

National Industrial Symbiosis Programme

The Pathway To A Low Carbon Sustainable Economy

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Peter Laybourn & Maggie Morrissey

NISP is devised and managed by:

International Synergies
industrial ecology solutions



National Industrial Symbiosis Programme The Pathway To A Low Carbon Sustainable Economy

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Additional information on the National Industrial Symbiosis Programme is available at www.nisp.org.uk

The NISP Vision

“To bring about long term business culture change through profitable actions that result in measurable environmental and social benefits thus making a significant contribution to international sustainability.”

“NISP addresses market failure and has undoubtedly scored a number of outstanding achievements, bringing a range of environmental, social and economic benefits and has become a very successful carbon reduction programme.”

Joan Ruddock MP, Former Parliamentary Under Secretary – Climate Change, Biodiversity and Waste

“The National Industrial Symbiosis Programme is the best example of the low carbon economy in action today”

Mick Lavery, Chief Executive, Advantage West Midlands

“NISP is making a significant difference in the UK by helping industry become more sustainable. It's great to see a programme that was created here having such an impact locally, nationally and globally.”

Lynne Jones, MP, Birmingham, Selly Oak



NISP - The Pathway to a Low Carbon Sustainable Economy

In 2003, NISP originated as successful regional pilot schemes in Scotland, West Midlands and Yorkshire & Humberside. In 2004 we published a document entitled, NISP – A Year of Achievement (pictured), which laid out our ambitions, plans and predictions for its future development and implementation nationwide. In 2005, the injection of government funding via Defra’s Business Resource Efficiency and Waste Programme enabled us to launch the world’s first ever National Industrial Symbiosis Programme - NISP.

Five years on, it is extremely gratifying to note that the ambition to deliver economic and environmental benefits to UK PLC through NISP’s free and open industrial symbiosis network has been realised beyond our most optimistic predictions.

The following pages provide a look at who we are, and what we have achieved in this short time. For example, making a substantial contribution to the UK’s carbon dioxide reduction target (2009 Budget - Reducing UK emissions by 110 million tonnes by 2020, based on 2005 emissions) and

boosting the UK economy by a staggering £1.5 billion to £2.4 billion Total Economic Value Added, as evidenced in the independent economic evaluation report detailed in Section 03.

October 2009



Industrial Symbiosis in the Context of Industrial Ecology

One of the most important concepts of industrial ecology is that, like the biological system, it rejects the concept of waste. Dictionaries define waste as useless or worthless material. In nature, however, nothing is eternally discarded; in various ways all materials are reused, generally with great efficiency. Natural systems have evolved these patterns because acquiring materials from their reservoirs is costly in terms of energy and resources, and this is something to be avoided whenever possible. In our industrial world, discarding materials wrested from the Earth system at great cost is also generally unwise. Hence materials and products that are obsolete should be termed 'residues' rather than 'wastes', and it should be recognized that wastes are merely residues that our economy has not yet learned to use efficiently.

Graedel, T.E. & Allenby, B.R., 2002. *Industrial Ecology* (2nd edition), p.19

What is Industrial Symbiosis?

