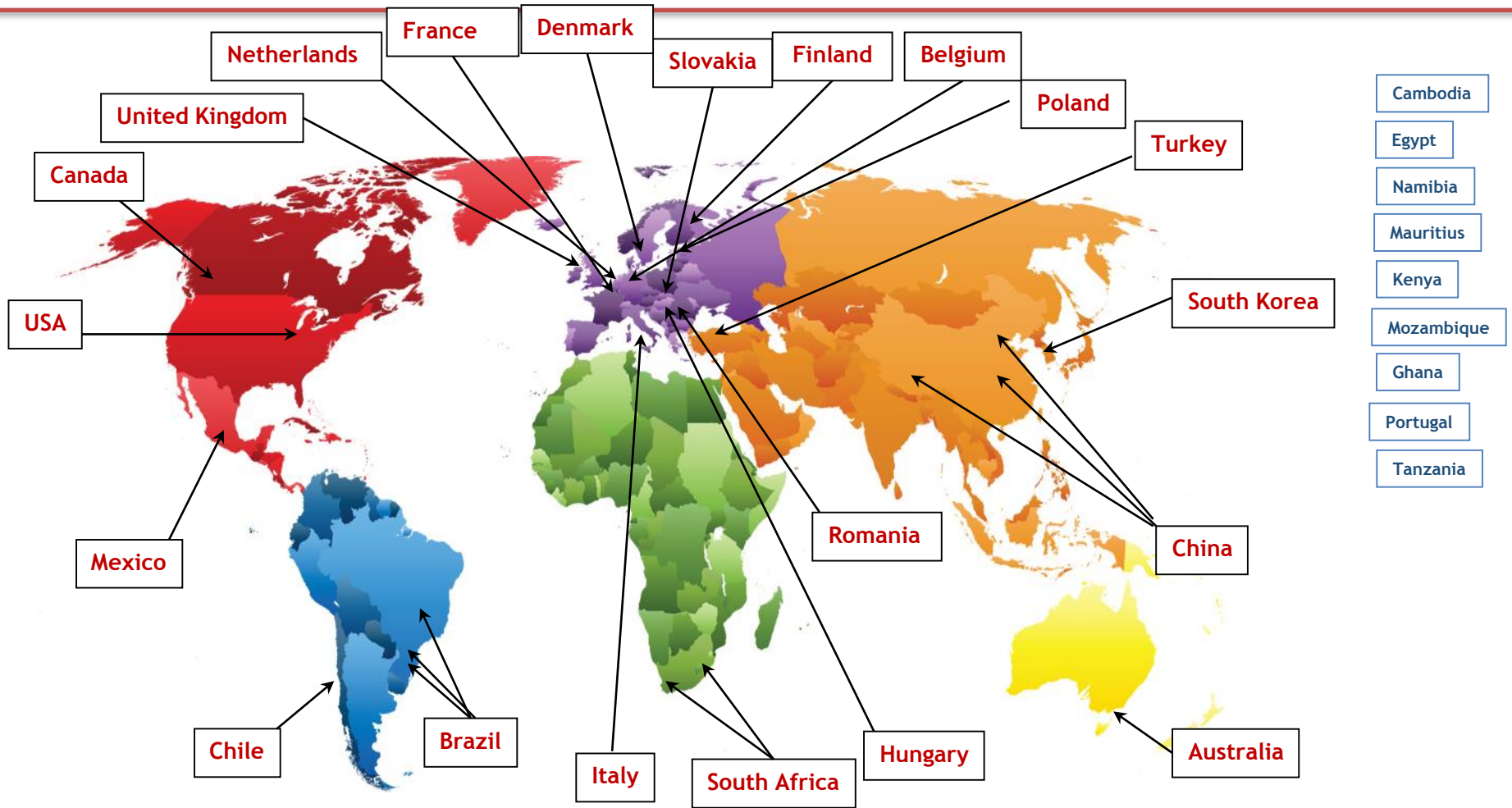
"Striving to lead the world in innovative industrial ecology solutions for a low carbon, sustainable economy"

Introducing International Synergies (ISL)

- Birmingham-based SME
- Offices in Birmingham, Brussels and Belfast
- Specialists in Industrial Ecology Solutions
(World leader in industrial symbiosis)
- Clients from public and private sector
- Experience in Europe, Asia, Africa, North and South America
- Proud partner in NISP Canada

International Synergies' Global Experience










Expressions of Interest



August 2014

International Synergies
industrial ecology solutions

International Synergies Limited: Global Recognition

- 2015  Keynote speaker on the Circular Economy at the Global Green Business Summit, Mexico City in April
- 2014  Circular Economy Session, speaker, at **GLOBE 2014**
- 2013  Chief Executive awarded Edie.net's **Sustainability Leader of the Year Award**
- 2013  International Synergies organises a Public Private Partnership on industrial symbiosis for the **Global Green Growth Forum (3GF)**
- 2013  Worldwatch Institute Europe, **Best Practice Business Innovation in a Living Economy** features NISP as exemplar
- 2010  NISP highlighted as **1 of 20 Worldwide Green Game Changing Innovations** in a report commissioned by the World Wide Fund for Nature (**WWF**)
- 2010  International Synergies received the **Environmental Excellence Award for Best Carbon Reduction Programme** for NISP
- 2010  OECD declares Industrial Symbiosis “a la NISP” an “**excellent example of systemic innovation vital for future green growth**”
- 2009  British Expertise International Award for **implementing Industrial Symbiosis on a Global Scale**

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Circular Economy – some common concepts

- *A Circular Economy is an economy that balances economic development with environmental and resource conservation.*
- *It puts emphasis on environmental protection and the most efficient use of and recycling of resources.*
- *It features low consumption of energy, low emission of pollutants and high efficiency.*
- *It involves applying Cleaner Production in companies, eco-industrial park development and integrated resource-based planning for development in industry, agriculture and urban areas.*

UNEP (2010): ABC of SCP ... almost identical to industrial ecology!

Drivers for circular economy in Europe

Resource risk	<ul style="list-style-type: none">• Volatility of resource pricing• McKinsey report, Resource Revolution• 20 critical raw materials identified by EU (and rising)
Regulation	<ul style="list-style-type: none">• EU policy incorporating IS/RE across Directorate Generals• Carbon Trading to include Scope 3 emissions (DG Climate Action)
Market/ culture change	<ul style="list-style-type: none">• Rising awareness of sustainability, climate change issues• Increasing severe weather events• Value creation

The Circular Economy Challenge

- How can we design our products with asset recovery in mind?
- How can we develop product lines to meet demand without wasting assets?
- How can we source material in regenerative loops rather than linear flows?
- How can we develop a revenue model that protects value up and down the chain? and
- How can we get our customers to cooperate with us?

Accenture on Fast Company 2013

<http://www.fastcoexist.com/1681904/5-business-models-that-are-driving-the-circular-economy>

Four (or more) Strategies for a Circular Economy

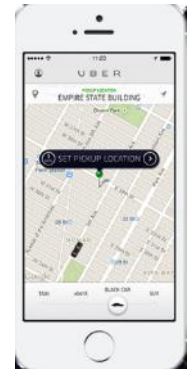
- Collaborative consumption
- Remanufacturing
- Servicising: product as service
- **Industrial symbiosis: resource recovery & innovation**

Strategy: Collaborative consumption



Examples:

- Lodging (airbnb)
- Taxi (Uber phone app)
- Clothing (Consignment shops)



Challenges: legislation, regulation, risk, tax implications

Strategy: Remanufacturing

Examples:

- Cars
- Copiers
- Healthcare equipment



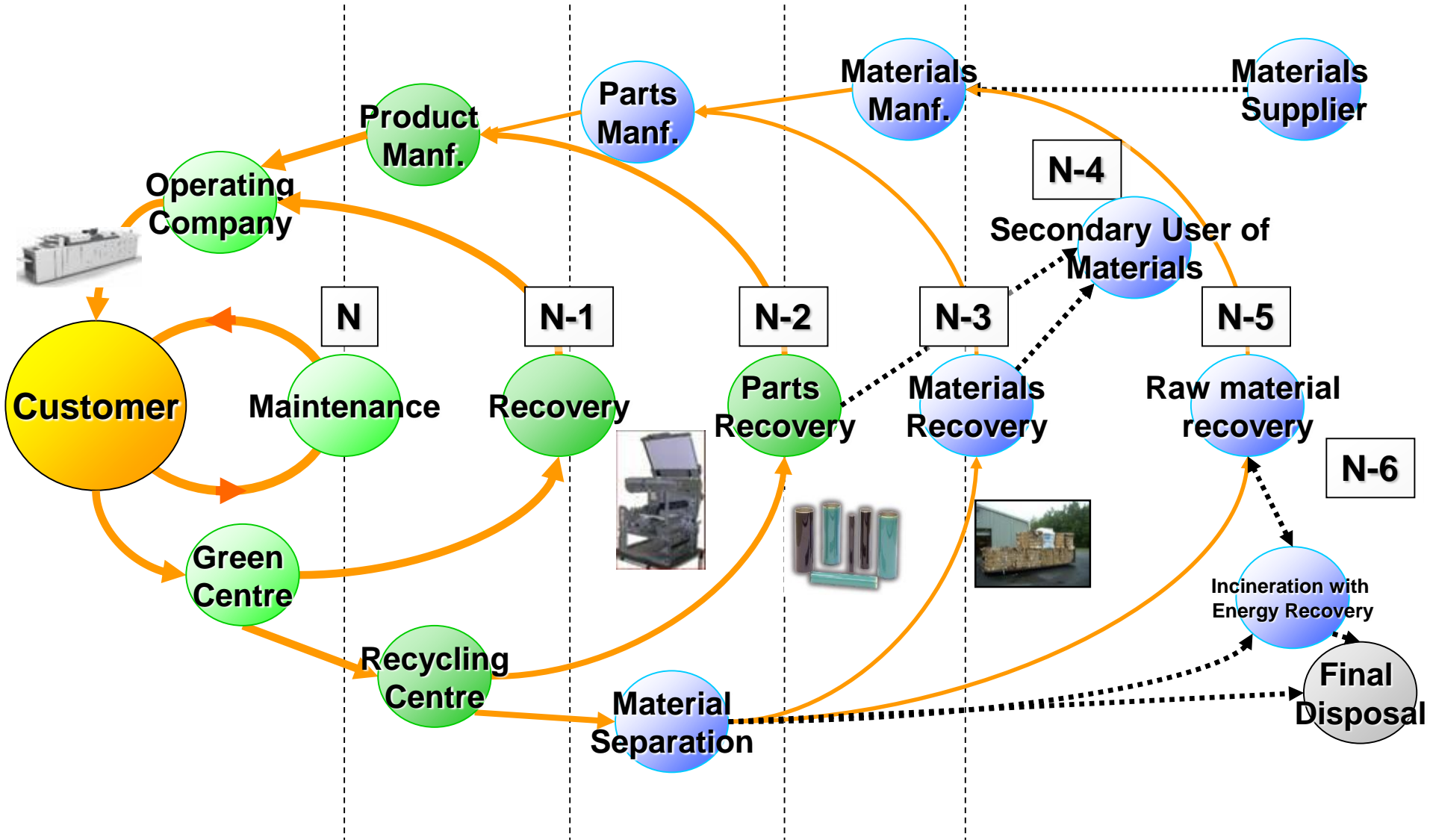
PHILIPS

Healthcare

Challenges: design for repairability, product take-back/ recovery, reverse logistics, customer perception



Life Cycle: Comet Circle



Strategy: Servicising (product as a service)

Servicising: The Quiet Transition to Extended Producer Responsibility

Tellus Institute, 1999

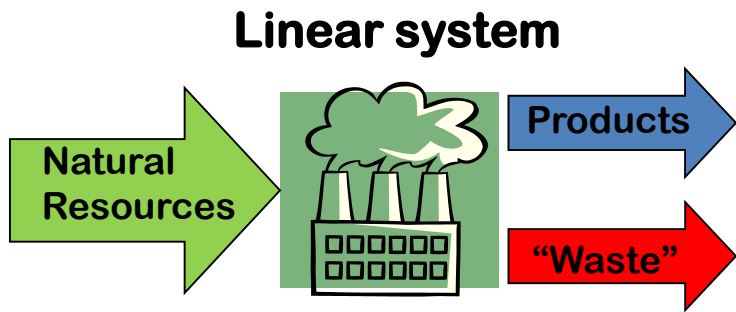
- Chemicals
- Mobile phones
- HVAC, Lighting, Carpet tiles: install and maintain

Challenges: property rights, accounting, control/influence over someone else's process, variability in consumer behaviour

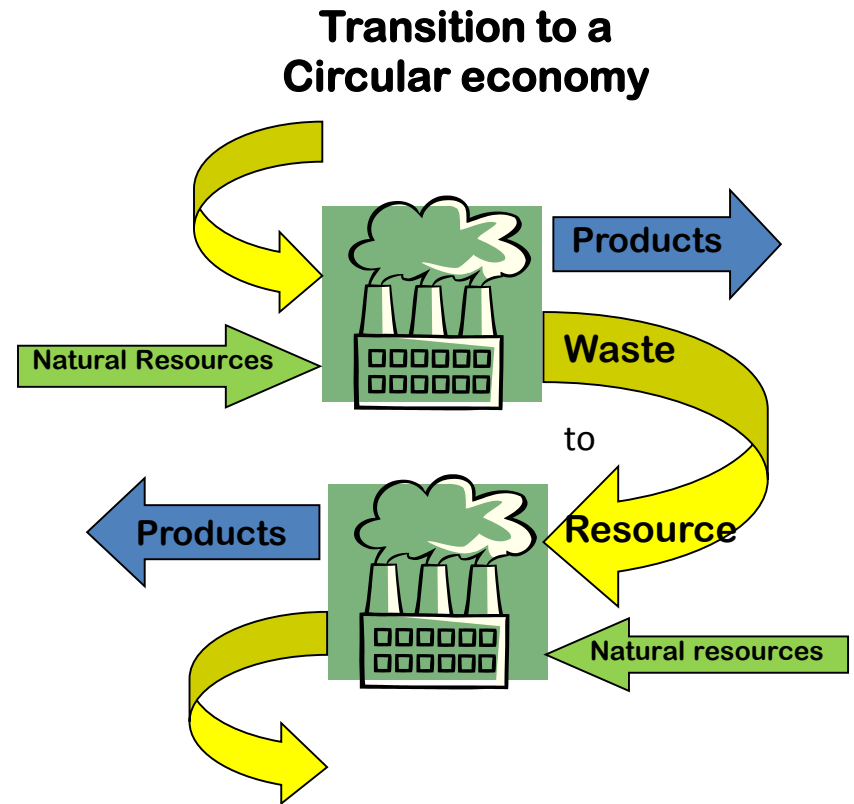
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Transition to a circular economy



Take – make – throw



Strategy: Industrial symbiosis

- All resources: materials, energy, capacity, expertise, logistics
- All sectors, all sizes
- 90% move up the waste hierarchy
- OECD: “industrial symbiosis (‘a la’ ISL’s National Industrial Symbiosis Programme) is systemic innovation vital for future green growth”

Challenges: legislation, technology, capturing economic value

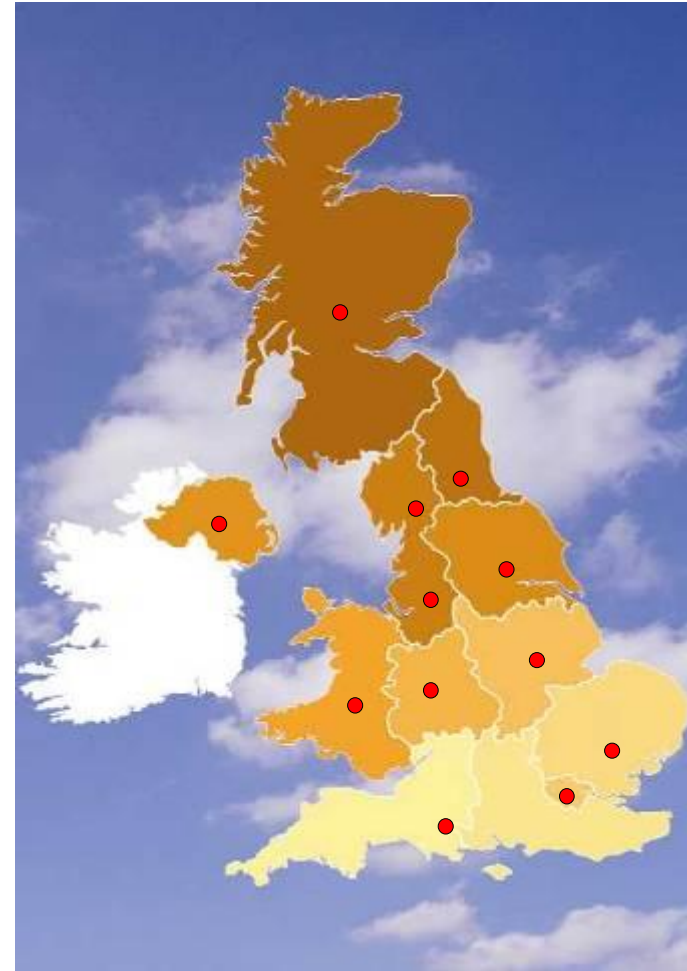
European Commission promotes industrial symbiosis for eco-innovation & green growth

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

* Citing NISP ®

International Synergies' NISP

- Initial idea 1999 (BPS); started 2002 in 3 regions
- Designed from outset to be a national programme
- Regional practitioner (delivery) teams, nationally co-ordinated
- Business-led Programme Advisory Groups
- Benefits:
 - Reduced costs, increased revenues, de-risking investments
 - Job creation, inward investment
 - Reduction in virgin material, water, CO₂, landfill
- Substantial efficiency benefits of national model
- Not a Government programme. Service contract using hypothecated landfill tax escalator



