Industrial Symbiosis:
The Pathway to a Low Carbon Sustainable Economy

Peter Laybourn - NISP Programme Director

Industrial Symbiosis Programme in the Iskenderun Bay Area 21st January 2010
Agenda

- Background to IS and NISP UK
- Results – physical and fiscal
- Case studies
- Organisation
- IS and Climate Change agenda
- International outreach
- Evolution of NISP
- Conclusion
Industrial Symbiosis advances sustainability in the industrial system

Linear system
- Natural resources
- Products
- Waste

Move toward Circular system
- Natural resources
- Products
- Waste
To resource
- Natural resources

Move toward Circular system
- Natural resources
- Products
- Waste
To resource
- Natural resources
What is *Industrial Symbiosis*?

Industrial symbiosis engages traditionally separate industries and other organizations in a network to foster innovative strategies for more sustainable resource use (including materials, energy, water, assets, expertise, logistics, etc).

Through the network, business opportunities are identified leading to mutually profitable transactions for
- innovative sourcing of required inputs and
- value added destinations for non-product outputs
+ Exposure to best practice/knowledge transfer
“Bring about long term business culture change through profitable actions that result in measurable environmental and social benefits making a significant contribution to international sustainability”
NISP increases

- Jobs
- Profits
- Sales
- Learning
- Innovation
- New business
- Inward investment
- Knowledge transfer
- Utilisation of assets

NISP reduces

- Use of virgin resources
- Use of potable water
- Hazardous waste
- CO₂ emissions
- Transport
- Pollution
- Landfill
- Costs
- Risk

NISP creates business opportunities
<table>
<thead>
<tr>
<th></th>
<th>Actual: Year on year</th>
<th>Scenario 1: Decay, 5 years</th>
<th>Scenario 2: Flat, 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Savings to Business</td>
<td>£156,082,258</td>
<td>£458,246,774</td>
<td>£780,411,290</td>
</tr>
<tr>
<td>Additional Sales for Business</td>
<td>£176,097,919</td>
<td>£528,293,757</td>
<td>£880,489,595</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landfill Diversion (Tonnes)</td>
<td>7,022,384</td>
<td>21,067,152</td>
<td>35,111,920</td>
</tr>
<tr>
<td>CO$_2$ Reduction (Tonnes)</td>
<td>6,038,059</td>
<td>18,114,177</td>
<td>30,190,295</td>
</tr>
<tr>
<td>Virgin Material Savings</td>
<td>9,704,711</td>
<td>29,114,133</td>
<td>48,523,555</td>
</tr>
<tr>
<td>(Tonnes)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Eliminated</td>
<td>363,626</td>
<td>1,090,878</td>
<td>1,818,130</td>
</tr>
<tr>
<td>(Tonnes)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Savings (Tonnes)</td>
<td>9,569,738</td>
<td>28,709,214</td>
<td>47,848,690</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jobs Created</td>
<td>3683</td>
<td>13,309</td>
<td>22,181</td>
</tr>
<tr>
<td>Jobs Saved</td>
<td>5087</td>
<td>18,379</td>
<td>30,632</td>
</tr>
</tbody>
</table>
Benefit Generated through NISP

<table>
<thead>
<tr>
<th>Benefit Generated</th>
<th>Input to NISP</th>
<th>5 Years Scenario 1</th>
<th>5 Years Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>£1 new income for Industry</td>
<td>2 pence</td>
<td>0.7 pence</td>
<td>0.4 pence</td>
</tr>
<tr>
<td>£1 cost saving for Industry</td>
<td>3 pence</td>
<td>0.8 pence</td>
<td>0.5 pence</td>
</tr>
<tr>
<td>1 tonne of virgin material saved</td>
<td>41 pence</td>
<td>14 pence</td>
<td>8 pence</td>
</tr>
<tr>
<td>1 tonne of water saved</td>
<td>41 pence</td>
<td>14 pence</td>
<td>8 pence</td>
</tr>
<tr>
<td>1 tonne of carbon dioxide (equivalent) reduced</td>
<td>65 pence</td>
<td>22 pence</td>
<td>13 pence</td>
</tr>
<tr>
<td>1 tonne of waste diverted from landfill</td>
<td>56 pence</td>
<td>19 pence</td>
<td>11 pence</td>
</tr>
<tr>
<td>1 tonne of hazardous waste eliminated</td>
<td>10.86 pounds</td>
<td>£3.62 pence</td>
<td>£2.17 pence</td>
</tr>
</tbody>
</table>

Scenario 1: Persistence 20% decay per annum

Scenario 2: Persistence 0% decay per annum

Based on England only

£27m investment in total over 5 years
Economic Impact Assessment

• Total Economic Value Added £1.47 billion to £2.45 billion 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 Regional Development Agencies). Defra economists have accepted this as ‘off the scale’ in terms of Govt. interventions

• All above achieved from a total investment of £27m over 5 years
Case Study:
profit from hazardous waste

Achievements

• €45,000 a year cost savings

• Hazardous Waste Diverted from landfill: 15 tonnes

• Carbon emissions reduced by: 242 tonnes
Case Study:
NISP transforming business

- 150,000 tonnes animal by-products diverted from landfill
- 10 jobs created
- 277,000 tonnes CO2 reduction
- Best practice solution to aid IPPC application
- Compliant with Animal By-products Regulations
- Reduced disposal and raw fuel costs – benefiting both companies
Case Study: Business Solution for Foundry Waste

- Links to foundries via Cast Metal Federation
- Identified ways to reuse spent foundry sand
- Sustainable solution rather than landfill
- Valuable business diversification for Befesa
- Additional Sales - £200k
- Landfill Diversion – 10,000 te
- Cost Savings - £300k
- Virgin Materials – 10,000 te
- Jobs Saved - 42
Case Study:
Innovative use of CO$_2$