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

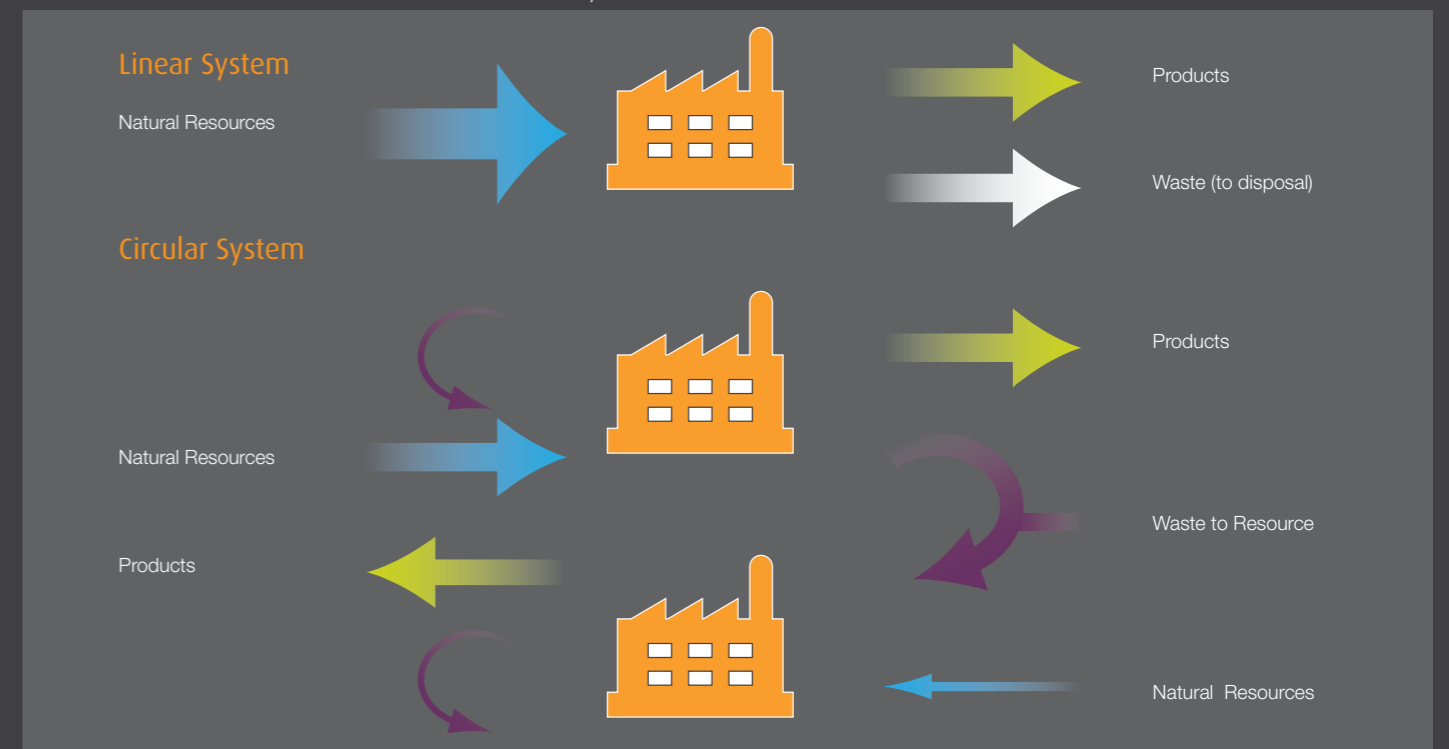
Through the network, business opportunities are identified leading to mutually advantageous transactions for innovative sourcing of required inputs, and value-added destinations for non-product outputs.

Organizations are also exposed to best practice and knowledge transfer, resulting in cultural and process changes.

Lombardi & Laybourn (submitted)

To achieve a low carbon sustainable economy industrial processes must move away from being linear and become much more circular.

NISP accelerates the transition toward the circular economy.





Foreword by NISP Chairman, **Professor Paul Ekins**

Professor of Energy and Environment Policy at the Energy Institute, University College London
Director of the Green Fiscal Commission
Founder Director of Forum for the Future

I was pleased to be involved with the launch of *NISP - A Year of Achievement*, back in 2004. However, it is only since becoming Chairman in 2006 that I have become fully aware of what a special and important operation NISP represents.

There are few more important objectives for the UK than to reduce its emissions of greenhouse gases (mainly carbon dioxide), and increase its resource productivity more generally. This is becoming increasingly realised as an imperative not just by governments round the world, including that of the UK, but by businesses themselves. It is no exaggeration to say that the competitive firms and economies in the future will be the ones that make most efficient use of energy and resources themselves, and develop and export the technologies and techniques to enable others to do so.

