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Facilitated Industrial Symbiosis

A Pillar for UK Industrial Strategy

RRfW Annual Conference

Leeds 1-2 December 2016

Peter Laybourn
Chief Executive
International Synergies Limited

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1. General update on industrial symbiosis
2. Reminder of past performance & future potential
3. Sir Mark Walport Annual Report (2017)
4. Rationale behind industrial symbiosis supporting an Industrial Strategy

Our vision

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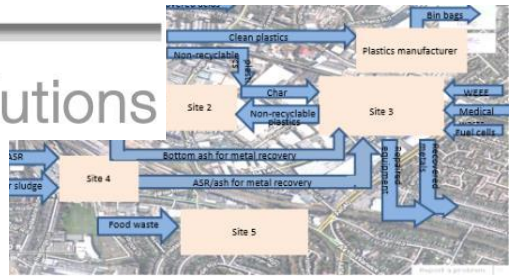
"Striving to lead the world in innovative industrial ecology solutions for a low carbon, sustainable economy"

NISP®
NATIONAL INDUSTRIAL SYMBIOSIS PROGRAMME

SYNERGie®

Industrial Symbiosis Limited

advancing industrial ecology solutions



| Industrial symbiosis: connecting industry, creating opportunity

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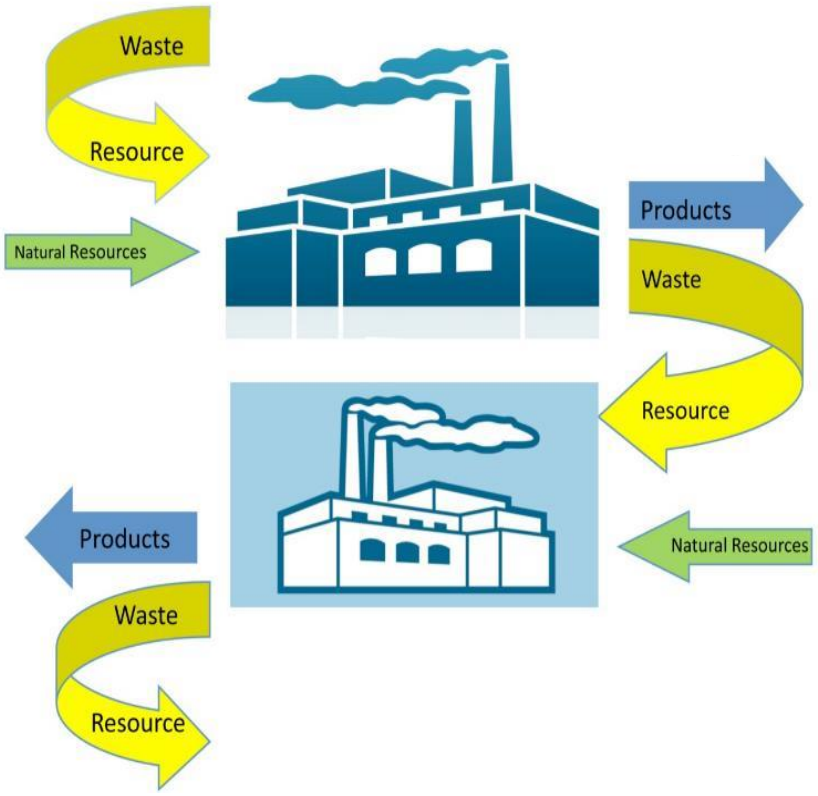
- Network of diverse organisations for **cross-sector business** opportunities
- All **resources** (materials, capacity, expertise & energy)
- Impact through **profitable transactions** (inputs, outputs, processes)



Lombardi & Laybourn, 2012, Journal of Industrial Ecology 16(1):28-37

| Industrial symbiosis delivers

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- Resource efficiency
- Demand-led innovation
- SME engagement
- Landfill diversion
- Water savings
- Carbon emissions reduction
- Virgin material savings
- Jobs
- Cascading of best practice
- Increased sales & reduced costs
- Profits leading to tax revenues

Driving factors

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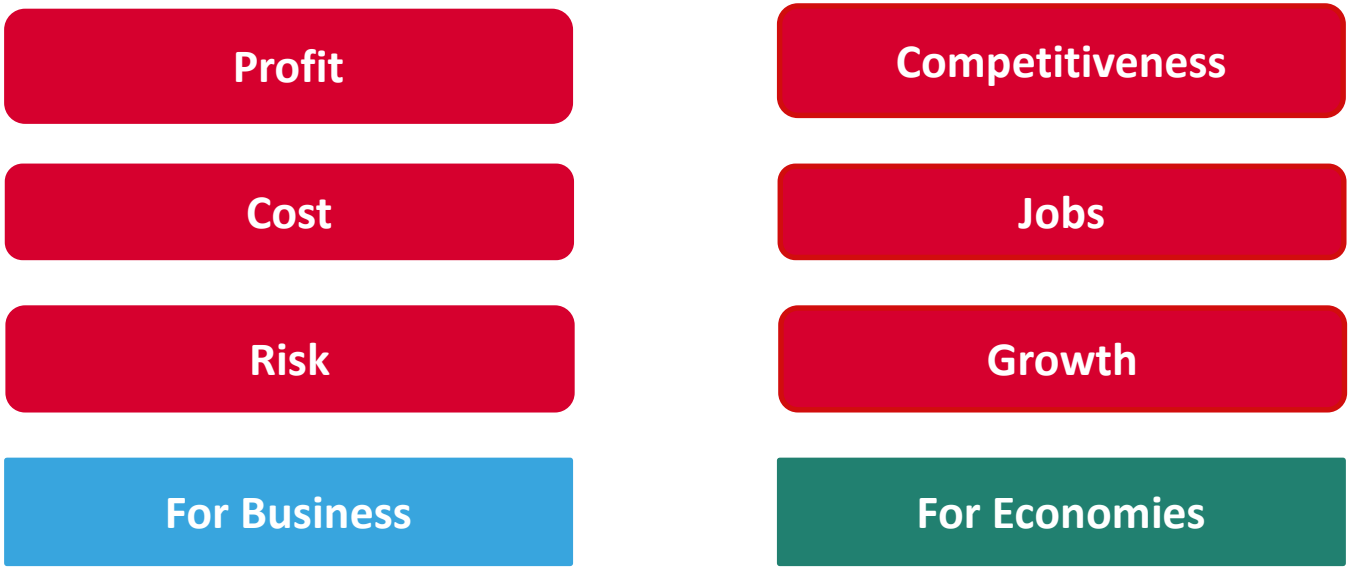

