Opportunities through Industrial Symbiosis: UK NISP and Global Experience

Ankara

31st January 2013

Peter Laybourn
Chief Executive
International Synergies Limited
1. NISP delivery model and results
2. International adoption/adaptation of Industrial Symbiosis
3. Eco-Innovation and Green Growth
4. Climate Change Mitigation and Energy Security
5. Economic Development applications of NISP
6. Recent European Policy
7. Concluding Remarks
Industrial Symbiosis is...

1. Good for business
2. Good for the economy
3. Good for the environment
4. No risk
What is Industrial Symbiosis?

In essence, industrial symbiosis is:

• Business opportunities for improved resource use
• Network of diverse organisations
• Yielding profitable transactions in:
  – Novel sourcing of inputs
  – Value added destinations for non-product outputs
  – Improved business and technical processes
1. The NISP delivery model and results
NISP: The Pathway To A Low Carbon Sustainable Economy

‘The Pathway To A Low Carbon Sustainable Economy’ charts NISP’s progress since becoming the world’s first national industrial symbiosis programme in 2005.

It demonstrates that the business-led NISP has a key role in the transition towards a low-carbon sustainable economy.

Available to download at:

http://www.international-synergies.com/images/pdfs/NISP_The_Pathway_to_a_Low_Carbon_Sustainable_Economy.PDF
Organisation:
Regionally Delivered, Nationally Co-ordinated

- World’s first National Industrial Symbiosis Programme (since 2005)
- Regional practitioner teams across the UK
- Investment from Government (Environment and Economic Development Agencies)
- Business-led Programme Advisory Groups (PAGs)
- Substantial benefits of a national model
Benefits of national or multi-region model...

- Replicate learning across the country
- Efficient use of expertise (don’t have to replicate!)
- Identification of trends and problems
- Strategic targeting of resources
- Rapid dissemination of best practice
- Rapid take-up of innovation and technologies
NISP Process

Practitioners facilitate all stages of synergy

1. Building the IS Network:
   - recruit new business members
   - access a diverse range of resources, sectors, business sizes and locations.

2. Quick Wins Workshop:
   - facilitate exchange of information between businesses

3. Resource Mapping:
   - record resources
   - facilitate potential matches

4. SYNERGie Management System:
   - on-line tool
   - information on resource and contact details
   - new and stored data.

5. Facilitated synergy – Role of practitioners
   - identify ‘idea’
   - facilitate negotiations
   - provide technical expertise

6. ‘Outputs Report’ for Implemented Synergies
   - summarises outputs
   - used for verification
1. Building the Industrial Symbiosis Network

- Recruit new business members
- Access a diverse range of resources, sectors, business sizes and locations
- Larger network = greater opportunity
- Currently 15,000+ industry members across Europe
- Growing international network (Belgium – UK)
NISP has circa 15,000 Members

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

**SMEs**
Alutrade
Arden Wood Shavings
Befesa Salt Slags
Bio Waste Solutions
BIP Oldbury
Coldwater Seaford Ltd
County Mulch
Delka 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
Whitby Recycling Services

**KEY POINTS**
- All sizes - Multi-nationals, SMEs, Micros, Entrepreneurs
- All sectors
- All resources
- **SMEs represent 90% of membership**
2. Quick Wins Workshop

- Facilitate the exchange of information and best practice between businesses
- Tried and tested, interactive business opportunity model
- Typically 50 - 60 organisations
- Generate 300+ potential synergies in a ½ day session
3. Opportunity Mapping
4. SYNERGie™ Management System

- On-line project and data management tool
- Information on resource and contact details
- New and stored historic data
- Bespoke report generating capabilities
- Vital support and management tool for UK practitioners
- Currently used in nine countries
5. Facilitated Synergy: Role of Practitioners

• Identify ‘IDEAS’
• Make introductions
• Facilitate negotiations
• Provide technical expertise
• Mine the network for answers and opportunity
• Use their industry expertise and knowledge
• Encourage and accelerate synergy progress
6. Outputs Reports for Synergies

