

# Industrial Symbiosis Faenza - ITALY

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**International Synergies**  
industrial ecology solutions

# Presentation Agenda

1. International Synergies Limited
2. What is Symbiosis and Industrial Symbiosis
3. Model of Delivery
4. NISP Achievements (UK)
5. Case Studies
6. Economic Regional Development
7. Recent European Policy Activity
8. How Far We have Come

# 1. International Synergies Limited

## Company Mission

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**“International Synergies strives to lead the world in innovative industrial ecology solutions for a low carbon, sustainable economy.”**

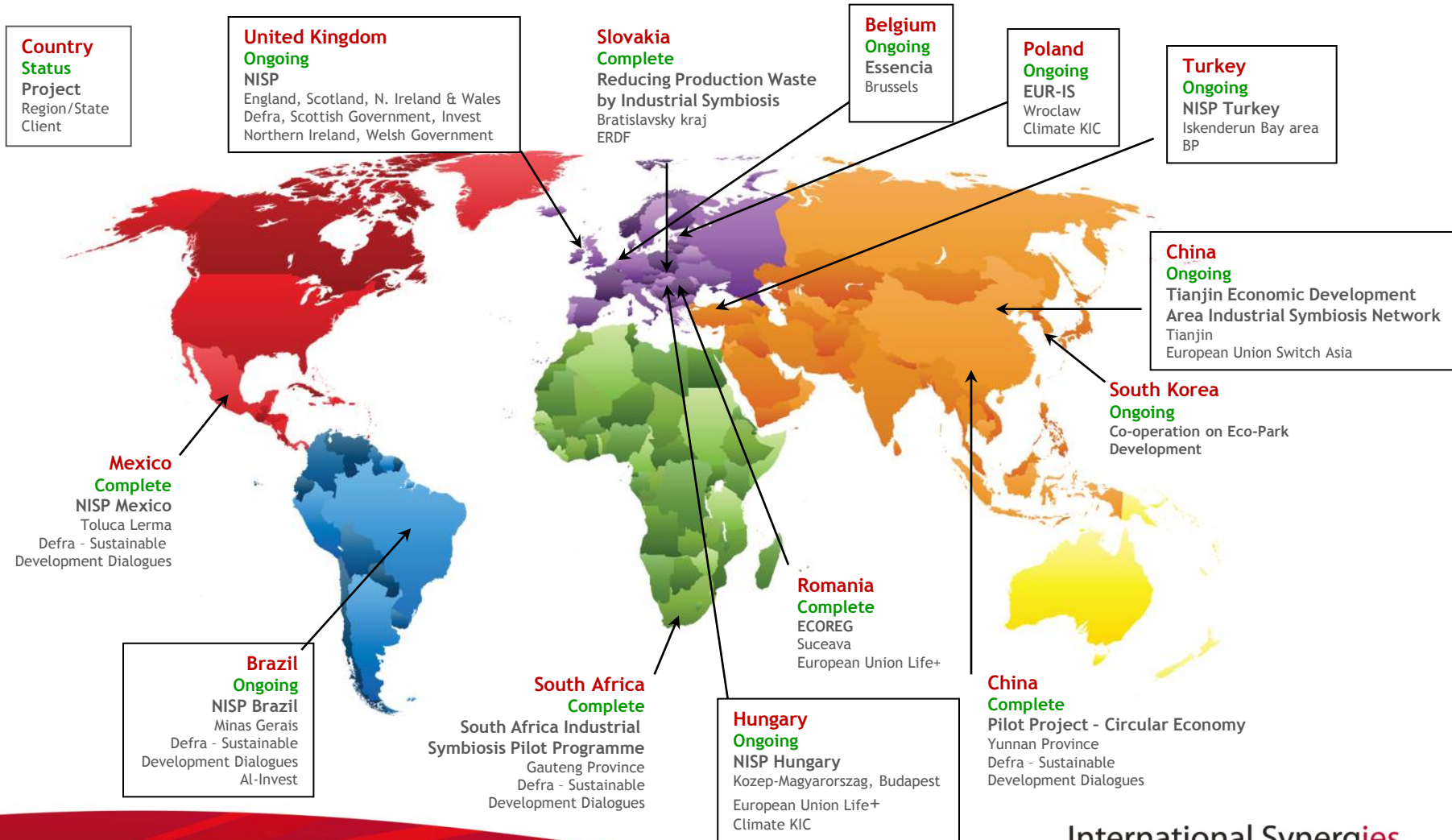
# International Synergies Limited

- Founded in 2005
- Offices in Birmingham, Brussels and Belfast
- 30 direct employees + 20 sub-contract
- Working across five continents
- ISO14000 and ISO9000 accredited