| Our global experience

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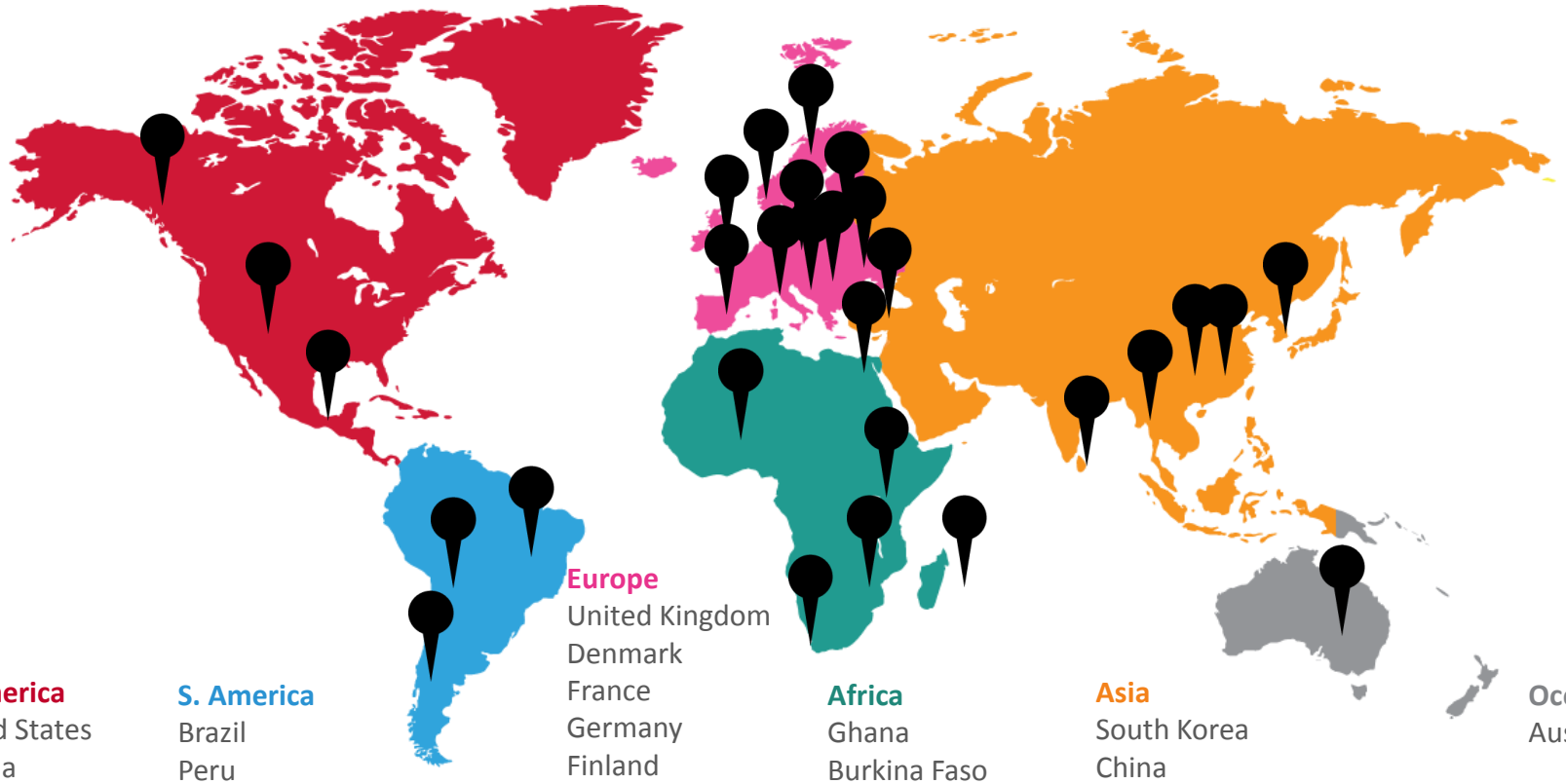

N. America
United States
Canada
Mexico

S. America
Brazil
Peru
Chile

Europe
United Kingdom
Denmark
France
Germany
Finland
Netherlands
Poland
Slovakia
Belgium
Romania
Hungary
Italy
Spain

Africa
Ghana
Burkina Faso
Mauritius
Kenya
Uganda
South Africa
Egypt

Asia
South Korea
China
Sri Lanka
Turkey

Oceana
Australia

Interreg Europe
European Union | European Regional Development Fund

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Workshop in Bretagne, Quimper March 2016

Programme National de Synergies Inter-Exchanges (PNSI)

WISP
Western Cape Industrial Symbiosis Programme

Business Opportunity Workshop
River Club, 28 September 2016

This is a summary of the Business Opportunity Workshop that took place on Wednesday, 28 September 2016 in which **44 companies** were represented. Delegates identified new business opportunities from under-utilised resources through the application of industrial symbiosis (IS) principles. A total of **257 resources** were discussed on the day and **1025 potential synergies** identified.