Achievements

- Reduction of 12,500 tonnes of CO$_2$ emissions
- Successful reuse of waste heat
- 65 new jobs created
- €30 million private investment in region
Case Study: Use of Waste Energy
Organisation - regionally delivered & nationally coordinated

- Began as 3 regional pilots in 2002/3 and went national in 2005
- World’s first and fully National Industrial Symbiosis Programme
- 12 regional teams across the UK
- 50+ NISP practitioners in place across all regions
- Part-funded by Defra
- 12 Business-led Programme Advisory Groups (PAGs)
- Benefits of a national model
NISP has circa 12,500 Members

<table>
<thead>
<tr>
<th>Corporates</th>
<th>SMEs</th>
<th>Micros</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marley Eternit</td>
<td>Premier Automotive Group</td>
<td>B.C.R Company</td>
</tr>
<tr>
<td>Veolia</td>
<td>BOC</td>
<td>G&amp;P Batteries</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>IKEA</td>
<td>Overtone Recycling</td>
</tr>
<tr>
<td>Anglian Water Services Ltd</td>
<td>Johnson Matthey</td>
<td>Premier Waste</td>
</tr>
<tr>
<td>Associated British Ports</td>
<td>Sainsburys</td>
<td>Renewable Energy Growers</td>
</tr>
<tr>
<td>SITA</td>
<td>Rentokil</td>
<td>Pennine Fibre Industries</td>
</tr>
<tr>
<td>Diageo</td>
<td>Lafarge Cement</td>
<td>Firth Rixson Castings</td>
</tr>
<tr>
<td>Shell</td>
<td>Coors Brewers</td>
<td>Country Chef</td>
</tr>
<tr>
<td>Peel Investments</td>
<td>Severn Trent</td>
<td>The Cheese Co.</td>
</tr>
<tr>
<td>Foster Yeoman</td>
<td>Anderson Group</td>
<td>Green BioDiesel</td>
</tr>
<tr>
<td>Bombardier</td>
<td>Tarmac</td>
<td>Alutraide</td>
</tr>
<tr>
<td>Michelin</td>
<td>Laing O'Rourke</td>
<td>Betts</td>
</tr>
<tr>
<td>Corus</td>
<td>Ford</td>
<td>Kingpin</td>
</tr>
<tr>
<td>HSBC</td>
<td>Carrilion</td>
<td>Auto Waste Solutions</td>
</tr>
</tbody>
</table>

KEY POINTS
- c12,500 members (October 2009)
- All sizes: Multi-nationals, SMEs, Micros, Entrepreneurs
- All sectors/all resources
NISP member workshops
## 30mt Carbon Dioxide Reduction

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input savings</td>
<td>Lower embedded energy in processing recycled materials than virgin raw materials</td>
</tr>
<tr>
<td>Process savings</td>
<td>Savings in gas, electricity or other fuel use by one of the synergy partners principally through innovation</td>
</tr>
<tr>
<td>Fuel substitution</td>
<td>Replacing fossil fuels with other non fossil fuel sources in industrial processes</td>
</tr>
<tr>
<td>Transport savings</td>
<td>Reduction in transport directly associated with synergies</td>
</tr>
<tr>
<td>Disposal savings</td>
<td>Reduction in biodegradable material sent to landfill</td>
</tr>
<tr>
<td>Energy Savings</td>
<td>Production of energy through, for example, anaerobic digestion and utilisation of waste heat</td>
</tr>
</tbody>
</table>
Carbon and Copenhagen (COP15)

- Reduces carbon at least cost
- Has full industry support
- Can be done today and scaled up tomorrow!
- Doesn’t require international agreements
- Can be implemented without any scheme such as cap and trade, CDM, offset etc
- No signs of diminishing returns
International outreach

- Sustainable Development Dialogues in association with Defra
  - China (Yunnan – Circular Economy Pilot)
  - Mexico (Toluca – Lerma)
  - Brazil (Minas Gerais)
- China (TEDA) + Shanghai*, Chongqing*, Wuhan*, Guizhou*
- Romania (Succeava)
- Hungary (Kozep Magyarorszag - Budapest)
- USA (Houston, Chicago)
- Mexico (Toluca-Lerma, Nuevo Leon)
- Canada (Nova Scotia)
- Germany (Lower Saxony)*
- India*
NISP México: ¿Qué sigue?

- NISP México, EdoMex
- Interest from:
  - Guanajuato
  - Distrito Federal
  - Nuevo León
  - Querétaro
  - Baja California Norte
  - Tamaulipas
  - Jalisco
  - Puebla

www.nisp.org.mx
Regional Economic Development through Intelligence Based Industrial Symbiosis (RED IBIS)

Develop regional economic advantage through opportunities identified by an IS approach to optimise regional resource and asset use (materials, energy, water, logistics, experts, knowledge, innovation and capacity, etc) to move toward a low carbon sustainable economy.
Summary

• A robust model that can cross economies and is flexible enough to adapt to different and changing economic conditions
• Potential for problem solving & other scenarios

Key success factors of NISP:
1. Business led
2. Free and open network
3. Independently facilitated
4. Govt. support
5. Innovation
6. Innovation
7. Innovation

Triple line benefits
Thank you and best wishes for IS in Turkey

• NISP The Pathway to a Low Carbon Sustainable Economy is available for download on the website

• For more information www.nisp.org.uk

• peter.laybourn@nisp.org.uk  tel: +44 (0)121 433 2660

• Any questions?