- Summarising the outcomes of the synergy
- Acts as a ‘sign off’ document for all involved parties
- Provides an audit trail
- Used for external verification purposes
- Methodology itself verified
- Potential to create case studies
Success Factors

**Practitioners**

- Industrial expertise
- Long term relationship building & facilitation
- Marrying data & expert knowledge
- Working with the regulator and technology providers to ‘enable’ IS activity

**Engagement Model**

- Extensive, diverse network
- Business opportunity programme
- History of exemplary performance
- Demand pull on innovation

**Data**

- Quality NISP data & limited access to regulatory data
Business Support for NISP

• **Confederation of British Industries**
  “NISP’s success in the UK demonstrates that industrial symbiosis has the potential to significantly reduce industrial and commercial waste and comprehensively lessen the adverse environmental impacts of business”

• **Engineering Employers Foundation**
  “There is a much greater potential role for the excellent work of NISP in sustaining security of supply by mapping and making connections between one body’s waste and another’s material demand”
“We will only **meet the challenge of catastrophic climate change** by working in partnership and I would like to thank NISP for all that you do to foster these relationships, with warmest best wishes”

- His Royal Highness, The Prince of Wales

“Before I joined NISP I wouldn't have had the opportunity to learn from others, discover the wealth of potential service provision or the support network through working with others in the local community. **Becoming a member has been one the best decisions I have made** and I continue to advocate any business to join NISP”

- Mark Bradford, Production Systems Manager, Toyota
The Constituents of an Industrial Symbiosis Network Managed by International Synergies

**Practitioner**
- Engages with businesses and regulators
- Facilitates synergies
- Delivers workshops

**Innovation Manager**
- Connects industry to universities
- Facilitates knowledge transfer
- Embeds innovation within the network

**Academia**
- Connects companies to research
- Supports post-graduate learning
- Valuable resource for Practitioners

**Business Members**
- Recruited across all sectors
- 90% SMEs and Micros
- 15,000 in UK alone

**Champions**
- Advocate for industrial symbiosis
- Commercial ‘steer’ to the programme
- Advice and guidance on delivery
# NISP (England) Delivered Outcomes
April 2005 - March 2012

<table>
<thead>
<tr>
<th>METRICS</th>
<th>In Year Benefits*</th>
<th>Lifetime Impact (Max 5 year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill diversion</td>
<td>9 million tonnes</td>
<td>45 million tonnes</td>
</tr>
<tr>
<td>CO$_2$ reduction</td>
<td>8 million tonnes</td>
<td>39 million tonnes</td>
</tr>
<tr>
<td>Virgin material savings</td>
<td>12 million tonnes</td>
<td>58 million tonnes</td>
</tr>
<tr>
<td>Hazardous waste eliminated</td>
<td>0.4 million tonnes</td>
<td>2 million tonnes</td>
</tr>
<tr>
<td>Water savings</td>
<td>14 million tonnes</td>
<td>71 million tonnes</td>
</tr>
<tr>
<td>Cost savings</td>
<td>€243 million</td>
<td>€1.21 billion</td>
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<tr>
<td>Additional sales</td>
<td>€234 million</td>
<td>€1.71 billion</td>
</tr>
<tr>
<td>Jobs</td>
<td>10,000+</td>
<td></td>
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<tr>
<td>Private investment</td>
<td>€374 million</td>
<td></td>
</tr>
</tbody>
</table>

€40 million investment since 2005
*all outputs independently verified

Rate Euro £1 = €1.18

International Synergies
industrial ecology solutions
## Excellent Return on Investment