First, and foremost, WISP would like to thank all the delegates who participated in this successful workshop. WISP would also like to thank the following speakers: Anzel Venter (WCG: DEADT), Eddie Hanekom (WCG: DEADP), Lauren Basson (GreenCape), Khanyiselo Kumalo (GreenCape) and Andre Page (National Cleaner Production Centre). Special thanks to Liesel Olivier from AgriProtein for sharing how WISP has assisted them growing their business, and in so doing, facilitating the idea of IS.

Who Was There:

7 Seas Plating	Groceries Unlimited	Rubble Cycle
AgriProtein	Jaigh Outsourcing	Select a Fish
Alnet	Jinko Solar	Snoek Wholesalers
Blue Planet Energy	Kimberly Clark SA	Stuttafords
BM Foods	Nampak: Bevcan	Syntell
CCS Logistics	National Glass	Tafelberg Furnishers
Checkers	New Horizons Energy	Tellumat
Combo Timbers	NGK Ceramics	Tramco
Coricraft	Peninsula Beverage Plain	UCT
CSK Material	Fin	Victory Fine Foods
Deli Spices	Plastoil	WastePlan
Distell (Epping)	Polyplank	ZTL Organics
Evedently Green	Reclite	Shereton
Forest Creations	Recycle 1st	Shredmaster
Fruit & Veg City	Romatex	

"IS is possibly one of the most underrated areas for the growth of SME's and job creation"
– Desmond Deary (ComboTimbers)

"An eye opener as to how other's waste / by-products can be utilised by other companies"
– John Metcalfe (National Glass Distribution)

What Did You Think WISP Could Achieve?

Boost Sales:	3.3 / 5
Reduce Costs:	4.4 / 5
Stimulate Innovation:	4.0 / 5
Promote Learning:	4.7 / 5
Reduce the Use of Virgin Material	3.6 / 5
Reduce Green House Gas Emissions	3.7 / 5

What You Thought About the WISP Workshop?

Meeting Your Expectations:	4.5 / 5
Networking Opportunities:	4,5 / 5

What NEXT:

wisp@green-cape.co.za ☎ 021 811 0250

1. Check your matches
2. Start discussions to progress matches
3. Contact WISP for support
4. Keep in touch about progress
5. WISP will also be in touch to see how it's going

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Thousands of case studies (synergies)

| Defining local: Market determines value

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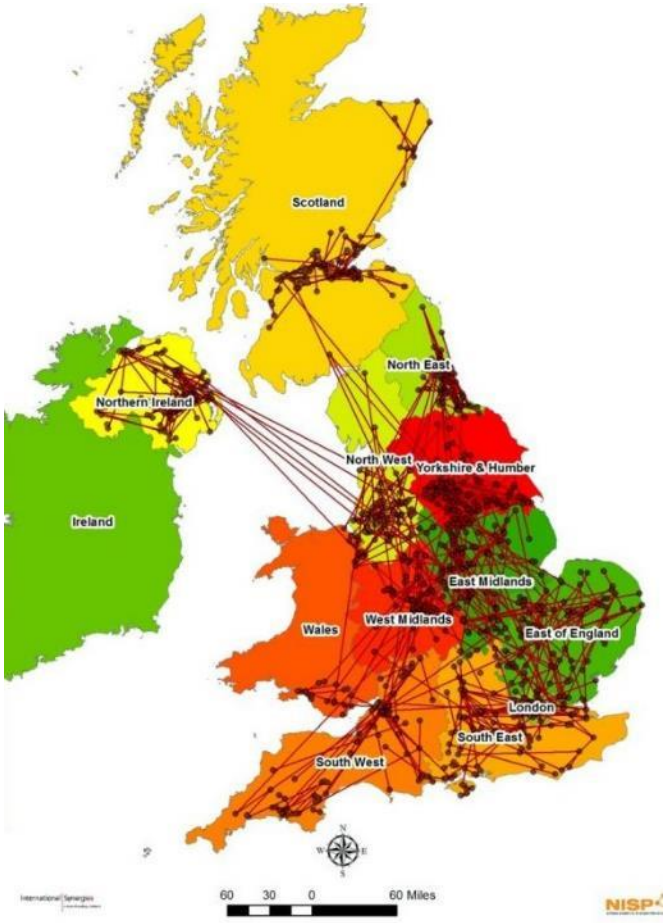
Half of synergies completed within 21 mile radius

One-quarter of synergies involved distances greater than 40 miles radius



Jensen et al (2011) Resources, Conservation and Recycling 55:703-712

England April 2005 – March 2013

METRICS	In Year Benefits*	Lifetime Impact (Max 5 year)
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	60 million tonnes
Hazardous waste eliminated	0.4 million tonnes	2.1 million tonnes
Water savings	15 million tonnes	72 million tonnes
Cost savings	€243 million	€1.21 billion
Additional sales	€234 million	€1.17 billion
Jobs	10,000+	
Private investment	€374 million	

€43.4 million investment - *All outputs independently verified
Rate of return for Govt. 9:1
Exchange rate £1 = €1.18

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NISP® (England) Economic Impact Assessment

Total investment over **5** years	£27 million
Total Economic Value Added	£1.5 - £2.5 billion
Direct receipts to Government	£148 - £247 million
Benefit Cost Ratio	32:1 to 53 :1

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 £27,650,000 between April 2005 and March 2010 and relate to outputs generated in England only.