# Evolution of NISP

- 1999: Learned about US-Business Council for Sustainable Development programme (Gulf of Mexico)
- 2003: Started as 2 Regional and 1 Sub-regional programmes
- 2005: Launched as a national programme
- 2008 - present: methodology transferred to 5 continents

# Our International Programmes



## 2. What is Symbiosis and Industrial Symbiosis



# Definition of the term Symbiosis

‘An interaction between two different organisms to the advantage of both’

**Concise Oxford  
Dictionary, 8th Edition**



# What is Industrial Symbiosis?

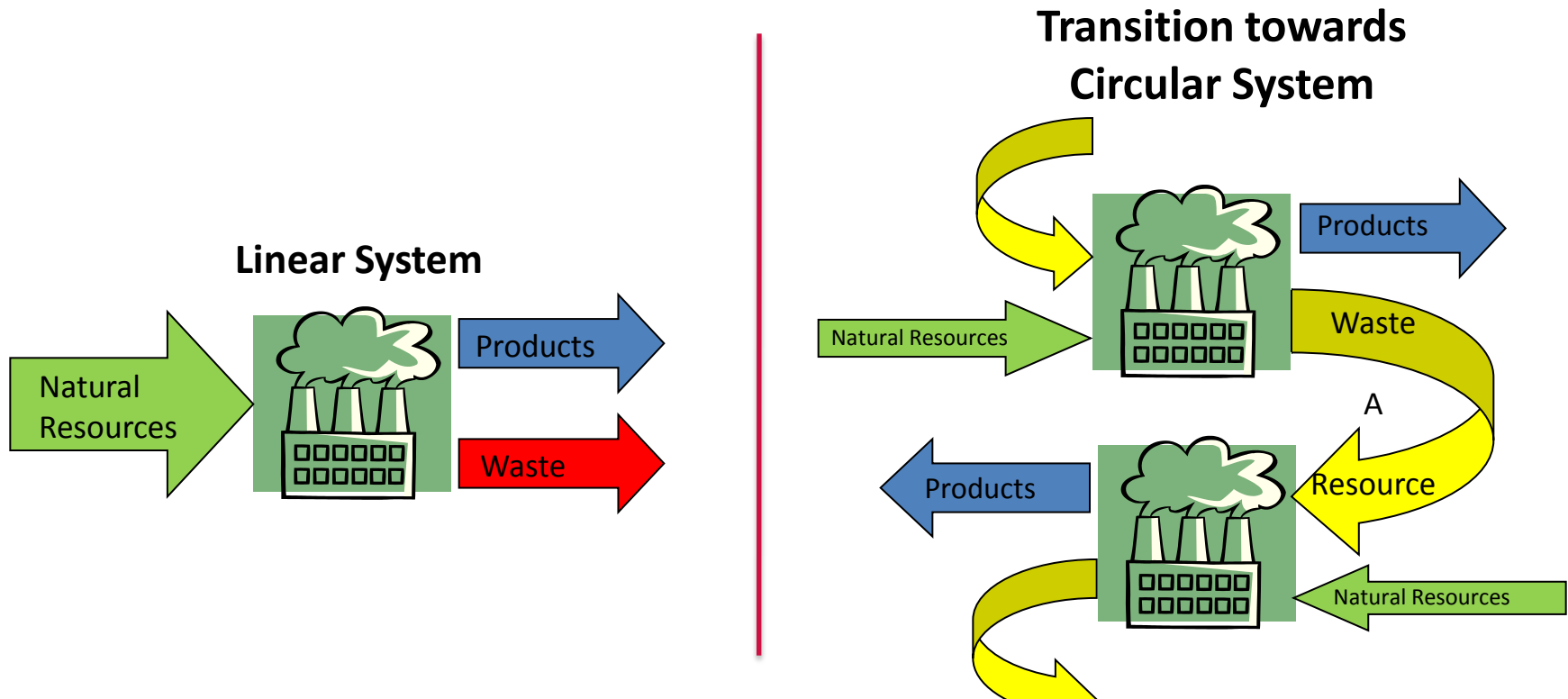
- Numerous academic definitions...