**April 2005 - March 2012**

<table>
<thead>
<tr>
<th>Unit Benefit Realised</th>
<th>In Year Spend</th>
<th>Lifetime Spend</th>
</tr>
</thead>
<tbody>
<tr>
<td>€1 new income generated for industry</td>
<td>€0.02</td>
<td>€0.005</td>
</tr>
<tr>
<td>€1 saved by UK industry</td>
<td>€0.02</td>
<td>€0.005</td>
</tr>
<tr>
<td>1 tonne of virgin material saved</td>
<td>€0.48</td>
<td>€0.100</td>
</tr>
<tr>
<td>1 tonne of water saved</td>
<td>€0.40</td>
<td>€0.080</td>
</tr>
<tr>
<td>1 tonne of CO₂ reduced</td>
<td>€0.73</td>
<td>€0.150</td>
</tr>
<tr>
<td>1 tonne of waste diverted from landfill</td>
<td>€0.64</td>
<td>€0.130</td>
</tr>
<tr>
<td>1 tonne of hazardous waste eliminated</td>
<td>€13.74</td>
<td>€2.740</td>
</tr>
</tbody>
</table>

Rate Euro £1 = €1.18

- Total Economic Value Added €1.8bn to €3.0bn, giving an investment multiplier of between 53.2 - 88.6

- €175 million to €290 million to Treasury in direct receipts

- Benefit:Cost Ratio in excess of 32:1
  3:1 considered good by Government and 8:1 excellent by Regional Development Agencies
Manchester Economics Report: Conclusion

NISP, having established the infrastructure to deliver the “symbiosis process” across industry, provides a strong foundation from which to increase the returns from public investment.

The triple line benefits achieved to date provide a compelling case for increased investment in the future.
UK Coal were alerted by involvement in the NISP Programme to test work carried at the National Renewable Energy Laboratories in USA which involved extracting ethanol from coal slurry which comprises a minimum of 20% ash, 20% moisture and the remainder being coal which is produced as a by-product of the coal cleaning process. 3.5 million tonnes of coal slurries are available in storage lagoons which will produce 1m tonnes of ethanol.

Research conducted by Newcastle University regarding the dewatering of sand is now being applied to UK Coal products in order to access new markets such as colliery spoil (mud stones) as a road making material and carbon containing clays for use in construction block manufacture whilst the residual carbon content is useful for firing the kilns.
Case Study: A Fruitful Collaboration

Companies:
- GrowHow UK (formerly Terra Nitrogen)
- 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
Welcome to Michelin
Paul Kinkead
Environment Manager
Reduction in waste to landfill

- **Corporate target** to eliminate production 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 to **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

2009 result was 57T

Joined NISP

2009 result was 57T
Original goal production waste, now all waste (includes process and catering)

3 examples:
• **Carbon black**, used in tyre production. Process waste was going to landfill, now to a composter (60tpa)
• **Talcum powder**, used in tyre moulding process, is contaminated with plastic. Minerals processing company received the waste, recycles the plastic and recovers the talc for mushroom casing manufacture (100tpa)
• **MetFab**, mixture of steel reinforcing wire and uncured rubber used to produce tyre casings. Off cuts were going to landfill, now going to a company that separates and recycles steel and rubber
2. International Growth
Industrial Symbiosis a la NISP around the world