Engagement at heart of NISP



15,000+ : all sectors, all sizes, all resources

CORPORATES

- Anglian Water Services Ltd
- BAE Systems
- Balfour Beatty
- Bombardier
- Denso Manufacturing Ltd
- Diageo
- Foster Yeoman
- HSBC
- Jaguar Land Rover
- Johnson Matthey
- Michelin
- Peel Group
- RICOH UK Products Ltd
- SITA
- TATA
- Toyota
- UK Coal Plc
- Veolia

SMEs

- Alutrade
- Arden Wood Shavings
- Befesa Salt Slags
- Bio Waste Solutions
- BIP Oldbury
- Coldwater Seaford Ltd
- County Mulch
- Delkia Bio-energy
- Farrow & Ball
- Firth Rixson Castings
- G&P Batteries
- Giffords
- Glendale Grounds Maintenance
- GPD Developments
- Green Tech Ltd
- Guala Closures Ltd
- H Sivyer
- Howarth Timber Engineering
- Jack Moody Holdings
- JBR Recovery
- John Pointon & Sons Ltd
- Kingpin
- LC Energy
- Lower Reule Bio Energy
- McGrath Barr
- MJ Allen
- Montracon
- New Earth Solutions
- Ramfoam Ltd
- Recycled UK
- Renewable Energy Growers
- Teknor Apex
- Westland Horticulture
- Works infrastructure Ltd

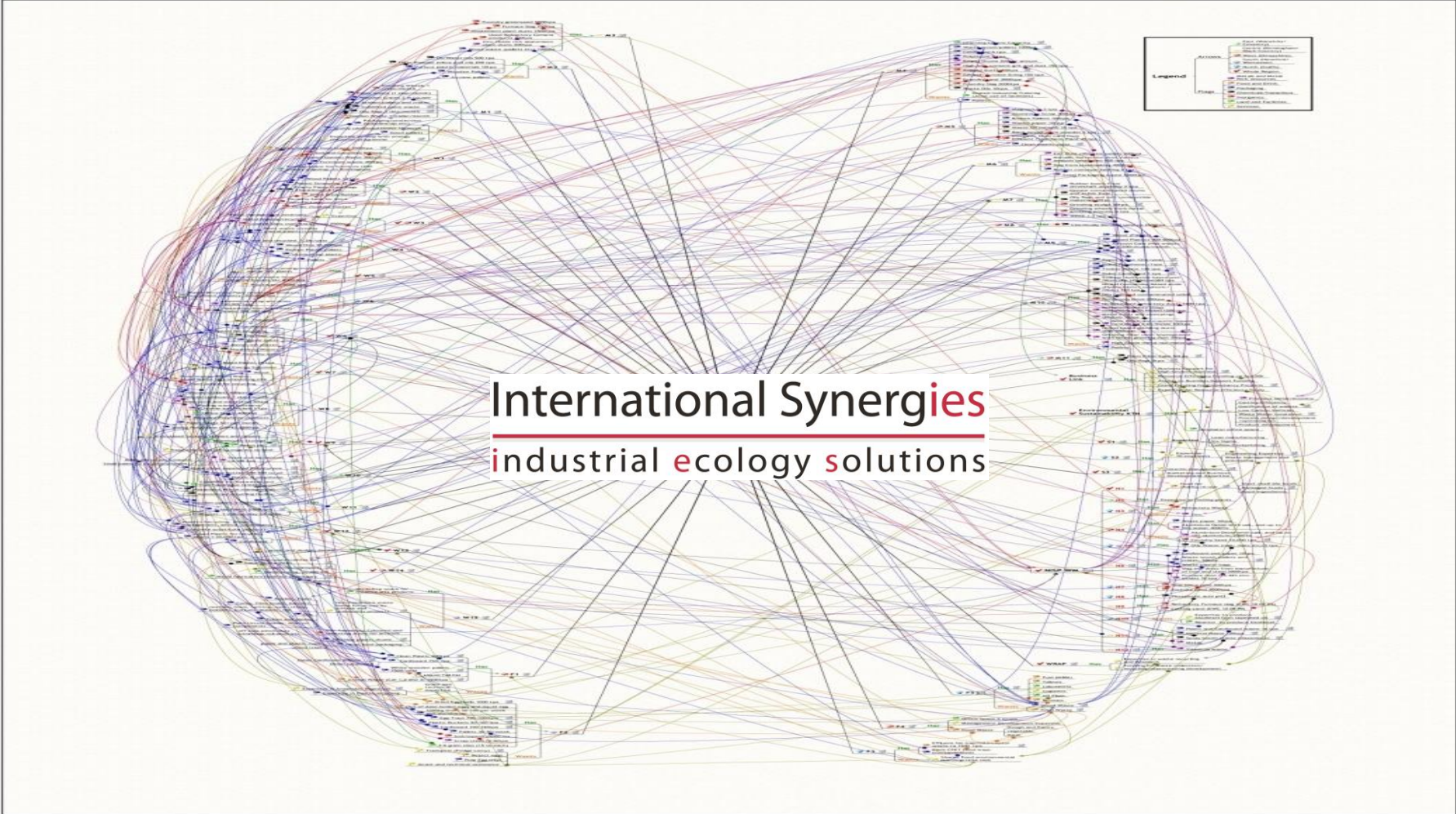
MICROS

- Advantage Waste Solution
- Akristos
- Analytichem
- Angelheart Inc
- Arrow Environmental
- Blendcheck Ltd
- Clarkson Enterprises
- Dinano
- Ecoideam
- Enviro (Grimsby)
- Facility Water Management
- John Carson Innovations
- Kito Engineering Solutions
- Manufacturing Production Solutions
- Ross Miller Farm
- TVLI
- Waste Check Ltd
- Whitby Recycling Services

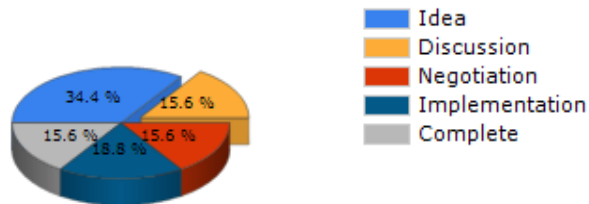
KEY POINTS

- All sizes - Multi-nationals, SMEs, Micros, Entrepreneurs
- All sectors
- All resources
- **SMEs represent 90%**

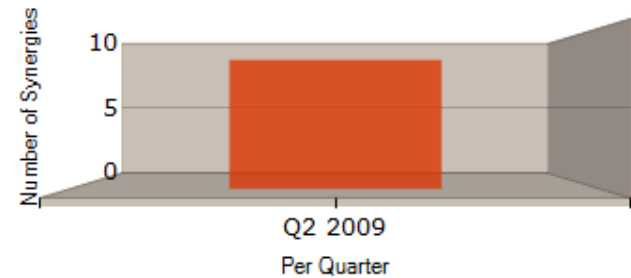
Opportunity Mapping



Synergies Status Chart



Synergies Completed Per Quarter



My Actions

Id	Status	Due Date	Action Against
95	Overdue	6/2/2009 12:00 AM	ISL
14	Pending	6/17/2009 12:00 AM	NISP
15	Pending	6/17/2009 12:00 AM	Robert Brown
32	Pending	6/18/2009 12:00 PM	Jon Smith
23	Pending	6/24/2009 12:00 AM	Reduce Printing Costs

Work in Progress Synergies

Id	Name	Stage
41	Synergy 41	Discussion
30	Move waste plastic	Completion
14	Scotland Synergy	Discussion
8	Help Airports	Idea
7	Reduce Printing Costs	Idea

Completed Synergies

Id	Name	Completion Date
15	Reduce Waste	6/26/2009
13	Patni Test Synergy	6/24/2009

Notifications

Resource Name	Synergy Id	Inc/Decr Resource	Delete
Asbestos	30	↑	✕
Asbestos	30	↓	✕
Patni Project Have	14	↑	✕
Plastic Crates	14	↑	✕
Plastic Crates	14	↓	✕

Thousands of Case Studies (Synergies)

A fruitful collaboration

ORGANISATIONS INVOLVED
Terra Nitrogen (UK) Limited
John Bourlas Ltd

SUMMARY
NISP North East is working with members Terra Nitrogen (UK) Limited and John Bourlas Ltd in a fruitful collaboration which sees a record breaking 26 acres greenhouse in Billesley growing tomatoes all year round, creating 60 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 materials. Looking for alternative ways to use its by-products, the company teamed up with Humbleton Ltd and vegetable grower John Bourlas Ltd to provide the infrastructure to supply and deliver cabbages to the 26-acre site.