## **In essence:**

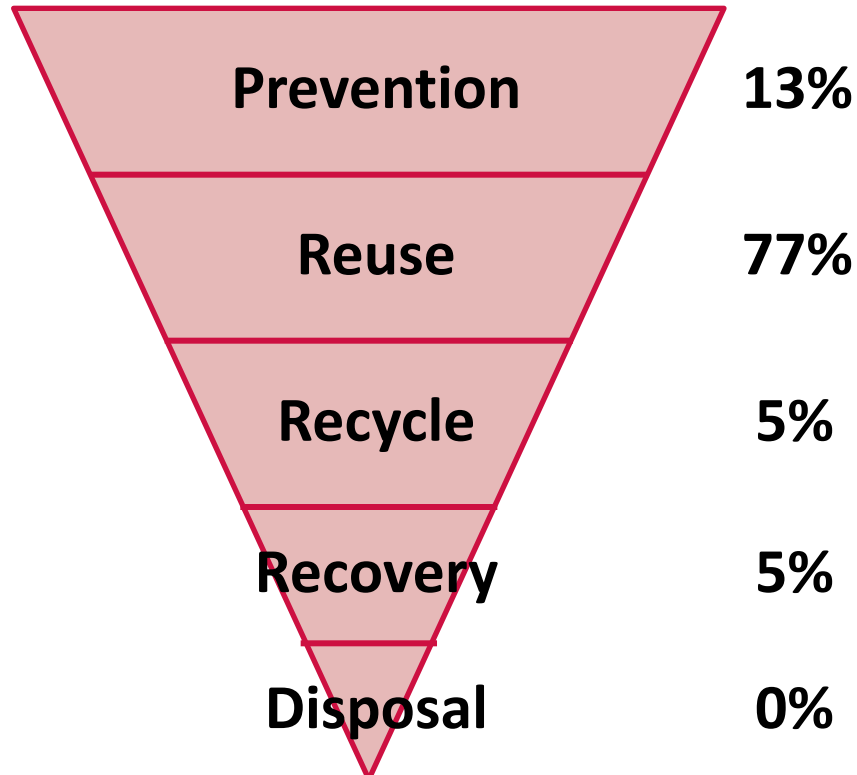
- Industrial symbiosis is a systems approach to a more sustainable and integrated industrial economy that identifies business opportunities to improve resource utilisation (materials, energy, water, capacity, expertise, assets etc)

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

# Industrial Systems: Linear v Circular



# Working at Top Levels of Waste Hierarchy



**NISP achieves 90% of its benefits at the top two levels of the waste hierarchy**

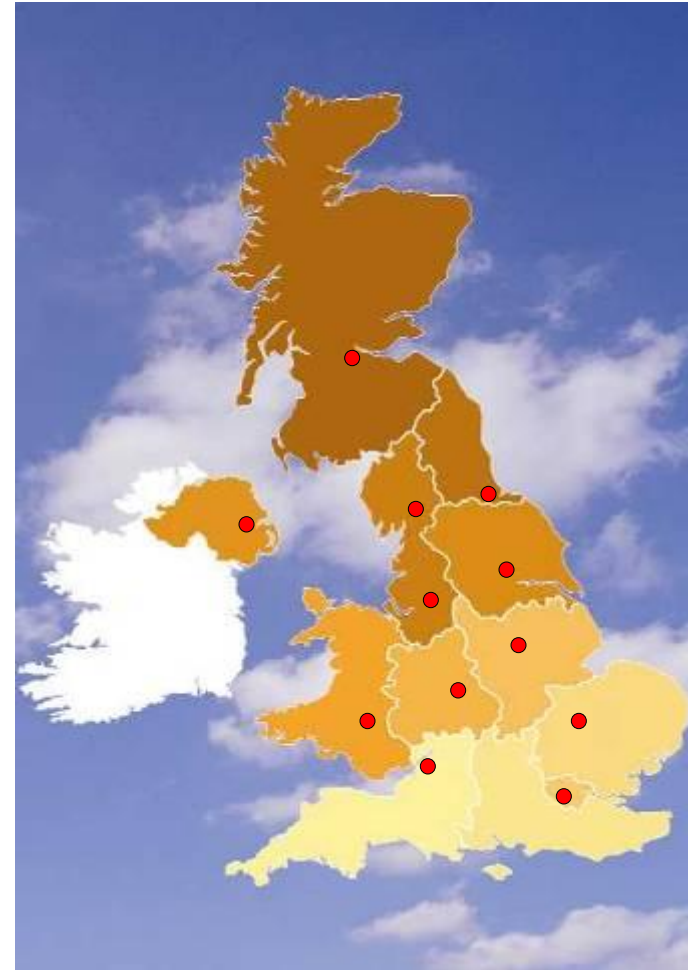
# Industrial Symbiosis is...

