Improving Resource Efficiency through Industrial Symbiosis: A brief world tour

WCEF
6th June 2019

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Chief Executive

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• ISL’s NISP® methodology
• A focus on European Commission support
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IPCC report (October 2018)

- Only a dozen years for global warming to reach a maximum of 1.5°C.
- Urgent and unprecedented changes are needed.

15 May 2019:
- 29°C near Arctic Circle
- CO₂ over 415 ppm
- First time in human history
Mitigation potential of resource efficiency
International Synergies:
Enabling resource efficiency through industrial symbiosis

Industrial Symbiosis Limited
advancing industrial ecology solutions

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Industrial symbiosis circa 15 years ago

N. America
United States (BPS)

Europe
United Kingdom (facilitated)
Denmark (organic)
Netherlands (facilitated)

Asia
South Korea (top down facilitated)
Industrial symbiosis today (spread of NISP® model)
NISP® methodology

Building the Network

Quick Wins Workshop

‘Outputs Report’ for Implemented Synergies

Opportunity Mapping

Facilitated synergy – Role of practitioners

SYNERGie® Management System

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## NISP® delivered outcomes

### England April 2005 – March 2013

<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>9.4 million tonnes</td>
<td>47 million tonnes</td>
</tr>
<tr>
<td>CO₂ reduction</td>
<td>8.4 million tonnes</td>
<td>42 million tonnes</td>
</tr>
<tr>
<td>Virgin material savings</td>
<td>12 million tonnes</td>
<td>60 million tonnes</td>
</tr>
<tr>
<td>Hazardous waste eliminated</td>
<td>0.4 million tonnes</td>
<td>2.1 million tonnes</td>
</tr>
<tr>
<td>Water savings</td>
<td>15 million tonnes</td>
<td>72 million tonnes</td>
</tr>
<tr>
<td>Cost savings</td>
<td>€243 million</td>
<td>€1.21 billion</td>
</tr>
<tr>
<td>Additional sales</td>
<td>€234 million</td>
<td>€1.17 billion</td>
</tr>
<tr>
<td>Jobs</td>
<td>10,000+</td>
<td></td>
</tr>
<tr>
<td>Private investment</td>
<td>€374 million</td>
<td></td>
</tr>
</tbody>
</table>

€43.4 million investment - *All outputs independently verified

Rate of return for Govt. 9:1

Exchange rate £1 = €1.18
SYNERGie 4.0

The Resource Matching App powering the circular economy

International Synergies
industrial ecology solutions
Key features of SYNERGie®4.0

- AI learning from users and best practice
- Advisor alerts and notifications
- Internal and supply chain KPI reporting
- Synergy matching
- Management system for industrial symbiosis
- Global configuration capabilities
- Integrated mapping of resources
- Secure multi-device web based system
UK recent developments (woken up at last!)

- Smart Waste Tracking (DEFRA, Environment Agency):
  System for Waste Enhancement Evaluation and Tracking (SWEET) using SYNERGie® 4.0 variant

- National Materials Database (ONS, DEFRA, BEIS):
  International Synergies on working group

- Engineering and Physical Sciences Research Council (EPSRC):
  UK Manufacturing Symbiosis Network Plus (UKMSN+)
  International Synergies industry partner
UKMSN+

- Leading universities
- Research partners
- Academic partners
- Industry partners
- Government partners

**Manufacturing shift to the circular economy**

**Manufacturing symbiosis capabilities**

<table>
<thead>
<tr>
<th>Business model innovations</th>
<th>Digital systems innovations</th>
<th>Materials innovations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Implementation of symbiotic restorative manufacturing ecosystems</td>
<td>• IoT, AI and digital services (Apps) applications in manufacturing symbiosis ecosystems</td>
<td>• Development of novel materials with superior adaptability and degradable capacity</td>
</tr>
<tr>
<td>• Design of circular supply chains and distributed manufacturing networks for restorative ecosystems</td>
<td>• Digital information hub for manufacturing symbiosis</td>
<td>• Safety aspects of materials reutilisation</td>
</tr>
<tr>
<td></td>
<td>• Modelling, simulation and digital integrations</td>
<td>• Development of novel materials for additive manufacturing</td>
</tr>
</tbody>
</table>