The 612 million greenhouse, the largest in the UK, will grow over 300,000 tonnes a year to include such as Spinefield and Sunburst. The site will use more than 12,000 tonnes of CO₂, 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 greenhouse. In addition, Terra Nitrogen will supply electricity to the greenhouse, ensuring Bourlas 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.
Terra Valley Regeneration linked 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 generation of the symbiotic relationship.

ACHIEVEMENTS

- 65 new jobs created
- Reduction of 12,000 tonnes of CO₂ emissions
- Successful reuse of waste heat
- £15 million private investment in region

CONTACT DETAILS
Dave Berrill, National Programme Manager, NISP - 0121 395 4000
Chloe Perry, Regional Co-ordinator, NISP North East - 01204 342430

www.nisp.org.uk

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 Chuffali. NISP were asked to examine the viability of using secure disposal points nearer to the production facility in Thurston, Cheshire.

BACKGROUND
Diageo produce this beer and there very keen date of care procedures that not only have to satisfy the Government 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 the products. As a NISP member, they asked for our help in finding a more financially and environmentally viable option for their liquid waste.

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 sites ranging from landfills agricultural land to the production 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 waste tonnes per year
- Diversion from waste disposal of 2000 tonnes per year

CONTACT DETAILS
Sheena Smith, NISP North West - 07800 861947

www.nisp.org.uk

Case Study www.nisp.org.uk

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 2008, the disposal of Metallor, 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.

The Solution
Management at the Ballymena plant needed to source an alternative disposal route to achieve their landfill diversion targets. Metallor, 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 Metallor and ease 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 Metallor in London and one also in Cardiff. This represents a low phased solution that helps divert the material from landfill to a number of outlets for the Ballymena site. WES is currently being additional outlets with spare capacity to process the output from another Michelin plant in Danvers and later in the near the French plants. The diversion from landfill, of Metallor, 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: £34,951
- Businesses Assisted: 4
- CO₂ Reduction: 381 T
- Training Outcomes: 4
- Landfill Diversion: 501 T
- Virgin Materials: 501 T

Paul Kirkwood
Quality Assurance & Environmental Systems Manager
Michelin Ballymena: 028 2560 3600

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

NISP
NISP Northern Ireland
Tel: 444 (0) 143 094 9515
Email: west@nisp.org.uk
Or visit www.nisp.org.uk

Case Study www.nisp.org.uk

Befesa, a new home for Waste Foundry Sand

Organisations involved: Befesa Salt Slags Limited, Various Foundries

The Challenge
Through links with the Cost 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 on the capacity of the plant increased the decision was made to look at other waste streams that were being generated within the heavy industries on the basis of offering an alternative to landfill.

The Solution
NISP have facilitated the relationship between Befesa Salt Slags Limited and numerous foundries within the West Midlands region. The Befesa facility was commissioned in 1998 and is recovering on an annual basis 4000 tonnes of aluminium concentrate with a leach metal yield of 3-5000, the re-crystallisation of up to 18000 of salt, which is a mixture of potassium and sodium chloride for reuse within the industry and also as a fertiliser, 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 Reductions: 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 Arrowood
Commercial Director, Befesa Salt Slags Limited
01645-780441

NISP West Midlands
Tel: 444 (0) 143 094 9515
Email: westmid@nisp.org.uk
Or visit www.nisp.org.uk

NISP
NISP NORTH EAST, NORTH WEST & SOUTH WEST

NISP[®] (England) Delivered Outcomes

April 2005 - March 2013

METRICS	In year benefits*	Lifetime benefits (max 5 years)
Landfill diversion	9.4 million tonnes	47 million tonnes
CO ₂ reduction	8.4 million tonnes	42 million tonnes
Virgin material savings	12 million tonnes	59.9 million tonnes
Hazardous waste eliminated	0.42 million tonnes	2.1 million tonnes
Water savings	14.5 million tonnes	73.2 million tonnes
Cost savings	£214 million	£1.1 billion
Additional sales	£209.2 million	£1.0 billion
Jobs	10,000+	
Private investment	£317 million	

£36.8 million investment since 2005

***all outputs independently verified**

Rate of return for Govt. 9:1

NISP® (England) Economic Impact Assessment

- Total Economic Value Added £1,470 million to £2,450 million, giving an investment multiplier of between 53.2 - 88.6
- £148 million to £247 million to Treasury in direct receipts
- Benefit Cost Ratio of 32:1 to 53 :1 (3:1 good by Govt. and 8:1 excellent by RDAs).
- All above achieved from a total investment of £27 million over 5 years

Input Required by NISP April 2005 - March 2010	
Benefit generated through NISP	Actual
£1 new income for industry	2 pence
£1 cost saving for industry	3 pence
1 tonne of virgin material saved	41 pence
1 tonne of water saved	41 pence
1 tonne of CO ₂ reduced	65 pence
1 tonne of waste diverted from landfill	56 pence
1 tonne of hazardous waste eliminated	£10.86

*Scenario 1 - Persistence effect with 20% decay per annum
*Scenario 2 - Persistence effect with 0% decay per annum

The above figures are based on total investment of £27,850,000 between April 2005 and March 2010 and relate to outputs generated in England only.

NISP Economic Valuation Report, by
Manchester Economics 2009

Welcome to Michelin

Paul Kinkead
Environment Manager



Reduction in waste to landfill

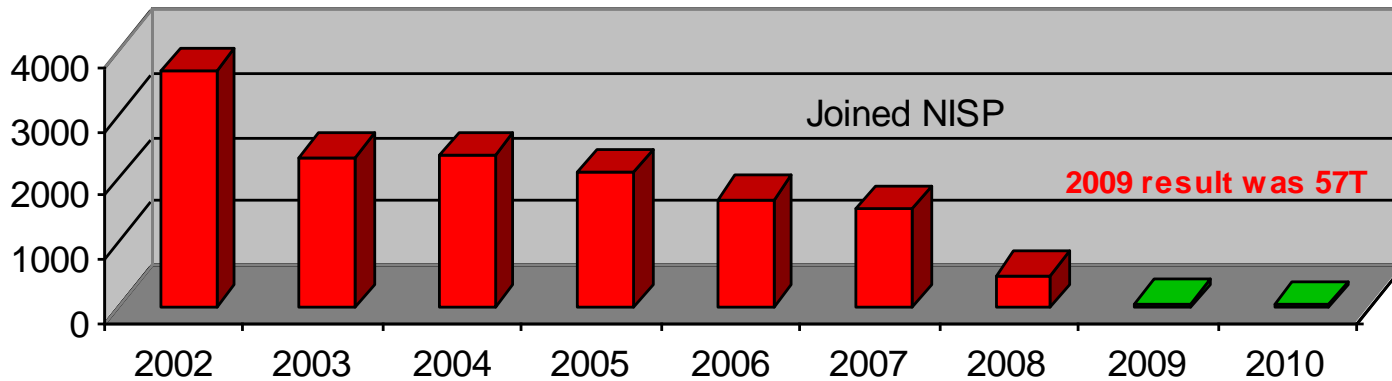
- Corporate target to eliminate process waste to landfill
- Challenge: difficult materials to recycle
- 36 individual waste streams
- Use of benchmarking within Michelin
- **Breakthrough : engagement with NISP to source creative and cost effective solutions**
- Access of expert solution providers



Reduction in waste to landfill

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

Tonnes to Landfill



What companies say

“NISP’s approach provides an excellent means for companies to identify and access methods of recovery, reprocessing and reuse for a variety of material waste streams from our projects. However, being a part of the NISP Network also means we’re able to tap into the UK’s best expertise on industrial waste streams and innovation and research.”

Alan Young, Head of Waste, Thames Water



International Synergies
industrial ecology solutions

What companies say

“Becoming a member of NISP has been one of the best decisions I have made and I continue to advocate any business to join”