- **Good for business**
- **Good for the economy**
- **Good for the environment**
- **No risk**

## 3. Model of Delivery

## Organisation: Regionally Delivered, Nationally Co-ordinated

- Began as three regional pilots in 2002/3 and went UK national in 2005
- World's first National Industrial Symbiosis Programme
- Regional practitioner teams across the UK
- Investment from UK and regional government (now in transition to a commercial model)
- Business-led Programme Advisory Groups (PAGs)
- Substantial benefits of a national model



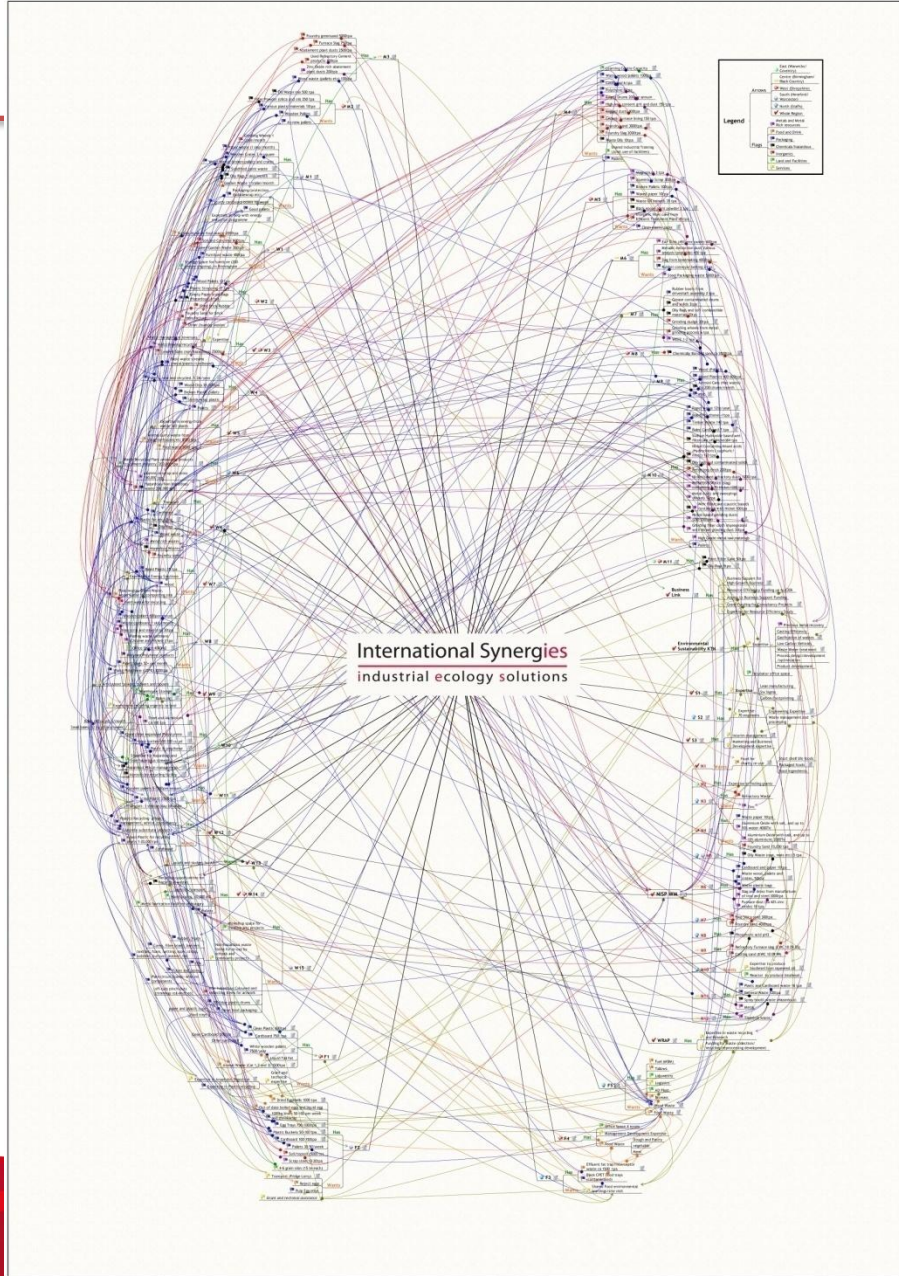
# Workshops

- Facilitating the exchange of information and best practice between businesses
- Tried and tested, interactive business opportunity model
- Typically 50 - 60 organisations in one room
- Can generate 300+ potential synergies from a facilitated ½ day session





# Opportunity Mapping



# 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 practitioners
- Used in nine countries

The screenshot displays the SYNERGie Management System interface. At the top, there is a navigation bar with the SYNERGie logo, a search bar, and a 'Quick Links' dropdown menu. The main content area is divided into four sections:

- My Actions:** A table listing actions with columns for Action ID, Status, Due Date, and Action Against.
 

Action ID	Status	Due Date	Action Against
73	Overdue	15/09/2010 09:00	Lawson Dennis
75	Overdue	19/11/2010 08:00	test match 73
111	Overdue	29/04/2011 09:00	Wessex Water - AD R
121	Overdue	07/07/2011 09:00	Marvel sand - Production
- Synergies In Progress:** A table listing synergies with columns for Synergy ID, Name, and Stage.
 

Synergy ID	Name	Stage
106	Wessex Water - AD R Us - Sewage Sludge	Discussion
74	test synerg 74	Idea
73	test match 73	Discussion
71	Severn Trent - ASA - Test resource	Idea
70	Sureclean - Grays composting - sewage sludge	Idea
- Notifications:** A table listing notifications with columns for Resource Name, Synergy ID, Resource Status, and Delete.
 

Resource Name	Synergy ID	Resource Status	Delete
aggregate	68	Decrease	[Delete]
Organic Waste	106	Decrease	[Delete]
food	105	Decrease	[Delete]
compost	73	Decrease	[Delete]
- Completed Synergies:** A table listing completed synergies with columns for Synergy ID, Name, and Completion Date.
 

Synergy ID	Name	Completion Date
167	China Woodcock - China Marvel - Test resource	13/08/2011
155	Marvel - Aggregate Us - Sand	08/07/2011
126	Marvel sand - Aggregates & Us - Foundry sand	06/07/2011
105	Monika's food synerg	28/04/2011

# Facilitated Synergies: 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

# Outputs Reports for Synergies

- Summarises 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 also 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

# Testimonials

*“Being part of a network like NISP means that we’re able to tap into some of the UK’s best expertise on reducing business waste by **incorporating the principles of industrial symbiosis into all aspects of the company’s commercial activity**. I would urge other companies from any sector to get in touch with NISP and make use of its **extensive expertise and knowledge** in improving resource effectiveness.”*

**Richard Laxton, Work and Environment Compliance Adviser**

**Arla Foods**

*“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**

## 4. NISP Achievements

## NISP (England) Delivered Outcomes: April 2005 - March 2012

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

€40 million investment since 2005

\*all outputs independently verified

Rate Euro £1 = €1.18



# Manchester Economics Report: Economic Impact Assessment (2005 - 10)

- 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**

## 5. Case Studies

# 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
- CO<sub>2</sub> reduced by 12,500 tonnes pa
- Successful re-use of waste heat
- €17 million private investment in region