In my experience NISP operates the most effective methodology that has yet been developed for increasing the resource productivity of industry. In 2008/09, NISP not only hit all seven targets laid down by the government, but six of them were exceeded by more than 100%.

Over the last five years the figures show that NISP has offered unrivalled value for money for the public investment it has received, delivering and over-delivering on the promise that industrial symbiosis would generate economic benefits, to both private businesses and to the Treasury through increased tax revenues, as well as important environmental improvements. It is therefore hardly surprising that NISP has been recognised at the European level as an exemplar under the EU's Environmental Technologies Action Plan, and is having success in Brazil, China, Mexico and the United States as well as in the UK and Europe. I am proud to have been associated with such achievements.

Of course, NISP's results are due to the great vision, commitment and sheer hard work of its staff. In this publication you will read about some of them, and the details of what they have achieved. As this achievement is built on over the next few years, industrial symbiosis can take further strides to realising the revolution in business practice in relation to resources and the environment – combining efficiency, productivity, profitability and responsibility – that is at the heart of its vision. I much look forward to continuing the journey with NISP down this important road.



Paul Ekins
Chairman

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NISP MEANS BUSINESS



01

Introduction

It's extremely satisfying to be prophetic. Looking back at what was written 5 years ago in *NISP – A Year of Achievement*, I am delighted that our predictions around the contribution that NISP can make in tackling climate change have come true. In addition, our forecasts on the economic benefits a national Industrial Symbiosis (IS) programme can generate have proved to be conservative. Indeed, we have accomplished much greater impact for UK PLC than we could have imagined, including attracting significant sums of inward investment and creating and safeguarding thousands of jobs.

During this time we have developed the tools and techniques to make us more efficient at delivering NISP. Of course none of the achievements would have been possible without the actions and input from industry, and we would particularly like to thank all of the companies that serve on the regional business-led Programme Advisory Groups around the UK.

It is remarkable how little we have had to change our narrative since we wrote *NISP – A Year of Achievement*. The main difference between then and today is that we now have a bank of externally verified evidence that proves that it is possible to decouple economic growth from environmental degradation. NISP has been recognised as an example of the low carbon sustainable economy in action. We have been proved right in term of our predictions; however the challenges (climate change and a sustainable economy) remain greater and more urgent than ever.

In 2004 we highlighted the potential world-wide interest and benefits of IS and have been pleased, but not surprised, at progress on this front. Many countries have identified the NISP model as one they wish to adapt and make their own, just as NISP was adapted from the By-Product Synergy model from the United States Business Council for Sustainable Development.

NISP not only supports the development of industries in the UK, but also identifies export opportunities for those companies that provides solutions through new environmental technologies to pressing environmental issues. We remain excited by the degree of innovation that the NISP network has produced, serving to bring research and development to market in an expeditious fashion.

I write this introduction in the full knowledge that public expenditure is (and is likely to be for some time) under severe pressure. Acknowledging this, we are proud to report that NISP has delivered stunning value for money giving the taxpayer an unprecedented return on investment (detailed results in Section 03).

Looking forward, I see IS as a mechanism that is robust, yet flexible and adaptable. It is able to optimise business and environmental benefit irrespective of background conditions in the economy and can do so at least cost. We have assembled an overwhelming evidence base of the contribution NISP is making to public finances and I would like to think that future governments will invest further in NISP, enabling NISP to fulfil its massive potential in contributing towards the development of **the low carbon sustainable economy.**