NISP Economic Valuation Report
Manchester Economics (2009)

- European Waste Framework Directive (2009)*
- 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)
- European Resource Efficiency Platform – key recommendation (2014)
- DG Innovation & Research: Short guide to assessing environmental impacts of research and innovation policy (2014)*
- Circular Economy Package (2015)
- EEA, Circular economy in Europe (2016)*
- SPIRE 13 (replication), DG GROW (estimate of market/platforms)

*Citing NISP

Adding value to global agendas

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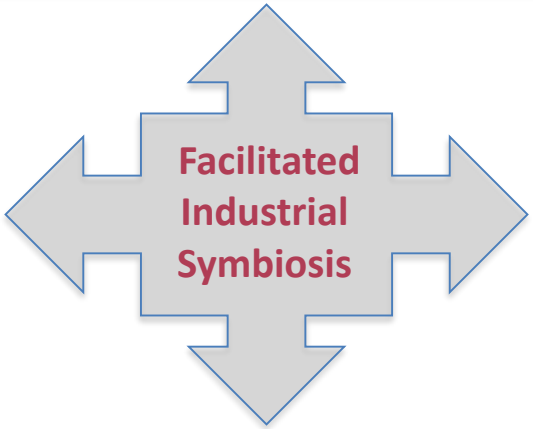
Resource Efficiency

G7 Alliance for Resource Efficiency
European Resource Efficiency Programme
Roadmap to a Resource Efficient Europe
Manufacturing Commission
COWI Report

Circular Economy

Circular Economy Package,
Accenture, UNIDO,
The Circulars,
Globe Scan 2015,
FP7 POLFREE & DYNAMIX, EEA



Climate Change

UK FCO
Financial Times
Natures Climate
Turkey INDC

Green Growth

Global Green Growth Forum
Global Green Bus. Summit
GLOBE Series
DG Regions & DG GROW
Technopolis Report

UN Sustainable Development Goals (UNEP)

Decent Work & Economic Growth (8)
Industry Innovation & Infrastructure (9)
Sustainable cities (11)
Responsible Cons'n,Prod'n (12)
Climate Action (13)
Partnerships (17)

Eco-innovation

UNEP, WWF,
OECD, ETAP,
DG Innovation,
Worldwatch Institute

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G7 GERMANY

2015 | G7 Alliance for Resource Efficiency

Industrial symbiosis: circular economy in action

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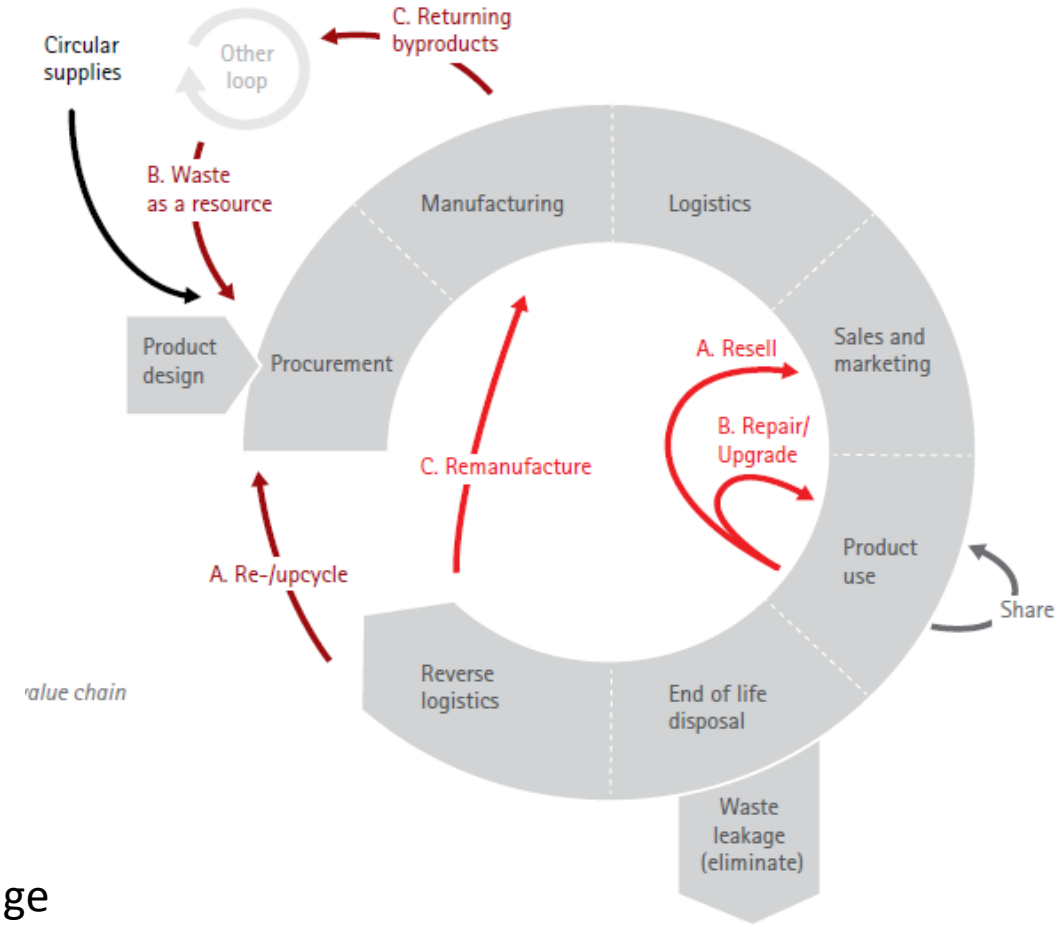
- Circular supplies
- Resource recovery
- Product life extension
- Sharing platforms
- Product as a service



Accenture 2014, Circular Advantage

- Circular Advantage, Accenture (2014)
- Globescan 2015 **www.govsgocircular.com**
  - 30 circular economy best practice examples for governments (two are industrial symbiosis)
  - report co-authored by Accenture, De Groene Zaak, EY, IMSA and Royal Haskoning DHV
- FP7 POLFREE & DYNAMIX 2015 (Top 10 proposals)
- Industrial Evolution, Manufacturing Commission (2015)
- Circular economy in Europe – Developing the Knowledge Base, European Environment Agency (2016)