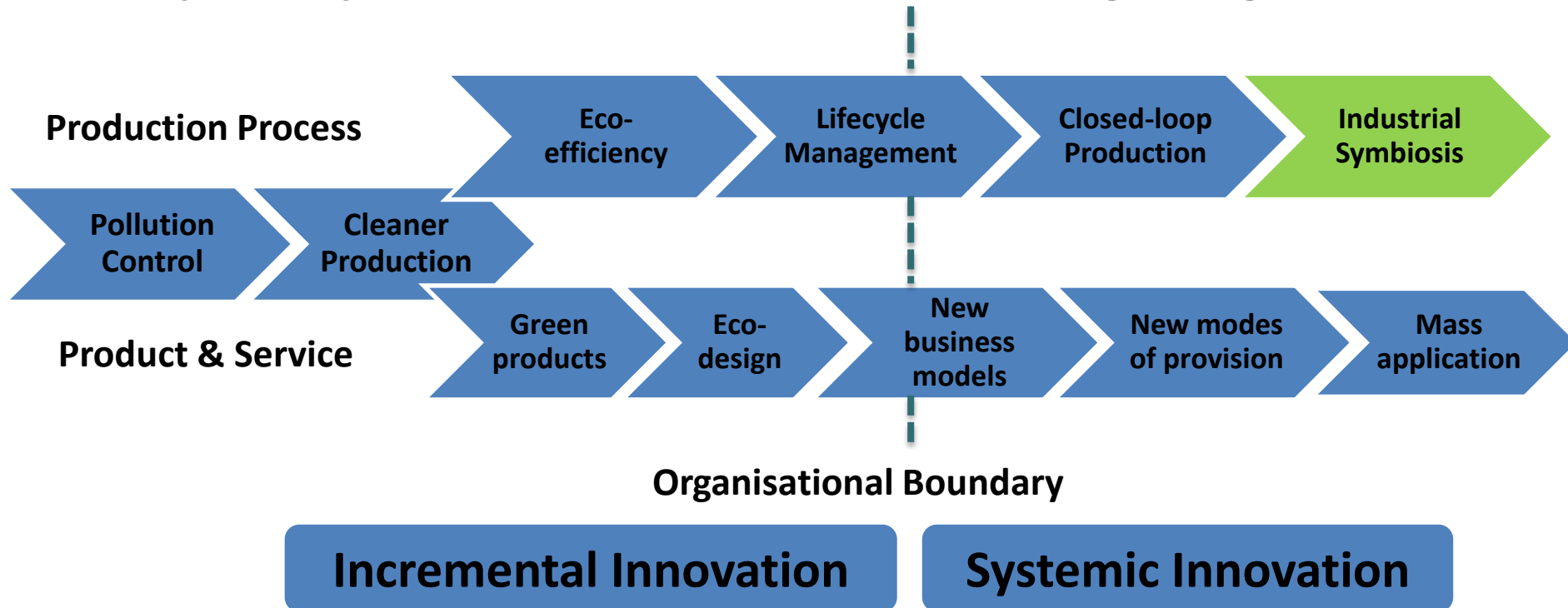
**Mark Bradford, Production Systems Manager,
Toyota**



International Synergies
industrial ecology solutions

OECD Identifies Industrial Symbiosis as Critical to Green Growth Agenda

OECD declared industrial symbiosis 'a la NISP' to be "an excellent example of systemic innovation vital for future green growth"



Innovation is key to industrial symbiosis

“Innovation occurs at the intersection of expertise, diversity and opportunity driven by making novel connections”



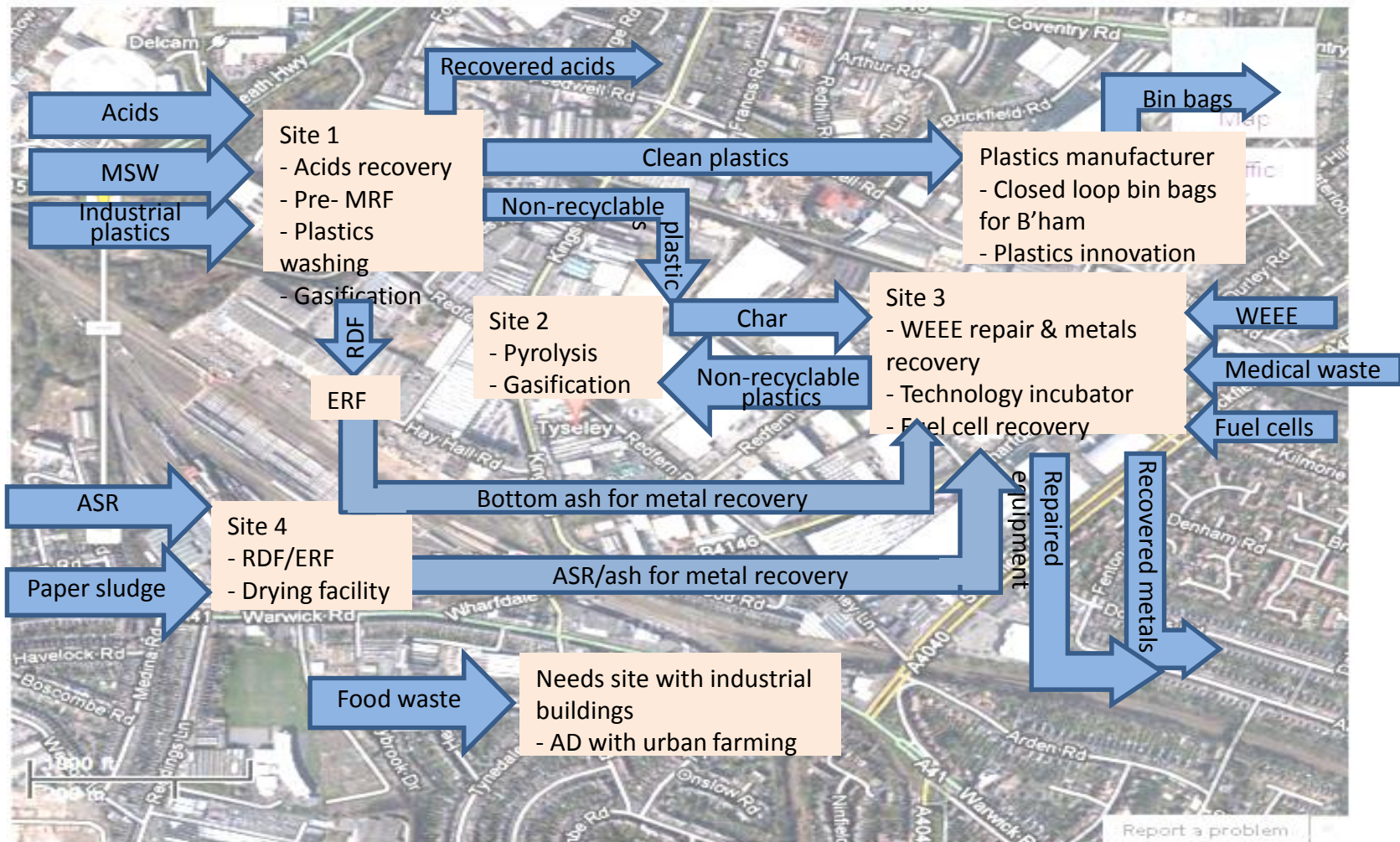
Eco-innovation in process

Recovering Precious Metals from X-Ray films

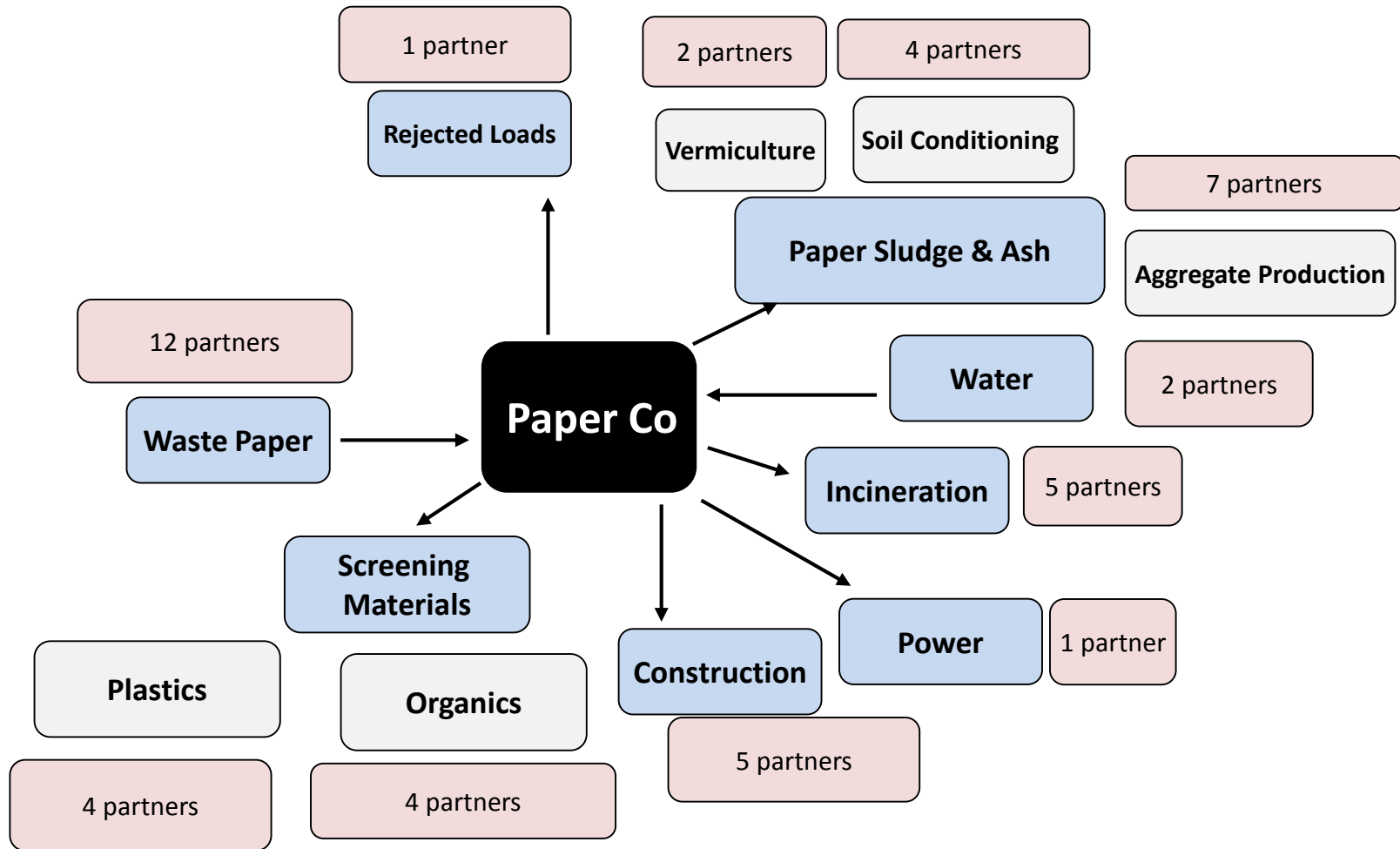
- Challenge: Change to X-ray films made existing process ineffective
- Solution: Engage with University innovation providers to change to process
- Parties involved: Betts Envirometal, University of Birmingham & International Synergies IS network
- CO2-eq reduction (**24 kt**)
- Eco-Innovation and Green Growth
- Materials security
- Regional Economic Development (**11 jobs**)