## Industrial Symbiosis Transforms Individual Businesses: John Pointon & Sons Ltd

### 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!)



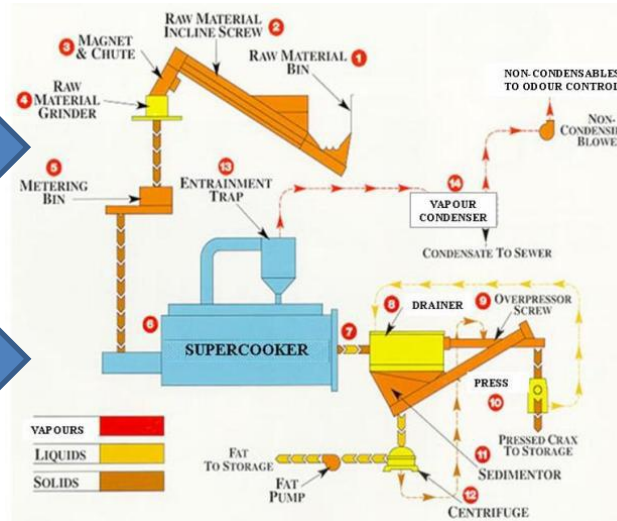
# Transforming John Pointon & Sons Ltd

## 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

Energy efficient pumps

Tallow engines

# Recognition for Eco-Innovation

ORGANISATION  
FOR ECONOMIC  
CO-OPERATION  
AND DEVELOPMENT



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**)