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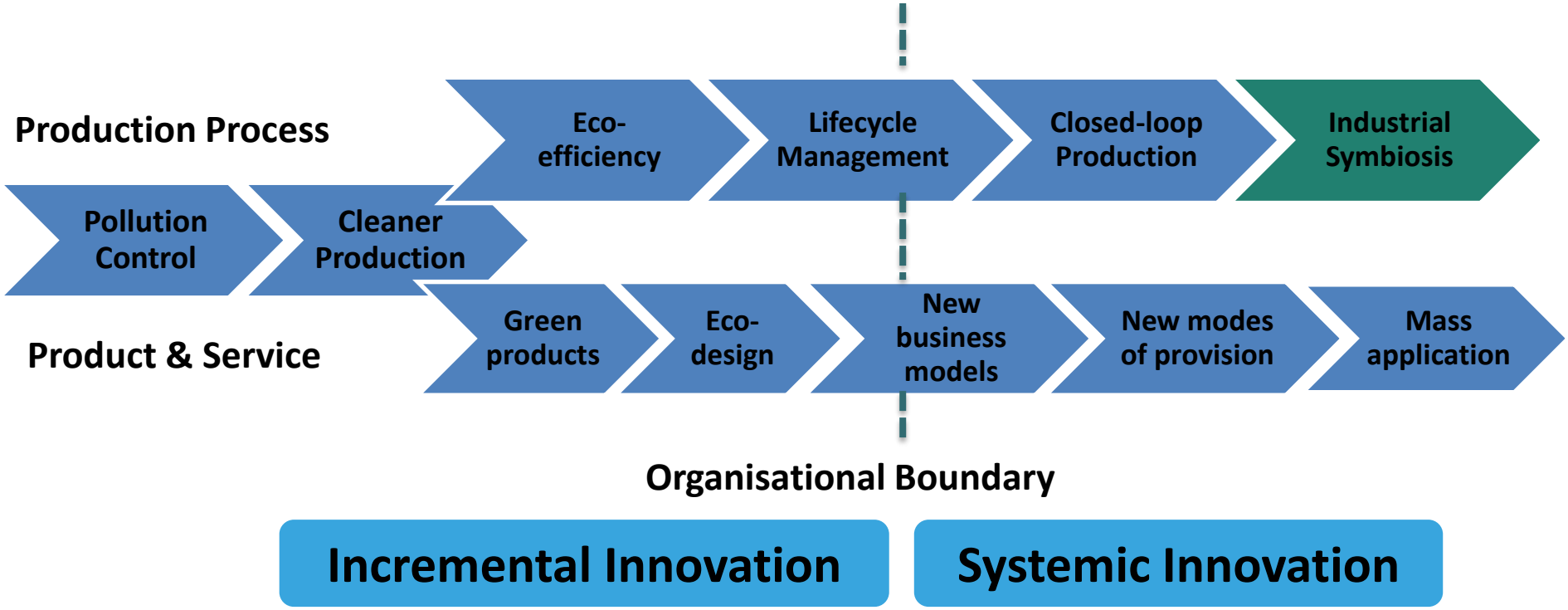
OECD declared industrial symbiosis ‘a la NISP’ to be an ‘excellent example of systemic innovation vital for green growth’



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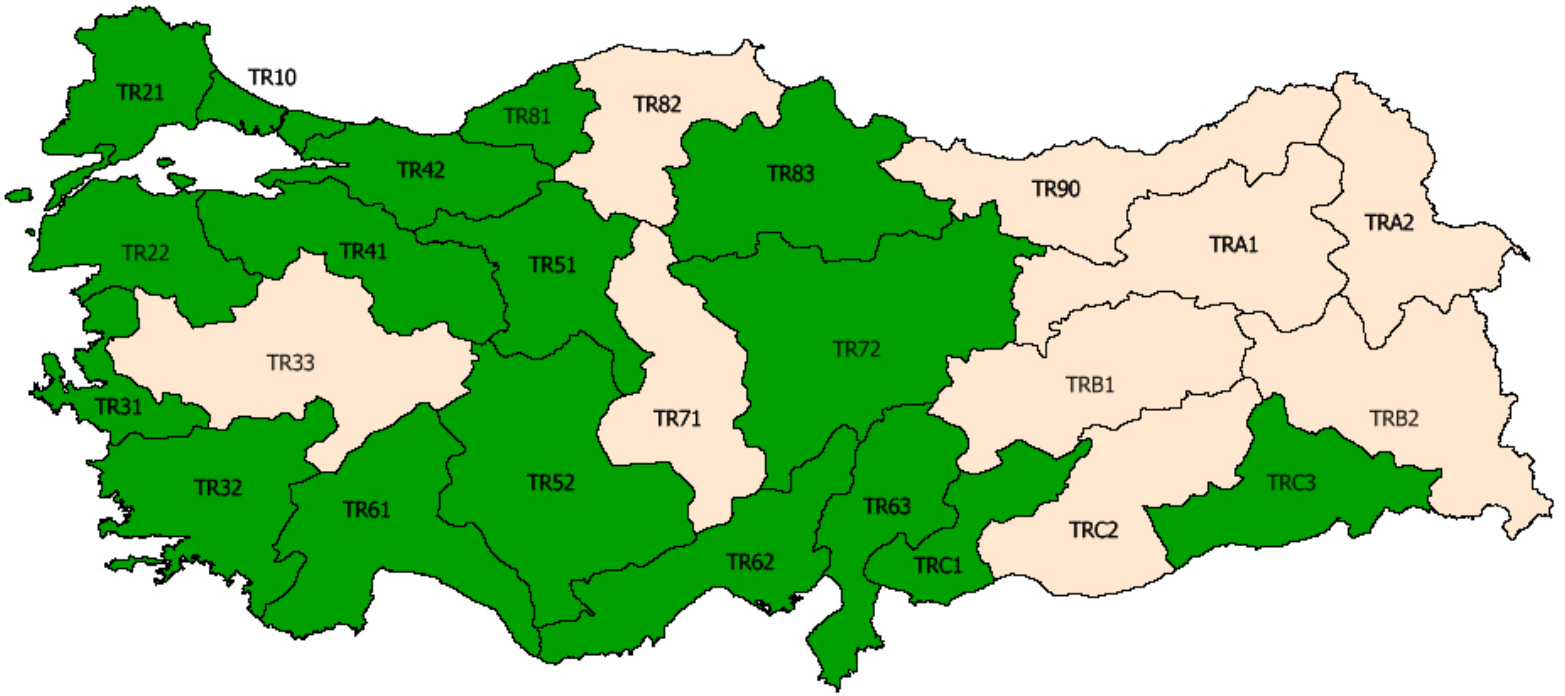
Regions with industrial symbiosis specific initiatives and strategies