<table>
<thead>
<tr>
<th>Country</th>
<th>Status</th>
<th>Project</th>
<th>Region/State</th>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slovakia</td>
<td>Complete</td>
<td>Reducing Production Waste by Industrial Symbiosis</td>
<td>Bratislavsky kraj</td>
<td>ERDF</td>
</tr>
<tr>
<td>Belgium</td>
<td>Ongoing</td>
<td>NISP</td>
<td>Bratislavsky kraj</td>
<td>ERDF</td>
</tr>
<tr>
<td>Poland</td>
<td>Ongoing</td>
<td>EUR-IS</td>
<td>Wroclaw</td>
<td>Climate KIC</td>
</tr>
<tr>
<td>Turkey</td>
<td>Ongoing</td>
<td>NISP</td>
<td>Iskenderun Bay area</td>
<td>BTC</td>
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<tr>
<td>Slovakia</td>
<td>Complete</td>
<td>Reducing Production Waste by Industrial Symbiosis</td>
<td>Bratislavsky kraj</td>
<td>ERDF</td>
</tr>
<tr>
<td>Hungary</td>
<td>Ongoing</td>
<td>NISP</td>
<td>Kozep-Magyarorszag, Budapest</td>
<td>European Union Life+ Climate KIC</td>
</tr>
<tr>
<td>South Korea</td>
<td>Ongoing</td>
<td>Co-operation on Eco-Park Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>Complete</td>
<td>Tianjin Economic Development Area Industrial Symbiosis Network</td>
<td>Tianjin European Union Switch Asia</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>Ongoing</td>
<td>Pilot Project - Circular Economy</td>
<td>Yunnan Province</td>
<td>§</td>
</tr>
<tr>
<td>Brazil</td>
<td>Ongoing</td>
<td>NISP</td>
<td>Minas Gerais</td>
<td>§</td>
</tr>
<tr>
<td>Chile</td>
<td>Ongoing</td>
<td>NISP</td>
<td>Toluca Lerma</td>
<td>§</td>
</tr>
<tr>
<td>Mexico</td>
<td>Complete</td>
<td>NISP</td>
<td>Toluca Lerma</td>
<td>§</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Pending</td>
<td>NISP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td></td>
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<tr>
<td>Finland</td>
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<tr>
<td>China</td>
<td>Ongoing</td>
<td>NISP</td>
<td>Toluca Lerma</td>
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</tr>
<tr>
<td>China</td>
<td>Complete</td>
<td>Pilot Project - Circular Economy</td>
<td>Yunnan Province</td>
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<tr>
<td>South Africa</td>
<td>Complete</td>
<td>South Africa Industrial Symbiosis Pilot Programme</td>
<td>Gauteng Province</td>
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<tr>
<td>Brazil</td>
<td>Ongoing</td>
<td>NISP</td>
<td>Minas Gerais</td>
<td>§</td>
</tr>
</tbody>
</table>
Other current interest...

- Argentina
- Australia
- Canada
- Cuba
- France
- Italy
- Portugal
- Western Cape, South Africa
Programa NISP Mexico

Febrero 2008 – diciembre 2009, en la región del Valle de Toluca

Apoyado y reconocido por SEMARNAT, Gobierno del Estado de México, AIEM, CEVAT, CANACINTRA, Cespedes
February 2008 - October 2009:

• More than 150 distinct companies in 18 months
• 5 industrial symbiosis workshops
• 2 workshops on energy efficiency and greenhouse gas inventories
• Additional events – difusion
  Radio: ABC radio (Informa AIEM)
  Press: Expansión y El Sol de Toluca
  Televisión: Megacable
• More than 1000 opportunities identified
• Investment in 2 biofuel companies
Started November 2008

• Partners: State Industry Federation (Federacao das Industrias do Estado - FIE) and Fundacao Estadualdo Meio Ambiente (FEAM)
• States: Minas Gerais, Rio Grande du Sur, Parana

30,000 tonnes ash replaced clay in brick manufacture. As the ash contained an organic component this reduced the amount of time required to fire the bricks, saving fuel while also enabling the manufacturer to increase production

7,800 tonnes waste sludge from wire manufacture used in cement. The sludge contained iron which enabled the cement manufacturer to decrease additional inputs of iron to their process
Programa NISP Brasil – Early Results

<table>
<thead>
<tr>
<th>CONCEPT</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste not disposed to landfill</td>
<td>94,510</td>
</tr>
<tr>
<td>CO₂ emissions reduced</td>
<td>82,420 ton</td>
</tr>
<tr>
<td>Cost savings generated</td>
<td>R$7,043,800 / £2,535,700</td>
</tr>
<tr>
<td>Additional sales generated</td>
<td>R$525,000 / £189,000</td>
</tr>
<tr>
<td>Virgin raw materials</td>
<td>15,2030</td>
</tr>
</tbody>
</table>

Febrero 2008 – Octubre 2009

Source: PROSIMIND-NISP Presentation in “Expo Negocios Verdes,” ITESM, 2010
Industrial Symbiosis in Chile

• Diverse industry sectors excellent for industrial symbiosis
• Commitment from industry through voluntary agreements brokered by CPL
  • Quintero-Puchuncavi: Oxiquim, Puerta Ventana, Capitania de Puertas
  • Huasco: CAP Mineria, Guacolda
• Many sector level agreements
• Builds naturally on Cleaner Production activity within businesses
• Strong regional networks
• Conclusion: Major opportunities for industrial symbiosis
China Project: Sludge Re-Utilisation

The Challenge
Sewage treatment plant in Tianjin Harbor Industrial Park
New policy: Landfill site doesn't receive sludge.