## 6. Economic Regional Development Applications for NISP

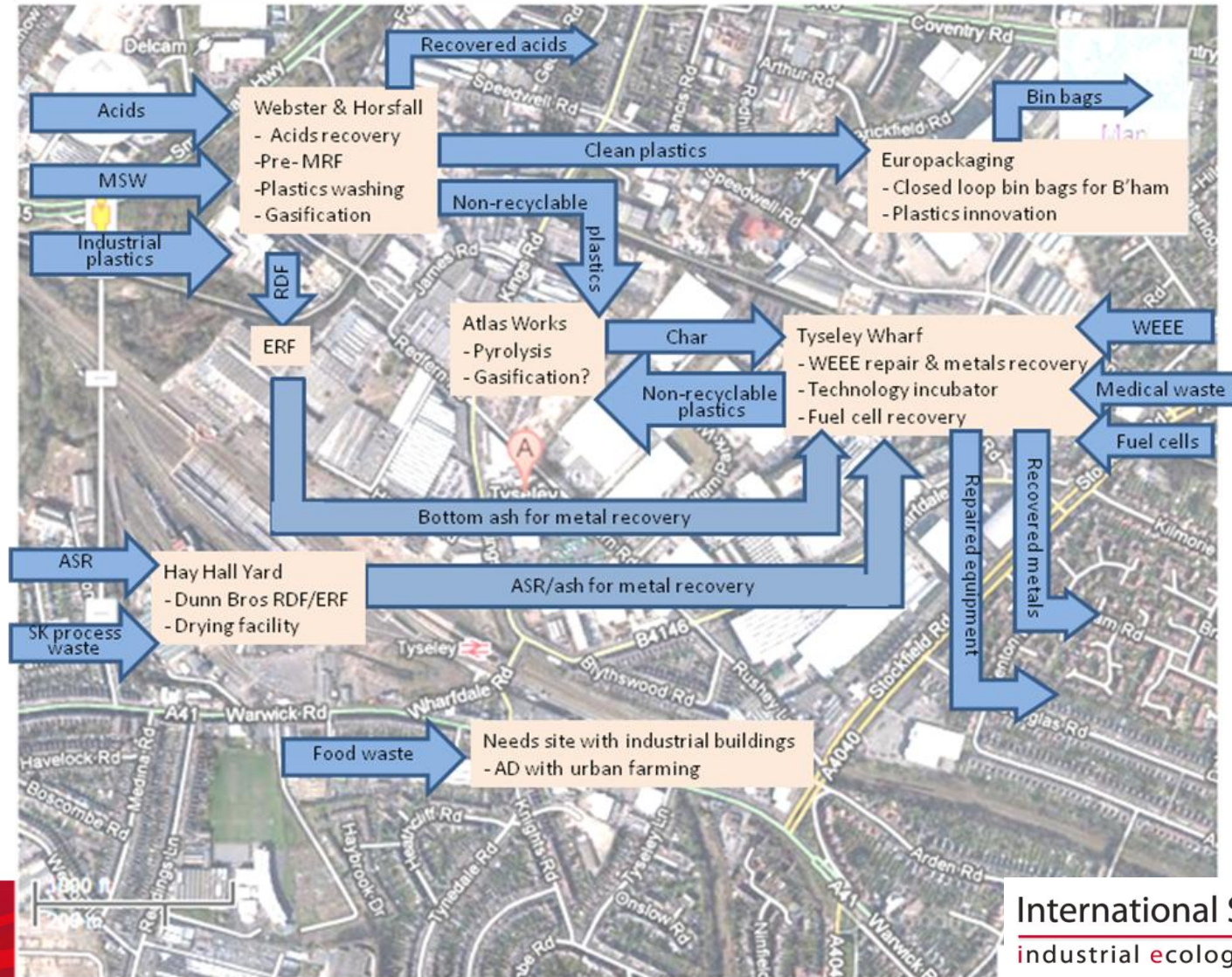


## Low Carbon Regional Economic Development 2011: Birmingham Big City Plan

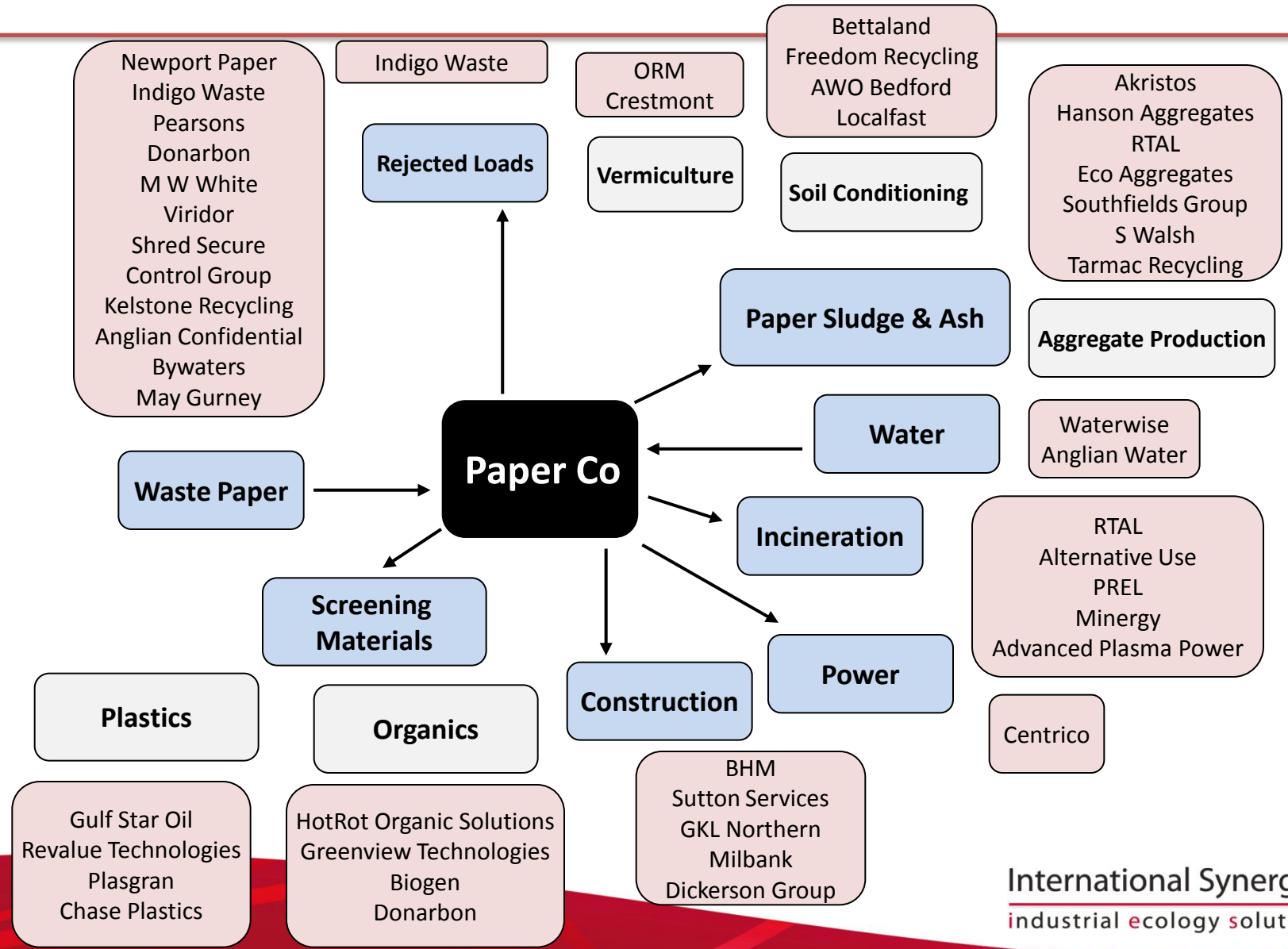
- Tyseley Environmental Enterprise Zone (TEEZ) - Framework for Action (May 2011)
- **Birmingham's Priorities for Tyseley:**  
“Support businesses and organisations to capitalise on low carbon opportunities and **maximise industrial symbiosis**”
- International Synergies Limited have been commissioned to produce report (completed October 2012)