Peter Laybourn
Programme Director



02

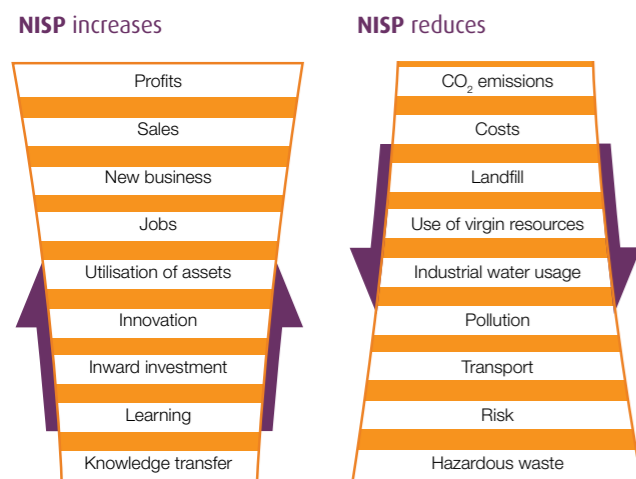
NISP - Delivering Sustainability

Achievements

Sustainable development is often conceptualised as having three dimensions or pillars: environment, economy and society. In the five years NISP has been operating as a national programme, it has delivered significant benefits to all three.

The graphic below illustrates how NISP increases the 'goods' that contribute to sustainable development and reduces the 'bads' that detract from it. NISP's holistic approach that impacts upon the full spectrum of resources, has often attracted the accolade that NISP is 'sustainability in action'.

So how does one describe NISP? Is it a waste programme, a resource efficiency programme, a carbon reduction programme or a job creation programme? The answer is none and all of the above. It is a business opportunity programme that efficiently and cost effectively delivers on the full sustainability agenda.



NISP's 5 Year Achievements*

During the last five years, NISP has helped its 12,500 member companies to:

- Divert over 7.0 million tonnes of waste from landfill
- Collectively reduce carbon dioxide (equivalent)** by over 6.0 million tonnes
- Generate £176 million in additional sales
- Reduce over £156 million in costs for industry
- Attract over £131 million in private investment in reprocessing and recycling
- Cut the use of virgin materials by 9.7 million tonnes
- Reduce water usage by industry by 9.6 million tonnes
- Eliminate over 363,000 tonnes of hazardous waste

* NISP's achievements are actual results from April 2005 to September 2009 and include a very conservative element of pipeline outputs for the remaining 6 months to March 2010. These figures are currently externally verified to the end of March 2009 and relate to England only.

** Carbon Dioxide (equivalent) – all references to Carbon Dioxide in this document refer to Carbon Dioxide (equivalent) which may include elements of the other 5 main greenhouse gases (Methane, Nitrous Oxide, Hydrofluorocarbons, Perfluorocarbons and Sulphur Hexafluoride)

How Benefits Continue to Accrue

NISP introduced a process of external verification for all of its outputs from the outset, to ensure a firm foundation of data and to quantify the precise impact of NISP.

In addition to the actual benefits generated by NISP 'in year', an element of 'persistence' is applied to the outputs to demonstrate the true long term impacts, sometimes called lifetime benefits of NISP's work. Persistence is defined as a level of output a synergy (a NISP facilitated project) is expected to deliver in subsequent years once the synergy has started. Not all synergies accrue the same benefits year after year. In some cases processes or markets may change, and outputs decrease over time. In other cases, production increases and benefits increase over time.

Two baseline scenarios for calculating lifetime benefits are included in the following tables based on the cumulative, externally verified, actual in year achievements. In both scenarios the lifetime benefits are assumed to be zero after five years.

In the first conservative scenario (Scenario 1) - the rate at which a synergy continues to add benefits over the lifetime of 5 years is assumed to reduce by a 'decay' factor of 20% per annum: thus, 100% of the benefits are reported in Year 1 and these are assumed to decline to 80% in Year 2, 60% in Year 3, 40% in Year 4, and 20% in Year 5.

The second more realistic scenario (Scenario 2) – is based more closely on NISP's experience that a synergy providing benefits will continue to deliver the same level of benefit in the subsequent years based upon the rational expectation the participating companies will continue with the synergy. For example a synergy delivering 100 tonnes of carbon dioxide reduction in Year 1 will deliver 500 tonnes of reduction over the lifetime of five years.

As Scenario 2 is the most realistic, we have used these figures on Pages 20, 30, 42, 46, 54 and 58.

Please note: Sufficient time series data of the same metrics covering the five year period is only available for the 9 English regions.