Pro-active Planning by Public Authorities for Economic Development & Regeneration



Industrial Symbiosis Opportunities: Attracting Inward Investment

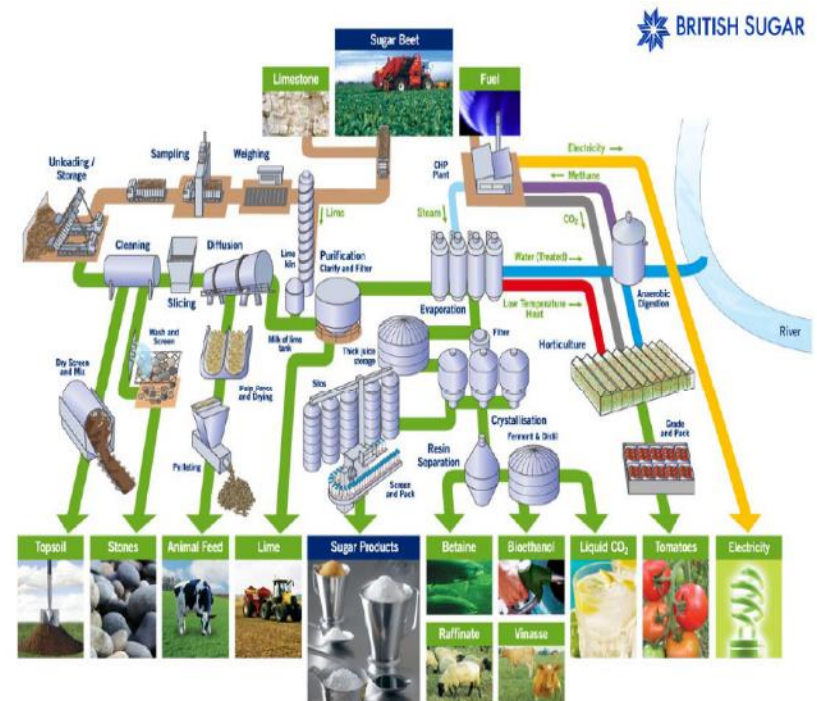


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Associated British Sugar: Beet to Biofuel

- UK sugar quota reduction in 2008 led to 650,000 tonnes of beet crop set to waste.
- A leader in applying Industrial Symbiosis
- Availability of raw material and technology led to business diversification opportunity.
- Site now producing 55,000 tonnes of bioethanol
- Fuel part used in own beet and sugar haulage fleet.



Associated British Sugar: Beet to Biofuel

From sugar producer to largest UK-based biofuel operation

- Bio-refinery CO₂ recovered & liquefied for use in supermarket refrigeration application.
- Company further expanded biofuel portfolio in JV with Dupont and BP
- £350M Refinery commissioned in 2013
- Processing 1.1M tonnes of wheat into 420M litres of biobutanol
- Residues converted into 500k tonnes of high grade animal feed



Eco-innovation in products

Key stage for school dinners

- 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
- 20,000 primary and 4,000 Secondary Schools = potentially 50-75,000 tonnes per year of food waste from these sources alone



Case Study: A Fruitful Collaboration

Companies:

- GrowHow UK
- John Baarda Ltd

Summary:

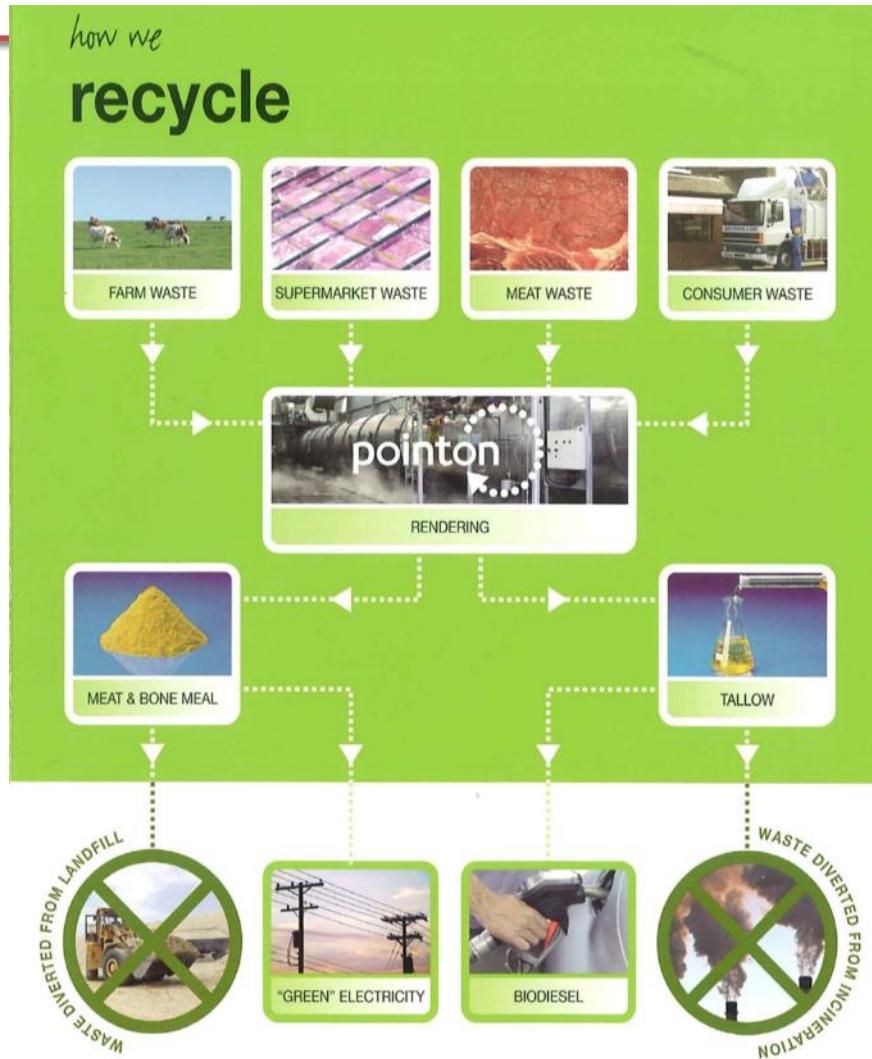
- Ways of using 'wastes' from manufacturing plant to grow tomatoes all year round

Achievements:

- 65 new jobs
- CO₂ reduced by 12,500 tonnes pa
- Successful re-use of waste heat
- €17 million private investment in region



Eco-innovation in business models



“Working with [International Synergies’] NISP has proved vital to our on-going commercial development as it provides innovative thinking, opportunities and solutions to a greater extent than any other organisation that we have engaged with.”

Martin Pointon,
Joint MD,
John Pointon and Son.

What companies say

“The opportunities available through NISP’s workshops have proved indispensable to the success of our business.”