# Economic Development: Closing Local Loops, Creating Jobs



# Inward Investment



## 7. Recent European Policy Activity

## Recent European Policy

- Best Practice under the European Waste Framework Directive (2009)
- 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)

## Underpinning Evidence: COWI Report (2011)

- 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 launched recently included 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)

## 8. How Far We Have Come



# 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

**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**

- H-udder-sfield
- Jersey
- H-erdington
- Milk-maidenhead
- Horn-church
- Curd-worth
- Whey-mouth
- Cowes
- M-ilkley moor
- Cow-den-beef

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.

Called 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-dwindling tips in lands every year.

charlotte.w

## 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 grower, has expanded his business partly because of a working relationship with Terra Nitrogen, which produces nitrogen products that can be turned into nitrogen fertilizer. The

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 to discover how their waste, energy and by-products can be turned into valuable resources and sold

which 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, 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.

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. After working with NISP, the company found that its

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 finished products – 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 treat-

ment is an issue, there are entrepreneurs and solution providers 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.

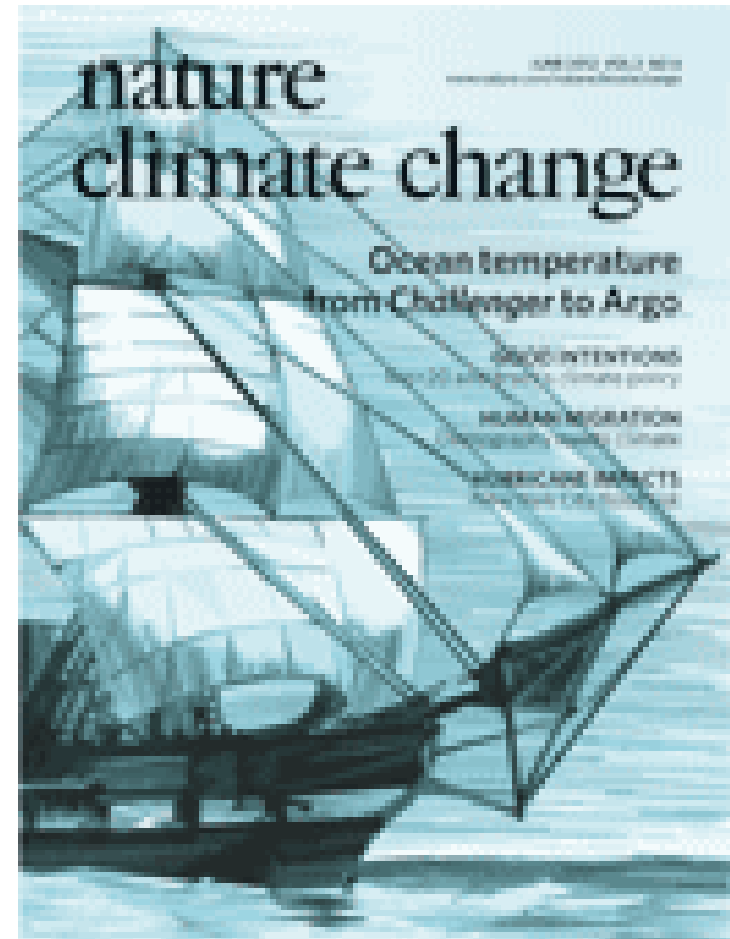
"The transaction costs of carbon reduction commitments are incredibly high," says Mr Laybourn. "The monitoring, audits, registration and trading all add costs. This has virtually no transaction costs. It need international markets or trading systems, and we can

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

## 2012: Nature Climate Change

**Assessing industrial  
symbiosis' contribution to  
climate change mitigation  
and energy security**



# 2012: Energy Delta Institute



ENERGY DELTA INSTITUTE



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## *EDI Quarterly*

*Volume 4, No. 3, October 2012*

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### **Editor's Note**

*by Jacob Huber*

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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 2<sup>nd</sup> 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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