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- Planning and regeneration
- Inward investment
- Construction & utilities (MI-ROG)
- Knowledge transfer
- Post-disaster/post-conflict situations (e.g. Lebanon)
- ASPIRATION – government direct involvement e.g. health, transport, municipalities
- Problem solving

Urban symbiosis: Opportunities built on existing assets

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Today Synergies

- Potential material, water and energy synergies
- Application of existing project funds
- Opportunities to engage with community

Tomorrow Inward Investment

- Opportunities for green growth and inward investment
- Businesses to benefit from technology transfer
- 'Catalyst' developments (key opportunity sites)
- Align with regional capacity gaps

Future Innovation

- Innovation potential for new business creation
- More opportunities for green growth and investment
- Resource recovery hub leading to EIP

Establish vision for target area building on existing technologies, skills, resources

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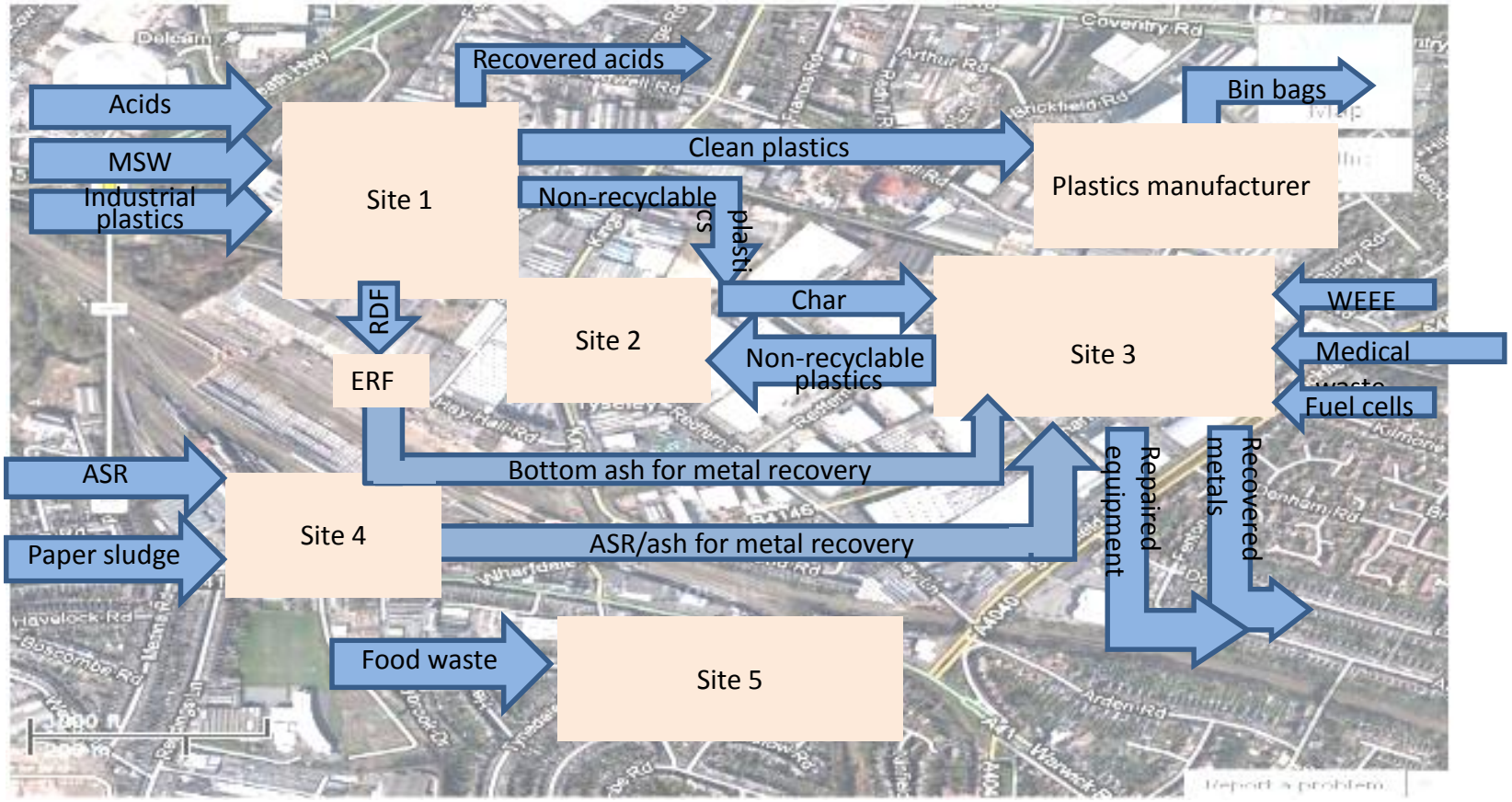
Economic development and regeneration in Birmingham