**Structural innovations**

- Development of logistics and transport capabilities supporting manufacturing symbiosis
- Strategic development of collaborative symbiotic relationships
- Development of regulations and policy frameworks for structural changes
European Commission support for industrial symbiosis

- Roadmap to **Resource Efficient** Europe – exemplar (2011)*
- DG Regions: Connecting **Smart and Sustainable Growth** through Smart Specialisation – exemplar (2012)*
- DG Enterprise: Communique on Green **Entrepreneurship** (2013)
- DG Innovation & Research: Short guide to assessing environmental impacts of **research and innovation policy** (2014)*
- **Circular Economy** Package (2015)
- European **Environment Agency**, Circular economy in Europe (2016)*
- DG Energy **Strategic Energy Technology** Plan (2018)
- And finally in 2018 ... *Citing NISP®
Waste Framework Directive amendments 2018

"Waste management in the [EU] should be improved and transformed into **sustainable material management** ... **promoting the principles of the circular economy** ... in a way that preserves resources and **closes loops**”

"... the Commission should be empowered to adopt implementing acts in order to establish detailed criteria ... **prioritising replicable practices of industrial symbiosis.**“

*Official Journal of the EU L150 Vol 61*
Cooperation Fostering Industrial Symbiosis

TNO, Technopolis, Trinomics, International Synergies, UCL

• **€73 billion** estimated across EU on cost reduction alone

• Public sector supported *facilitated industrial symbiosis is best model* to address market failures

• **No evidence of fully operative commercial facilitation** (of industrial symbiosis) in Europe

• Success of industrial symbiosis initiatives is largely dependent on the *policy environment*
“There is a significant exploitable industrial symbiosis potential for Europe”

“Overall industrial symbiosis is expected to grow significantly. Moving towards a low carbon resource efficient industry and society implies that more industrial symbiosis solutions will be required and implemented”

“There is a lack of common standards or guidelines on the measurement and reporting of symbiotic exchanges, despite initiatives such as NISP®”

* Call for Tender: European Network of Businesses and SMEs for Industrial Symbiosis, 2019 (Remember EUR-ISA November 2013?)
CWA Industrial Symbiosis (Pre-standard)

- Convened Brussels Feb 2018
- 4 European project sponsors
- Participants: industry, practitioners, policy makers, academia
- Chaired by Dr Rachel Lombardi, International Synergies Limited
- Launched by Dr Janez Potočnik
- Published December 2018
European VET call on industrial symbiosis

- EU Programme: ERASMUS+ “New Skills Agenda”
- Sector Skills Alliances for implementing a new strategic approach (“Blueprint”) to sectoral cooperation on skills
- Focus on cross-sectoral industrial symbiosis (IS) and energy efficiency
- €4 million over 4 years
**EARLY OUTCOMES**

- $6.3M economic benefit
- 24,000 t CO$_{2e}$ saved
- 250,000 t waste diverted

**PHASE 1**

- ~ 18 months
- ~ 5.8 FTE people power
- $1M from eight funders

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North of Israel
NISP Project

• Small-medium Industrial areas
• Agricultural Industries
• 2,100 Factories
• 75,000 employees
• 4,500 square kilometer
• 1.4M residents

• Launch March 2019
• 75 sites
• 550 resources
• 15 synergies in progress
• 1 synergy completed
“After the success in Britain (NISP), the Ministry of Economy will try to save 200 million new Israeli shekels a year, using industrial waste recycling”
On 13th May, 37 companies from the Northern Region participated in the first NISP4ISrael Hackaton. The aim was to connect the participants to identify beneficial, commercial opportunities for their underutilised resources. Over 190 resources were discussed and 236 potential matches were captured! This workshop provided a basis for attendees to interact, and resulted in the identification of a series of innovative partnerships between businesses.
WISP
Western Cape Industrial Symbiosis Programme
Delivered by GreenCape
WISP in a Nutshell:

Funded by

Delivered through

In collaboration with
What has WISP Achieved:

**Key Performance Indicator** | **To Date** (03 June 2019)
--- | ---
Waste Diversion | > 69,000 tonnes
Additional Revenue | $ 2.5 million
Cost Savings | $ 1.8 million
Private Investment | $ 0.61 million
Fossil GHG Savings | 152,000 tonnes CO$_2$e
Job Creation | 29 temporary
25 permanent
1526 economy-wide jobs

>650 Companies in the Network
>5000 Under-utilised Resources Identified
Industrial Symbiosis

Improving productivity through efficient resource management

investni.com/industrialsymbiosis
Resources as efficiency tools

**Economic value**
- Generated additional Sales: £16.4 million
- Delivered cost savings: £25.7 million
- Created & saved: 103 jobs

**Environmental value**
- Landfill Diversion: 397k tonnes
- CO₂ Emissions Reduction: 352k tonnes
- Added value to 1700+ businesses

Industrial Symbiosis
Improving productivity through efficient resource management
Model for Turkey: Planning nationally (May 2019)

Governance:

- **Government owner**: Ministry of Industry and Technology (MoIT)
- **National Coordinating Body**
- **National Innovation Partner**
- **Delivery teams**
  - Region 1
  - Region 2
  - Region 3
  - Region 4
  - Region N

Support:

- **Database and management tool**
- **Regional/Local Programme Advisory Groups (PAGs)**
SHAREBOX validated impacts (majority SMEs in Turkey)

<table>
<thead>
<tr>
<th>Metric</th>
<th>Project Target</th>
<th>Delivered impact (project life)</th>
<th>Delivered Vs Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste avoided (tonnes)</td>
<td>500,000</td>
<td>515,500</td>
<td>+3%</td>
</tr>
<tr>
<td>Virgin resources saved (tonnes)</td>
<td>750,000</td>
<td>635,500</td>
<td>-15%</td>
</tr>
<tr>
<td>CO$_2$ saved (tonnes)</td>
<td>500,000</td>
<td>1.38 million</td>
<td>+176%</td>
</tr>
<tr>
<td>Additional sales (€)</td>
<td>3 million</td>
<td>53.85 million</td>
<td>+1,667%</td>
</tr>
<tr>
<td>Cost savings (€)</td>
<td>3 million</td>
<td>14.12 million</td>
<td>+366%</td>
</tr>
<tr>
<td>Jobs created or safeguarded</td>
<td>20</td>
<td>74</td>
<td>+270%</td>
</tr>
<tr>
<td>Private investment (€)</td>
<td>No Target</td>
<td>4.45 million</td>
<td>+4.45 million</td>
</tr>
</tbody>
</table>
Success factors addressing market failures

✓ Full-time practitioners with industrial experience
✓ Engagement model (all sizes, all sectors)
✓ Holistic – resources, energy, capacity, expertise, logistics, water etc.
✓ Data and ICT (SYNERGie®4.0)
✓ Sustained investment

Market failures
Time poverty of SMEs
Informational
Lack of pricing for externalities
What can go wrong/barriers

- Some funds not ideal for IS activity
- Short term investments/treating as a pilot
- Too much emphasis on feasibility studies
- Delivery teams with inadequate skills/training
- Over reliance on workshops and ICT tools (no magic formula!)
- Lack of supportive policy framework
- Focus on SMEs alone (large companies have an important role to play)
- Market failures
- Emphasis on self-sustaining programmes
The future

Reactive/demand-led model – still enormous opportunities

Pro-active/planning model – strategic applications are growing

Both of above making more use of AI, BIG Data

Increasingly explicit in policy (e.g. EU, Israel, Turkey etc.)

Sustainability ... we choose what is sustainable!

Don’t mend what isn’t broken!
Thank you for listening

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