The Solution
Professional sludge treatment company, extracting protein from sludge for the manufacturing of protein products
Companies met in workshop and developed potential synergy
15 tons of sludge transferred per month

The Results
- Businesses Assisted: 2
- Additional Sales: 70,000 Yuan
- Cost Savings: 464,000 Yuan
- Landfill Diverted: 180 t/year
- Virgin Materials: 180 t/year
Splitting the Sludge

Wastewater → Sludge → Microbial Cell Destruction → Separation

Hydrolysis

Protein

Enrichment
- Foaming agent
- Nutrient Solution
- Fire extinguishing agent
- Other Products

Drying
- Foam Ceramics
- Construction Materials
- Landscaping soil
- Other Products

Sludge Residue

w/c reduced to 50-60%, organic matter degradation up to 40%. Pathogens inactivation; Sludge stabilized
3. Eco-Innovation and Green Growth
Recognition for Eco-Innovation

The Organisation for Economic Co-operation and Development (OECD, 2010) declared Industrial Symbiosis an “excellent example of systemic innovation vital for future green growth”

NISP is accredited by the European Commission as an Exemplar of Eco-Innovation through its Environmental Technologies Action Plan (ETAP, 2007)

NISP has been highlighted as 1 of 20 Worldwide Green Game Changing Innovations in a report commissioned by the World Wide Fund for Nature (WWF)
OECD Identifies Industrial Symbiosis as Critical to Growth Agenda

OECD has recently declared industrial symbiosis ‘a la NISP’ to be “an excellent example of systemic innovation vital for future green growth”

Production Process
- Pollution Control
- Cleaner Production
- Economic Efficiency
- Lifecycle Management
- Closed-loop Production
- Industrial Symbiosis

Product & Service
- Green Products
- Eco-design
- New Business Models
- New Modes of Provision
- Mass Application

Organisational Boundary

Incremental Innovation
Systemic Innovation
Technology and Innovation: Eco-Innovation Exemplar

• Some potential synergies require innovative solutions
  - new technologies
  - new applications for existing technologies

• Immediate demand pull on of R&D and technology innovation

• University of Birmingham studies have found a high level of innovation in synergies
  - 50% involved best available practice
  - 20% involved new research and development

• NISP is an EU Environmental Technologies Action Programme (ETAP) and OECD Eco-Innovation Exemplar
From dirty industry to clean energy company

- Animal renderer
- Initial NISP engagement: by-products diverted from landfill to cement industry
- Second stage: improve efficiency of processes
- Third stage: move into bio-fuels
- Fourth stage: anaerobic digestion and grid connection
- Result: new vision as energy company (same inputs!)
IS Transforms Individual Businesses: John Pointon & Sons Ltd

INPUTS
- Fallen animals
- Waste food in packaging

Process Changes

OUTPUTS
- Meat & bone meal to cement - high calorific value, minerals
- Bio-combustible
- Produce electricity
- Community support for new site
4. Economic Development Applications for NISP
Zone 1 is a significant generator of Carbon Dioxide

Energy Corridor project would reduce the requirement for individual steam raising plant and lead to the optimisation of CHP systems, thereby reducing combustion and CO2 in the Zone.
Low Carbon Regional Economic Development 2011: Birmingham Big City Plan

- Tyseley Environmental Enterprise Zone (TEEZ) - Framework for Action (May 2011)

- Birmingham’s Priorities for Tyseley: “Support businesses and organisations to capitalise on low carbon opportunities and maximise industrial symbiosis”

- International Synergies Limited have been commissioned to produce report (completed October 2012)
Economic Development:
Closing local loops, creating jobs
Clifford Hill / Jackie Homan
Birmingham City Council
International Synergies Report on Tyseley