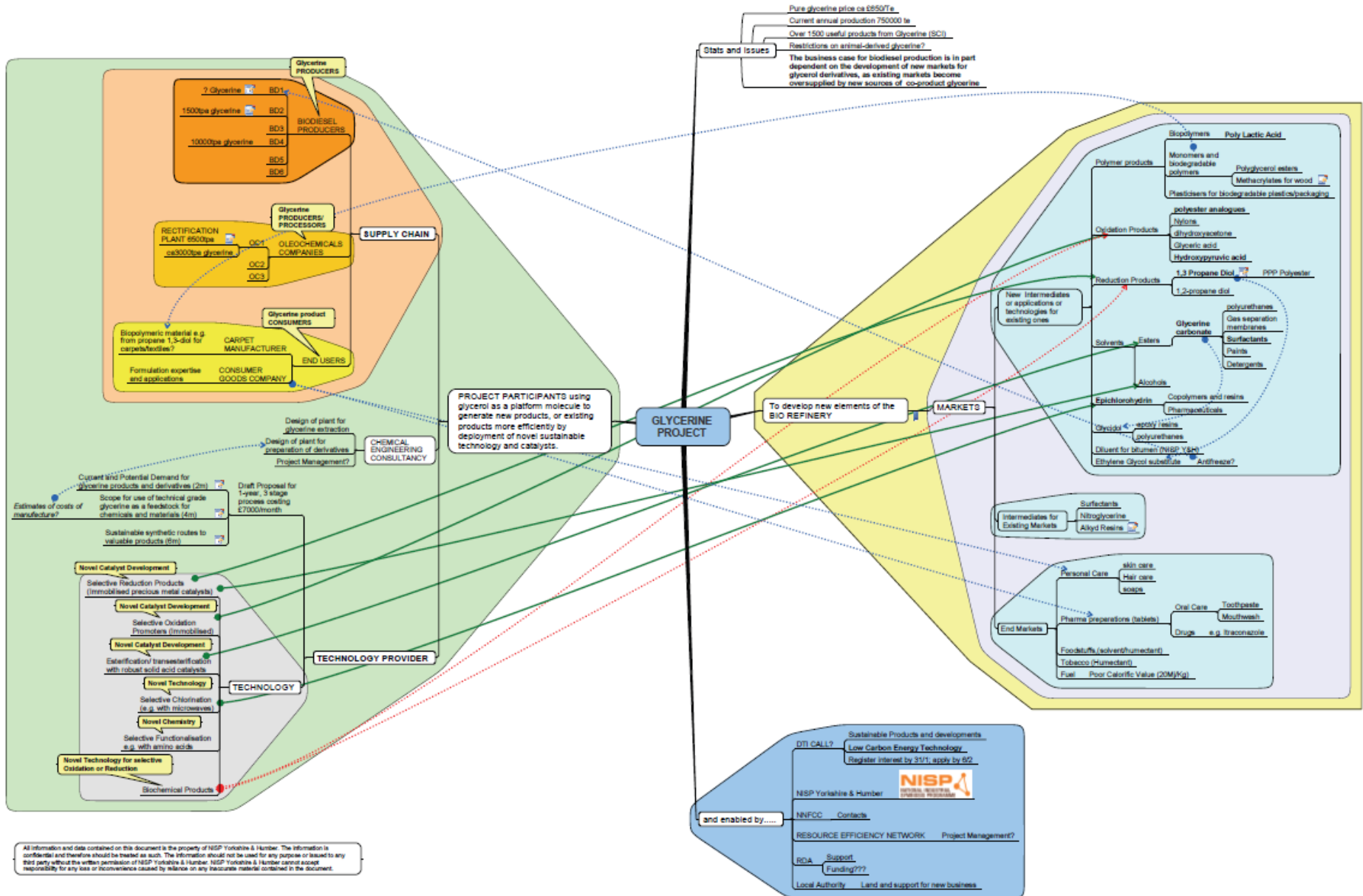
Helen Franklin, Managing Director, Lower Reule Bioenergy Ltd

Lower Reule Bioenergy Ltd
GREEN ENERGY FROM WASTE

NISP  [®]
NATIONAL INDUSTRIAL SYMBIOSIS PROGRAMME

International Synergies
industrial ecology solutions

The Development of the Biorefinery using Glycerine, as a by-product from the emerging biofuels industry as a platform molecule



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Practical experience tells us about delivery...

- X • **Exchange** of waste (doesn't happen)
- X • Geographic **proximity** (exceptions)
- X • Collaboration and **trust** (not required)
- ✓ • Network
- ✓ • Cascading best practice
- ✓ • Innovation

Practical experience tells us about context...

- ✗ • **Diminishing returns** (hasn't happened yet)
- ✗ • Classifying as “**waste**” (constrains success)
- ✗ • **Limit** to certain sectors, materials, municipalities (antithesis of industrial symbiosis)
- ✓ • **Engage** with Government departments
- ✓ • Addresses the **market failure** of information and pricing (lack of) of externalities

Industrial symbiosis: Tool for the circular economy

Success factors:

- Practitioners with industrial experience
- Engagement model
- Data



Impacts:

- Eco-Innovation
- Inputs
- Outputs
- Improved business processes
- Jobs

(Lombardi and Laybourn, 2012. J. Industrial Ecology)

The Future

- NISP franchise via Cleaner Production Centres
- Deployed in post disaster/post conflict areas
- Cross border synergies/trade
- Embedded further into economic policies
- Evaluation tool for private equity investors
- Carbon mitigation /offset
- Scope 3 emissions strategies
- Education, particularly vocational and MBA

2004: Industrial Symbiosis as a Novelty



MOO-ving home

BY CHARLOTTE WARD

IT'S no bull – now they're going to build houses out of DEAD COWS!

A Midland firm is making eco-friendly bricks from the bone ash left behind when cattle carcasses are incinerated.

The pioneering recycling project started when WRE Services Ltd., of Hagley, near Stourbridge, teamed up with Akristos Ltd., of Newcastle-under-Lyme, Staffordshire.

WRE Services is contracted by the Rural Payments Agency to dispose of the remains of cattle over the age of 30 months for which there is no market.

The company incinerates the remains of around 440 cows a week at plants in Harmer Hill, Sloughshire, and Langar, Nottinghamshire.

This leaves behind about 1,000 tonnes of bone ash a year which has to be disposed of in costly landfill sites.

But in a new "green" initiative, the firm is now sending the ash to Akristos so it can be recycled into bricks which could go on sale to house-builders as early as next month.

The cattle-into-bricks project is the latest example of innovative ways in which one firm's waste can become another's raw material to make new products.

Culled industrial symbiosis, the programme is backed by regional development agency Advantage West Midlands.

Ralph Hepworth, environmental technology manager with Advantage West Midlands, said: "This remarkable project demonstrates just what can be achieved by industrial symbiosis.

"There is almost no limit to the wastes that can be re-used and made into new and useful products if we are sufficiently flexible to identify the opportunities and then take them."

Akristos director Mike Evans said: "We are recycling a very substantial amount of materials which would otherwise go to landfill.

"The bricks are made from traditional materials mixed with a variety of inert waste products.

"As well as bricks, we are looking at markets for concrete blocks and ways in which a whole range of other products can be utilised.

"The future potential is enormous."

Martin Gibson, a director of WRE Services, said: "There are benefits not only to both companies but also to the environment by reducing the amount of incinerated bone ash which goes to landfill."

More than 10 million tonnes of waste is disposed of at ever-expanding tips in the West Midlands every year.

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NO BULL.. IT'S THE HOUSES MADE FROM DEAD COWS

RECYCLED: eco-friendly bricks made from the bone ash of cows



TOP TEN PLACES TO BUILD COW BRICK HOUSES

- Hudder-sfield
- Jersey
- Herrington
- Milk-maidenhead
- Horn-church
- Curd-worth
- Whey-mouth
- Cowes
- M-ilkley moor
- Cow-den-beef

2010: Financial Times Managing Climate Change

Alliances that lead to creative industrial symbiosis

Resources

One company's waste may turn out to be suitable fuel for another, says Sarah Murray

It is not often that a global chemicals company goes into partnership with a small-scale vegetable farmer. However, John Baarda, a Yorkshire tomato grower, has expanded rapidly because of a fruitful working relationship with Terra Nitrogen, a global nitrogen producer, by recovering and reusing the nitrogen company's steam heat and 12,500 tonnes of its carbon dioxide.

The partnership means

that Terra Nitrogen can cut its carbon footprint substantially, while John Baarda pumps the carbon dioxide into its greenhouses to boost plant growth.

It also diverts Terra Nitrogen's steam to heat 38 acres of greenhouses in which 300,000 tomato plants are cultivated throughout the year.

This alliance is one of many being fostered by the National Industrial Symbiosis Programme (NISP), a UK government-funded organisation that helps companies discover how their waste can be turned into valuable products and sold to others.

The link between every-

thing is turned into fuel pellets, and used oils from the cosmetics industry, which can be transformed into a raw material for biodiesel. "When one company's waste becomes another company's resource, it is fascinating," says Dax Lovegrove, head of business and industry at the WWF.

The WWF has included NISP in its "green game-changers" initiative, a collection of case studies of innovative sustainable ways of doing business.

To foster these partnerships, NISP brings together companies and industries around the country. In free workshops, companies working in seemingly unrelated businesses learn how

In addition, a database stores and matches resources entered by NISP staff and those of its member organisations.

"We run cross-sector industry workshops," says Peter Laybourn, chief executive of International Synergies and NISP programme director and founder. He adds: "Most people are trying to do something within their company, whether on waste or carbon, but not many people have time to look outside their company boundary."

In the workshops, executives from different sectors can learn about what their counterparts in different businesses or sectors do, and where opportunities might lie for the productive exchange of energy, water or waste materials.

"We're trying to break down barriers to cross-sector activity," explains Mr Laybourn. For Mr Laybourn, the key to finding these opportunities is the sharing of knowledge.