| TRIS -- Transitioning Regions Toward Industrial Symbiosis

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TRIS
Interreg Europe

European Union
European Regional
Development Fund

- Birmingham, UK: Birmingham City Council, Industrial Symbiosis Ltd
- Emilia Romagna, Italy: DG Environment, ASTER
- Central Hungary: IFKA, Herman Otto Institute
- Småland, Sweden: Energy Agency SE
- Valencia, Spain: IVACE, AIDIMME

| SYNERGie® -- *our* Internet of Things

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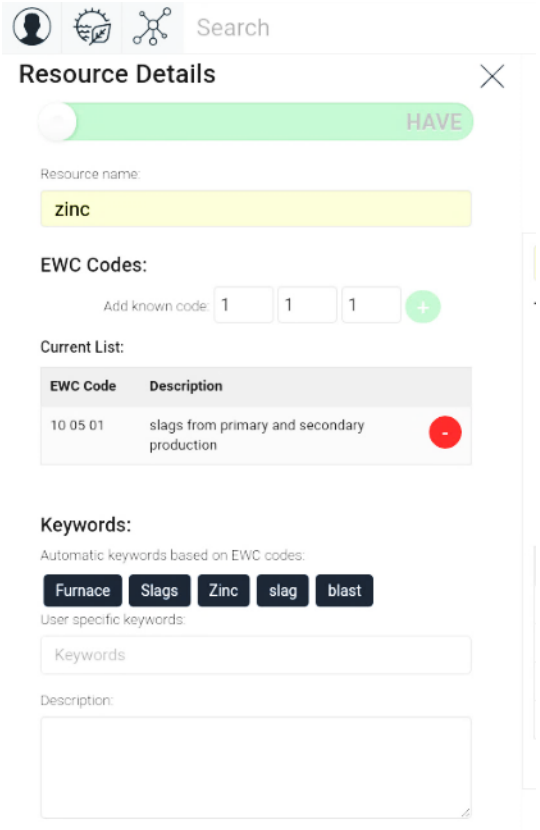

- Resource reuse management platform
- Based on 10 years' experience and data from 30,000 companies
- Used in 22 countries, 6 continents
- Hosting data from 30,000 companies
- Horizon 2020 next generation development of SYNERGie® 2.0
- EWC, BREF, SIC, UN CPC

Quick overview

- H2020 SPIRE-6: Energy and resource management systems for improved efficiency in the process industries

International Synergies Ltd.	University of Twente	University of Leeds	Zurich University of Applied Sciences	Instituto de Tecnología Cerámica
Universitat Politècnica de Catalunya	Dechema E.V.	Chemie-Cluster Bayern	Keros Ceramica, S.A.	Kerafrit, S.A.
Iberica de Suspensiones, S.A. (Sogefi Group)	Grupo Guzman	Eskisehir Chamber of Industry		INNOVACIO I RECERCA INDUSTRIAL I SOSTENIBLE SL,

National Industrial Strategy Industrial Symbiosis contribution:

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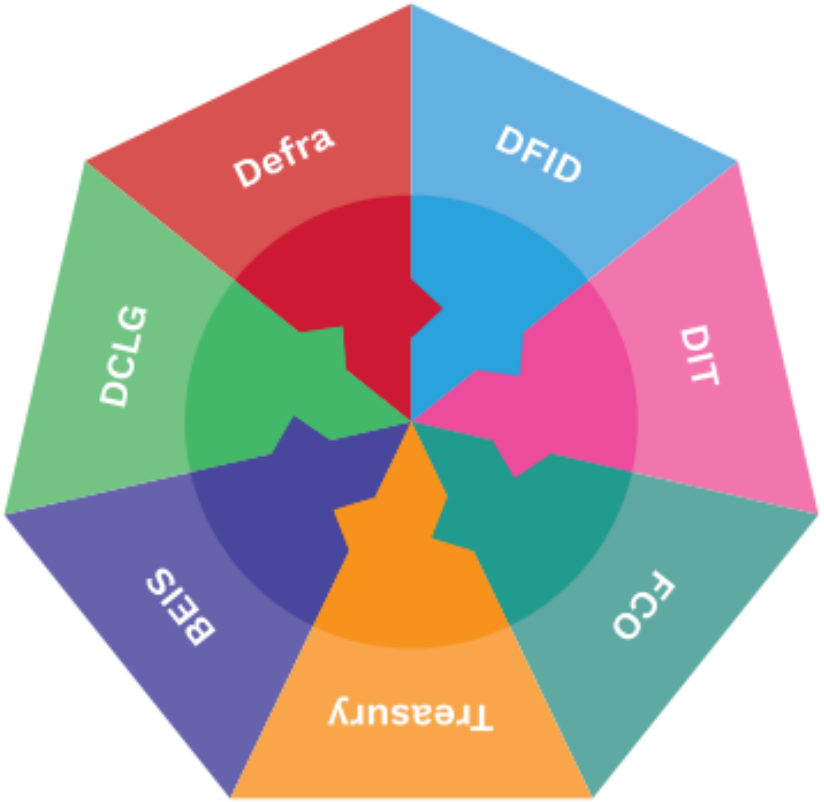
- Enhance competitiveness
- Secure future resources
- Deliver on environment
- Systems approach
- Circular economy in action
- Untapped potential
- Measurable outcomes
- Coordinating function
- Not just industry
- Demand pull on innovation
- Create and safeguard jobs