Externally Verified Outputs

Figures reported to reflect actual in year benefits and persistence as described on previous page.

Results April 2005 - March 2010

| Economic | Actual * | Scenario 1† | Scenario 2† |
|-------------------------------|--------------|--------------|--------------|
| Cost savings to business | £156,082,258 | £468,246,774 | £780,411,290 |
| Additional sales for business | £176,097,919 | £528,293,757 | £880,489,595 |

| Environment | Actual * | Scenario 1† | Scenario 2† |
|-------------------------------------|-----------|-------------|-------------|
| Landfill diversion (Tonnes) | 7,022,384 | 21,067,152 | 35,111,920 |
| CO ₂ reduction (Tonnes) | 6,038,059 | 18,114,177 | 30,190,295 |
| Virgin material savings (Tonnes) | 9,704,711 | 29,114,133 | 48,523,555 |
| Hazardous waste eliminated (Tonnes) | 363,626 | 1,090,878 | 1,818,130 |
| Water savings (Tonnes) | 9,569,738 | 28,709,214 | 47,848,690 |

| Social | Actual * | Scenario 1†† | Scenario 2†† |
|--------------|----------|--------------|--------------|
| Jobs created | 3683 | 13,309 | 22,181 |
| Jobs saved | 5087 | 18,379 | 30,632 |

*NISP's achievements are actual results from April 2005 to September 2009 and include a very conservative element of pipeline outputs for the remaining 6 months. These figures are currently externally verified to the end of March 2009.

† Scenario 1 - Persistence effect with 20% decay per annum
 Scenario 2 - Persistence effect with 0% decay per annum

†† Arriving at the total employment contribution of NISP interventions, employment safeguarded and created, a factor of an indirect and induced employment multiplier of 1.6 is used. The employment multiplier represents the result of further spending by those jobs retained/created through an indirect effect (supply chain impacts) and induced effect (income impacts) at a national level.



03

Fiscal Performance

Having identified the environmental, economic and social outputs that NISP has facilitated for its members, via third party independent verification, we were interested to find out the overall impact the programme has had on the economy. The following extract is taken from the executive summary of an independent report published in 2009. The lead economist on the report was Kram Sadiq, Director at Manchester Economics, who has 18 years experience of economic development in the UK and overseas.

The full report (NISP Economic Valuation Report) goes into far more detail, but we have focussed here on the two scenarios (outlined in Section 02) of a 'decay' model of 20% per year reducing to zero benefits after 5 years (Scenario 1) and 100% persistence for 5 years (Scenario 2). The true picture will be somewhere between the two. However, with full detailed knowledge of NISP, we believe NISP delivers closer to the Scenario 2 level of benefits, because many synergies do increase over time, offsetting those that decay.

NISP Economic Valuation Report, Manchester Economics and Scott Wilson Business Consultancy - September 2009:
"The triple line benefits achieved to date provide a compelling case for increased investment in the future."

"This economic valuation report sets out the achievements of NISP throughout England, working with industry to develop opportunities using the industrial symbiosis approach. After nearly 5 years, NISP has matured into an effective business programme that delivers value to businesses, the environment and society. This has positively impacted on companies' sales and cost efficiency, as well as delivering environmental and social benefits.

The highlights from our review of the Key Performance Indicators (KPI's) over the past 5 years (cumulative, excluding persistence effects) for English regions are:

- More than 7 million tonnes of waste have been diverted from landfill, including 0.363 million tonnes of hazardous waste;
- Carbon dioxide (equivalent) savings of over 6 million tonnes;
- Virgin materials saved of around 9.7 million tonnes; and
- Water saved of 9.5 million tonnes.

This activity promoted by NISP has generated in excess of £176m sales and £156m cost savings for participating companies (excluding additional savings accrued from the persistence effect). This has led directly to over 8,770 jobs being safeguarded and created.