"We don't know what we don't know," he says. "And it's incredible when we



'If companies can make use of waste, it will be a big benefit' - Dax Lovegrove

bring the brains together from different sectors because it's so creative.

Take John Pointon & Sons, a large West Midlands animal renderer. NISP helped CTO Holdings, one of the UK's largest snacks producers, to generate £11,000 in additional sales to Jayplas, the UK's largest plastics recycler.

Jayplas is now buying the company's plastic waste – the polypropylene plastic sacking used to package potato powder and the small plastic trays used to package the finished products – to reprocess and sell

meat and bone meal – a byproduct that was once sent to landfill – could be a viable alternative fuel for the kilns of cement companies.

In the East Midlands, NISP helped CTO Holdings, one of the UK's largest snacks producers, to generate £11,000 in additional sales to Jayplas, the UK's largest plastics recycler.

Jayplas is now buying the company's plastic waste – the polypropylene plastic sacking used to package potato powder and the small plastic trays used to package the finished products – to reprocess and sell

48m tonnes of virgin material being used across the country.

Industrial symbiosis also saves companies money. "Whatever companies can do to avoid landfill costs and make use of their waste is going to be a big business benefit," says Mr Dax. "And there's so much opportunity to partner with others in this."

At the same time, industrial symbiosis has the potential to create a new industry of "middlemen". Because waste materials do not always emerge in the appropriate form for companies to use right away, secondary processing or treatment is often needed to turn by-products into materials suitable for reuse. In highlight

an issue, there are entrepreneurs out there for that kind of business," says Mr Laybourn. He also argues that, when it comes to combating climate change, industrial symbiosis is extremely cost-effective compared with other initiatives such as carbon trading.

NISP estimates a cost of about 62p for every tonne of carbon dioxide saved through its programmes.

"The transaction costs of carbon reduction commitments are incredibly high," says Mr Laybourn. "The monitoring, audits, registration and trading all add costs. This has virtually zero transaction costs. It doesn't need international agreements or trading mechanisms, and we can scale it up."

One company's waste may turn out to be suitable fuel for another, says Sarah Murray

"If companies can make use of waste, it will be a big benefit" Dax Lovegrove

2013: Financial Times Mainstream Business Education

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FEATURE OF THE WEEK January 20, 2013 11:59 pm

The sustainable path to profit: don't throw out the rubbish

By Sarah Murray



Few business schools spend much time promoting courses in waste management. But when seen in terms of resource management or industrial symbiosis (one company's refuse becoming another's raw material), waste starts to look like a hot topic for any manager wanting to cut costs, bolster raw materials supplies and promote environmental sustainability.

This is something few business managers have yet considered, says Bob Adams, business partnerships director at Sustainable Conservation, a California-based non-profit.

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FEATURE OF THE WEEK
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"It's about extractive resources and putting them through the same old system to get profit from them," he says. "Somehow we can't quite make that leap to the next way of thinking."

He believes this is where management education has a role to play. "It's going to be the generation of people coming through business schools that have a chance to rethink things and inspire new solutions."

Pressure for managers to focus on waste is certainly increasing. With many raw materials diminishing in supply, there is a growing awareness of the importance of resource conservation to the long-term sustainability of many business models.

"In an age of plentiful and cheap resources you can afford to throw them out," says Andrew Hoffman, director of the Erb Institute and professor of sustainable enterprise at the Ross School of Business. "But as the price and the scarcity starts to go up, capturing them and bringing them back will be critical."

Case study

Meanwhile, consumption is rising. Research from McKinsey suggests that growth in emerging markets

EDITOR'S CHOICE

MBA CHALLENGE
Teams of students work with the Global Fund for Children in our second annual MBA Challenge

WOMEN AT B-SCHOOL
A weekly interview with women in the world of business education. This week: Danica Furg

VIDEOS

When it comes to persuading consumers to think differently about waste, reuse of materials draws not only on technical knowhow but also on marketing skills. This was something Jo Gilroy, an Exeter Business School student, discovered when she embarked on one of the sustainability consulting projects that forms part of the school's One Planet MBA.

Ms Gilroy worked with UK-based Elvia & Kresse, which produces expensive lifestyle accessories from recycled materials, such as handbags made from discarded fire hose. The company also uses military-grade parachute lining and metal-coated mesh from mobile phones.

The resulting products sell at high prices. "I've been something that was totally unwanted and turned it into something that people are prepared to pay quite a bit of money for," says Ms Gilroy.

Working on the consulting project highlighted the fact that creating luxury products from unwanted items and marketing them in sophisticated ways can help change the way people look at waste, she says.

Ms Gilroy believes that resource management needs to become a more prominent part of business education.

"[Waste] is going to become more prevalent... and the issue of diminishing resources becomes more pressing - for business, this is not something that's going to go away."

This is the case at Yale School of Management, which covers such topics through a joint MBA and a master of environmental management. And at the University of Michigan, the MBA/MSc, run by the Ross School and Rackham Graduate School's School of Natural Resources and Environment, includes courses in resource management and industrial ecology.

Students at Rice University's Jones Graduate School of Business have the option of an internship at Waste Management, a Texas-based provider whose services include collection, transfer, recycling, resource recovery and disposal.

At Exeter University Business School in the UK, the One Planet MBA elective on biomimicry explores how business can look to nature when designing products, processes and systems that increase energy and resource efficiency and reduce or eliminate waste. The school has also published a case on Desmo, a carpet producer in the Netherlands, which is incorporating waste materials into its flooring tiles.

could create up to 3bn more middle-class consumers in the next 20 years - good news for companies, but only if they have access to supplies of the raw materials needed to feed that consumption. Waste is also becoming part of risk management because companies are held increasingly accountable for the environmental impact of manufacturing by-products.

Experts argue that to overcome such risks, managers will need to find ways of returning more industrial material to the supply chain and incorporating into their businesses concepts such as industrial ecology and biomimicry (following principles found in nature to maximise efficiency of materials and energy).

"These are critical areas that business managers will increasingly need to understand and are not being trained to consider," says Prof Hoffman.

Peter Laybourn, chief executive of International Synergies, also acknowledges the need for business students to learn how to manage and recycle waste. However, he stresses that future managers must also be equipped to look beyond internal processes and collaborate with others on waste management.

"Companies are so used to trying to solve their own problems, but the solutions might be right next to them," says Mr Laybourn, whose National Industrial Symbiosis Programme helps companies to discover how their waste, energy and by-products can be turned into resources and sold. "There's a lot of cross-fertilisation that companies might miss if they don't know about this."

In different forms, waste management is starting to crop up in business school content and activities, often through joint degrees.

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FINANCIAL TIMES JOBS



The Accenture GlobeScan report Feb 2015

- www.govsgocircular.com
- Top 30 circular economy best practice examples for governments
- International Synergies UK NISP and capacity building work for South Africa included
- Report co-authored by Accenture, De Groene Zaak, EY, IMSA and Royal Haskoning DHV


Concluding Remarks

- Industrial Symbiosis ‘a la NISP’ has a proven track record to deliver on eco-innovation and green growth and is a flexible tool to help deliver the circular economy
- Industrial Symbiosis is a much broader policy instrument than previous implementation indicates
- NISP is an excellent model and new implementers can learn from the UK’s mistakes
- Global Green Growth Forum 2014 “Scaling up what works is the best strategy for green growth.”

“The concept of industrial symbiosis is indispensable to the long-term development of global industry in **all countries** of the world. Developing economies around the world can achieve a more sustainable industrial development trajectory and move their economies towards a circular model more rapidly by taking advantage of the opportunities inherent in this approach.”

You can help launch NISP Canada

[Learn more here](#) 

Welcome

The National Industrial Symbiosis Programme (NISP) is all about 'Connecting Industry and Creating Opportunity' for business. It helps companies cut disposal, storage and transport costs and generate sales by adding value to previously under-used or discarded resources.

The NISP Network identifies mutually profitable links or synergies between its business members so that under-utilised and under-valued resources from one (materials, energy and water) are recovered and reused elsewhere in the industrial network – creating a truly CIRCULAR ECONOMY!

NISP Canada

For the past 7 years, NISP has been running [successfully in the UK](#). Now [Light House](#) and [One Earth](#) are pleased to introduce the National Industrial Symbiosis Programme (NISP) in Canada! This program will be launching across the country in March 2014.

Support

NISP Canada is generously supported by a grant from [The J. W. McConnell Family Foundation](#) as part of [Cities for People](#).

"[Cities for People](#) is an initiative that explores the following question: *How can we enhance social, ecological, and economic wellbeing and help civic cultures thrive?* It engages multiple stakeholders – citizens, community organizations, policy makers, municipalities, universities, private companies and foundations – in taking collaborative action to create more resilient and livable cities."

NISP Canada Launches
March 27th, 2014

2
days to go.

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BENEFITS
The National Industrial Symbiosis Programme (NISP) is all about

Thank you for listening...

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