Dr Jacqueline Homan,
Sustainability and Science City Manager,
Birmingham City Council
Birmingham’s Green Ambitions

- Set out in the Leader’s policy statement in July 2012
- Established the Green Commission
- Carbon reduction target is 60% by 2027
- Chair of the Eurocities Environment Forum
- CCE Team covers a range of issues (e.g. policy, energy, work with schools, food)
The IS project

- Identification of potential resource synergies at Tyseley.
- Understanding of how transport infrastructure can be used in an intelligent and resource efficient way.
- Highlighting opportunities for green business growth and inward investment.
- Identification of specific businesses in Tyseley that could be targeted for technology transfer/ might benefit from R&D.
- Scoping the potential for establishing a resource efficiency innovation centre.
- To identify catalyst developments for the Tyseley area (key opportunity sites).
- To establish market demand for an incubator for innovative business start-ups in resource efficiency at Tyseley.
- To contribute towards the repositioning of Birmingham as a leader in resource efficient technologies and a key place for businesses to locate.
Outcomes

• The work particularly looked at metals and metal recovery and low carbon fuels and technologies.
• The focus was on carbon reduction and job and wealth creation.
• What we can do now
• What we might do in the ‘medium term’ with inward investment
• What we might do with innovation, drawing upon demand and research/ business expertise.
• This was explored in the TEEZ, TEEZ+1, +2 and +5 miles areas.
Today: examples

- Precious metals in road sweepings (c. £57,000 in value).
- Silver from medical waste (more than £130,000 in value from amalgam alone)
- Small scale CHP opportunities
- Wood recovery for energy (e.g. at Birmingham Airport)

- Potential if the area was widened?
Tomorrow: examples

- Low grade heat could be used in urban farming
- Plastics washing facility could improve recycling
- Non-recyclable plastics → pyrolysis
- Inward investment targeted to process high value WEEE components
Future innovation

• Use of platinum and palladium from road sweepings in fuel cell industry
• WEEE reprocessor would enable recovery of plastics as well as precious metals
• Innovation to recover clean wood from contaminated wood
TEEZ as an innovation centre

- Alternative energy research
- Hydrogen and electric vehicle research
- Precious metals and rare earth element recovery
- Low carbon living
What next?

- Exciting opportunities for synergy within and beyond TEEZ
- Fresh perspective on possibilities
- Some quick wins and challenging ambitions
- TEEZ a reality, not just a strategy
- BUT complements strategic thinking
- Lifts us out of silos
- Will require cross-sector partnership working to deliver
Thank you!

jackie.homan@birmingham.gov.uk
07833 059273
5. Climate Change Mitigation and Energy Security
“If companies can make use of waste, it will be a big benefit”
Dax Lovegrove

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

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 grower. However, the alliance between Terra Nitrogen and a company that makes wood pellets that are used as fuel for biomass boilers is a shining example of how waste products can be turned into valuable resources.

Terra Nitrogen, which is based in the Netherlands, has been using wood pellets as a substitute for coal in its power generation. The company has been able to reduce its carbon footprint by up to 80% by using wood pellets instead of coal, which is a significant reduction in greenhouse gas emissions.

The wood pellets are made from waste wood, which is collected from the sawmills and other sources. The wood is then broken down into small particles and compressed into pellets that can be easily transported and stored.

The alliance between Terra Nitrogen and the wood pellet company has been successful because it has created value for both parties. The wood pellet company is able to sell its product to Terra Nitrogen, which in turn is able to reduce its carbon footprint and save money on fuel costs. In addition, Terra Nitrogen is able to provide a reliable and sustainable source of energy to its customers.

In summary, the alliance between Terra Nitrogen and the wood pellet company is a shining example of how waste products can be turned into valuable resources, and how businesses can work together to create value for all parties involved.
Assessing industrial symbiosis’ contribution to climate change mitigation and energy security
2012: Energy Delta Institute

EDI Quarterly

Volume 4, No. 3, October 2012

Editor’s Note
by Jacob Huber

Welcome to the October edition of the EDI Quarterly! The June edition of our publication was skipped in favor of this double issue celebrating EDI’s 24th lustrum and featuring contributions on industrial ecology (with a focus on eco-industrial parks) and energy security. We are proud to announce that the Quarterly has been chosen to disseminate the proceedings of the first International Work Conference on Applied Industrial Symbiosis.