The value of engagement with NISP is evidenced by the high levels of attribution of benefits reported by participating companies. Moreover, the feedback indicates that programme support persists over the long term, and does not necessarily diminish over time.

The report examines the impact of NISP activities based on an assessment of persistence. The impacts have been calculated based on persistence of 5 years (with two scenarios, a 20% and a 0% allowance for decay in impacts over an annual basis). This shows that the impact of NISP activity has led to:...

...continued

- Landfill tonnage diverted of between 21.1 million and 35.1 million tonnes
- Decrease in carbon dioxide (equivalent) of between 18.1 million and 30.2 million tonnes;
- Cost savings of between £468m and £780m;
- Increase in sales of between £528m and £880m.

The outputs delivered by NISP have been achieved with reduced funding over the past two years. This demonstrates that value for money has improved over the programme with the cost-effectiveness ratios improving across landfill, carbon dioxide (equivalent) savings and virgin materials. For example, the cost per tonne of landfill diverted has fallen from £0.58 in the first year to £0.15 in year five.

The wider value for the community has been measured through the contribution of the programme to GEVA (capturing direct and indirect employment and profit value added) and TEVA (capturing the environmental value). The financial contribution of NISP to GEVA is in the range of £396m to £660m. These figures represent an investment multiplier between 14.3 to 23.9.*

The net Total Economic Value Added (TEVA) ranges from £1,470m to £2,450m, representing an investment multiplier of between 53.2 to 88.6.

The results show that the impact of NISP on the Exchequer[†], measured as a combination of income tax, corporation tax and VAT, is also significant, with impacts ranging from £148m to £247m.

*NISP having established the infrastructure to deliver the 'industrial 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.***

NISP Economic Valuation Report, Manchester Economics and Scott Wilson Business Consultancy - September 2009

***Total Economic Value Added (TEVA)**

The HMT Green Book states that monetary values for the environment should be incorporated - where possible - to provide a more balanced assessment in making investment choices. Therefore, in assessing the total economic impact of a public intervention the concept of total economic value (used in the conservation field) recognises that combining strict economic values (e.g. GVA) with wider benefits (e.g. monetary values for environmental outputs) provides a better measure of overall economic benefit or economic damage avoided. The measure of total economic value added (TEVA) therefore simply combines the narrow GVA definition outlined above with the monetary benefits for environmental values.

†Exchequer fiscal flows

The Exchequer fiscal impact can be derived from examining three principal tax benefits:

- Corporation tax: this is based on the additional profits generated from NISP interventions and is based on a share of GVA calculated. Within the average 31% GVA/sales ratio business profits make up approximately 15%. The corporation tax impact is based on taking 26% (a proxy for the average corporate tax rate) of the profit value within NISP attributed GVA;
- Income tax from additional employment: the calculation of the income tax effect of the net employment created and safeguarded employment is based on using a marginal tax rate of 22% and assuming that on average each job generates a taxable income of £18,000; and
- VAT on additional sales: the additional sales metric (adjusted for attribution) is assumed to be a VAT inclusive value. 17.5% of this sales value is therefore taken as an estimate of the VAT contribution.[‡]

The combination of these tax impacts represents the flow to the Exchequer as a result of the synergy outputs from NISP. From the Treasury's perspective it will have invested tax revenues (to deliver an environmental policy target) through NISP and the ratio of this investment to tax receipts can be represented in the form of a tax multiplier.

[‡]It is recognised that the current rate of VAT is 15% however during the NISP period of operation, VAT stood at 17.5% for the majority of NISP's operations.



Best Value for Money

The data in the table opposite demonstrates extraordinary value for money delivered by NISP in achieving the programme's economic, environmental and social outcomes. In comparison to other programmes receiving funding from government, the table illustrates NISP provides the best value for money bar none.

If we look at actual carbon dioxide reduction outputs achieved, we are able to calculate the input cost per tonne of carbon dioxide reduced is only 65 pence.