BEIS

Department for Business, Energy & Industrial Strategy

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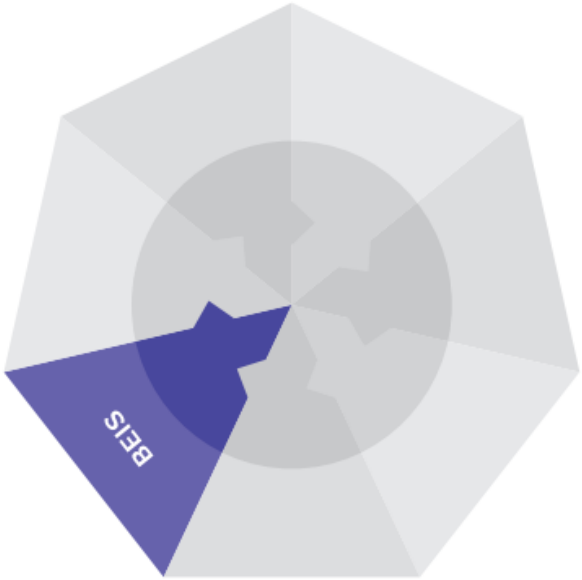
Department for
Business, Energy
& Industrial Strategy



Industrial Symbiosis contributes to policy goals

- Industrial strategy post BREXIT
- Green Growth
- Competitiveness
- Demand-pull innovation
- Jobs
- Entrepreneurship
- Carbon budget
- National materials database for resource security
- Energy efficiency

OECD	*"Industrial Symbiosis is systemic innovation vital for future green growth"*
Edie.net	*"NISP best low carbon project"*
BEIS	*"Whole economy approach to tackling climate change"*
NISP	*"20% of synergies involve new R&D"*

International Synergies study on behalf of Innovate UK identified through industrial symbiosis "over 17 million tonnes of alternative raw materials generated each year that is available for reuse by the construction industry"

A UK centre of excellence for Industrial Symbiosis

To achieve the vision of a national strategy the establishment of a UK centre of excellence would provide a mechanism to pull the multiple policy threads together in a whole systems approach and act as a focal point for government and industry alike.

Objectives

- Increase competitiveness of UK industry
- Informing policy
- Aligning research agendas with industry needs
- Promoting industrial symbiosis worldwide to combat Global Climate Change
- Increase exports of cleantech/greentech
- Identify inward investment opportunities
- Increase productivity through innovation

In Summary

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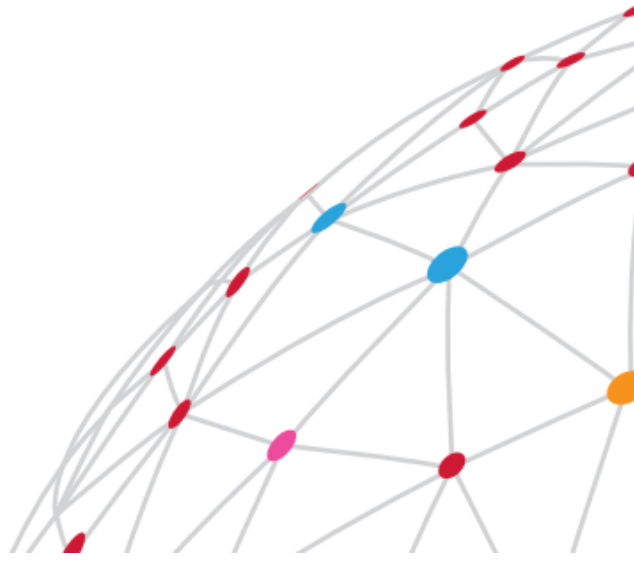
National Industrial Symbiosis Strategy - UK taking the lead

Investment in a national strategy can be justified on so many individual levels (jobs, climate change mitigation, innovation, waste, resource security etc.) but taken together the case is compelling. The primary motivation behind a strategy is to improve UK competitiveness. In addition, a strategy would be a concrete follow up action from the UK in response to the G7 Alliance on Resource Efficiency from 2015 and demonstrate world leadership in this vitally important area for green growth.

Rationale for a strategy

- Opportunity cost
- Timing right (Brexit)
- Global uptake
- Cross-departmental synergies
- Measurable
- Value for money
- Strategic policy alignment across departments
- Building on existing structures and investments
- New markets, jobs, innovation, partnerships



Evidence Base

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There is a substantial independent body of evidence that supports industrial symbiosis as a tool to deliver not only on UK competitiveness but also on global agendas including green growth, eco-innovation, climate change mitigation and sustainable development goals (particularly 8, 9, 11, 12, 13 and 17). The list below contains just some of the sources of evidence that are available.

UK Evidence

- CBI
- EEF
- Manchester Economics
- University College London
- University of Birmingham
- Institute for Manufacturing
- Cambridge
- Invest Northern Ireland
- Defra
- Walport Report 2016
- Birmingham City Council
- National Audit Office
- Highways England
- MIROG

International Evidence

- Circular Economy package
- Roadmap to a Resource Efficient Europe
- WWF
- COWI report for DG ENV
- OECD
- UNEP, UNIDO, UNDP
- G7 alliance on resource efficiency
- Technopolis report for DG INNO
- European Resource Efficiency Panel Recommendations
- Global Green Business Summit
- SPIRE
- Global Green Growth Forum (3GF)
- Worldwatch Institute

| Three take-aways

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Facilitated industrial (urban/city) symbiosis is:

- Delivering the circular economy TODAY
- Ideally delivered locally/ regionally with national co-ordination providing added value and efficiencies
- Strategic policy tool for governments to achieve green growth
- A logical pillar of an UK Industrial Strategy

"Scaling up what works is the best strategy for green growth"

Global Green Growth Forum (3GF)

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Thank you for listening

Peter Laybourn, Chief Executive

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