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12 Utilizing excess heat
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Savings</strong></td>
<td>Lower embedded energy in processing recycled materials than virgin raw materials</td>
</tr>
<tr>
<td><strong>Process Savings</strong></td>
<td>Savings in gas, electricity or other fuel use by one of the synergy partners principally through innovation</td>
</tr>
<tr>
<td><strong>Fuel Substitution</strong></td>
<td>Replacing fossil fuels with other non fossil fuel sources in industrial processes</td>
</tr>
<tr>
<td><strong>Transport Savings</strong></td>
<td>Reduction in transport directly associated with synergies</td>
</tr>
<tr>
<td><strong>Disposal Savings</strong></td>
<td>Reduction in biodegradable material sent to landfill</td>
</tr>
<tr>
<td><strong>Energy Savings</strong></td>
<td>Production of energy through, for example, anaerobic digestion and utilisation of waste heat</td>
</tr>
</tbody>
</table>
NISP Resource Streams with CO$_2$ savings

- Aggregates
- Batteries
- Chemicals
- Food & Drink
- Metals
- Organics
- Paper
- Plastic
- Tyres
- Wood
6. Recent European Policy Activity
Recent European Policy

- Roadmap to a Resource Efficient Europe (2011)
- DG Enterprise Sustainable Industry-Going for Growth & Resource Efficiency (2011)
- European Climate Knowledge and Innovation Community (2012)
- European Resource Efficiency Platform (2012)

• Economic analysis of resource efficiency policies; “the National Industrial Symbiosis Programme has the maximum possible score based on economic and environmental benefits amongst 120 policies from 23 countries”

• The report presents evidence to support a European-wide replication of NISP stating, “NISP shows high potential for improving resource efficiency, and the programme could be successfully replicated in every EU Member State”

• “NISP has significant implications for profitability...and provides for a long-term sustainable investment for growth”
Now in mainstream industrial policy...

“The new Industrial Policy update to be launched this week will include practical proposals for industrial symbiosis schemes across Europe...Industrial symbiosis will be one of our priorities in 2013”

Commissioner Potočnik in a speech to the Business Europe Advisory Board and Support Group (Oct 2012)
7. Concluding Remarks
How Far We Have Come
2004: Industrial Symbiosis as a Novelty

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 WEE Services Ltd of Hagley, near Stourbridge, teamed up with Akriztos Ltd of Newcastle-under-Lyme, Staffordshire.

WEE 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, Steepleford 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

AKRIZTOS

Alkali In It can be recycled into bricks which could go on sale to house builders as early as next month.

The cattle-to-bricks project is the latest example of innovative ways in which a farm’s waste can become another’s raw material to make new products.

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

Ref: Hayworth, 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 range of things 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.”

Akriztos 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 rather than 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 utilized.

“The future potential is enormous.”

Martin Gibson, a director of WEE 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-increasing costs in the West Midlands every year.

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Global Green Growth Forum (3GF)

• International Synergies invited to put together a Public Private Partnership (PPP) for the Forum in October 2013
• Governments of Denmark, China, Mexico, South Korea, Kenya and Qatar (Brazil and Chile likely to join in 2013)
• All the world’s leading institutions including WB/IFC/UNEP/UNIDO/WWF/WBCSD/WRI
Industrial Symbiosis in Turkey

• Industrial Symbiosis delivers on the Circular Economy:
  • Climate change mitigation
  • Waste reduction/Resource productivity
  • Green growth through innovation
• In Turkey, many success factors already in place
  • Networks of companies
  • BTC and TTGV expertise
  • Diverse economy, strong regional leadership and coordination
• Great opportunity to build on success to date and create a multi-regional or national programme

Thank you for listening!
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