However, if we look at the carbon dioxide outputs achieved throughout the life of the programme (applying persistence as previously explained), the cost per unit falls to a mere 13 to 22 pence per tonne. No current carbon trading systems or voluntary offset programmes can match this incredibly low level of cost per tonne of carbon dioxide reduction.

As shown in the Manchester Economics report on the previous pages, NISP achieves these stunning outputs while returning between £148m and £247m to the Treasury.

A Significant Return on Investment

There is increasing scrutiny today on how public money is spent. NISP's achievements, based on a modest level of public sector investment, have provided a significant return on investment for the taxpayer.

Input Required by NISP April 2005 - March 2010

| Benefit generated through NISP | Actual | Scenario 1* | Scenario 2* |
|---|----------|-------------|-------------|
| £1 new income for industry | 2 pence | 0.7 pence | 0.4 pence |
| £1 cost saving for industry | 3 pence | 0.8 pence | 0.5 pence |
| 1 tonne of virgin material saved | 41 pence | 14 pence | 8 pence |
| 1 tonne of water saved | 41 pence | 14 pence | 8 pence |
| 1 tonne of CO ₂ reduced | 65 pence | 22 pence | 13 pence |
| 1 tonne of waste diverted from landfill | 56 pence | 19 pence | 11 pence |
| 1 tonne of hazardous waste eliminated | £10.86 | £3.62 | £2.17 |

*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.



04

NISP - Methodology

NISP goes beyond the traditional waste/process source approach, looking to allow its member companies to take advantage of a range of matching opportunities, from surplus space to good business practice”

Elliott P. Laws, Former President for Safety, Health & Environment, Texaco

Responsiveness and robustness are inherent within the NISP model. These attributes, combined with academic underpinning and a clear vision for NISP, explain how NISP has achieved such success in such a relatively short time. NISP’s holistic approach sees it yielding benefits across the full spectrum of resources used by industry. It is not limited to material resource streams but also has a positive impact on water, energy, logistics, expertise and asset utilisation.

Network

The unique industrial network developed by NISP has been built up over the last five years. This network is the channel through which NISP identifies and facilitates profitable transactions or synergies between member companies, transcending traditional sector boundaries. As of October 2009 membership of NISP exceeded 12,500 companies. NISP members are from all sectors and comprise companies of all sizes, including FTSE 100 multi-nationals and individual entrepreneurs. Small and medium size enterprises (SMEs) and micros make up over 90% of the membership.

NISP has 12,500 business members including:

| Corporates | SMEs | Micros |
|----------------------------------|--------------------------|-----------------------------|
| Bombardier | Aerospace | Alutrade Akristos |
| Carillion | B.C.R Company | Analytichem |
| ConocoPhillips Petroleum Company | Country Chef | Belhaven Smokehouse |
| Corus | Firth Rixson Castings | Clarkson Enterprises |
| Diageo | G&P Batteries | Clayton Hall Farm |
| Ford Motor Company | Green BioDiesel | Facility Water Management |
| HSBC | JBR Recovery | Greenway |
| IKEA | Macswen | Kito Engineering Solutions |
| Marley Eternit | Pennine Fibre Industries | Maltwood |
| Michelin | Renewable Energy Growers | Marches Wood Energy Network |
| Shell | Sterecycle | Prestonfield House Hotel |
| Veolia | The Cheese Company | Renewable Product |

Facilitators (Industrial Symbiosis Practitioners)

Five years ago, the term ‘Industrial Symbiosis Practitioner’ did not exist. Today, there are 60 working in the UK. These experienced facilitators, the majority of whom come from industry backgrounds, are organised in regional teams and work closely together. They are unique and exceptional at what they do. Although an impressive array of tools are available to support IS Practitioners, it is their knowledge and relationships with NISP member companies, built up over time, that make them the key asset of NISP and form the foundation of NISP’s success. Because of NISP’s accomplishments, there is a danger the implementation of industrial symbiosis is seen as a straightforward task – it is not. It is extremely difficult, requiring the specialist skills of IS practitioners, forward looking companies and often requiring innovation.

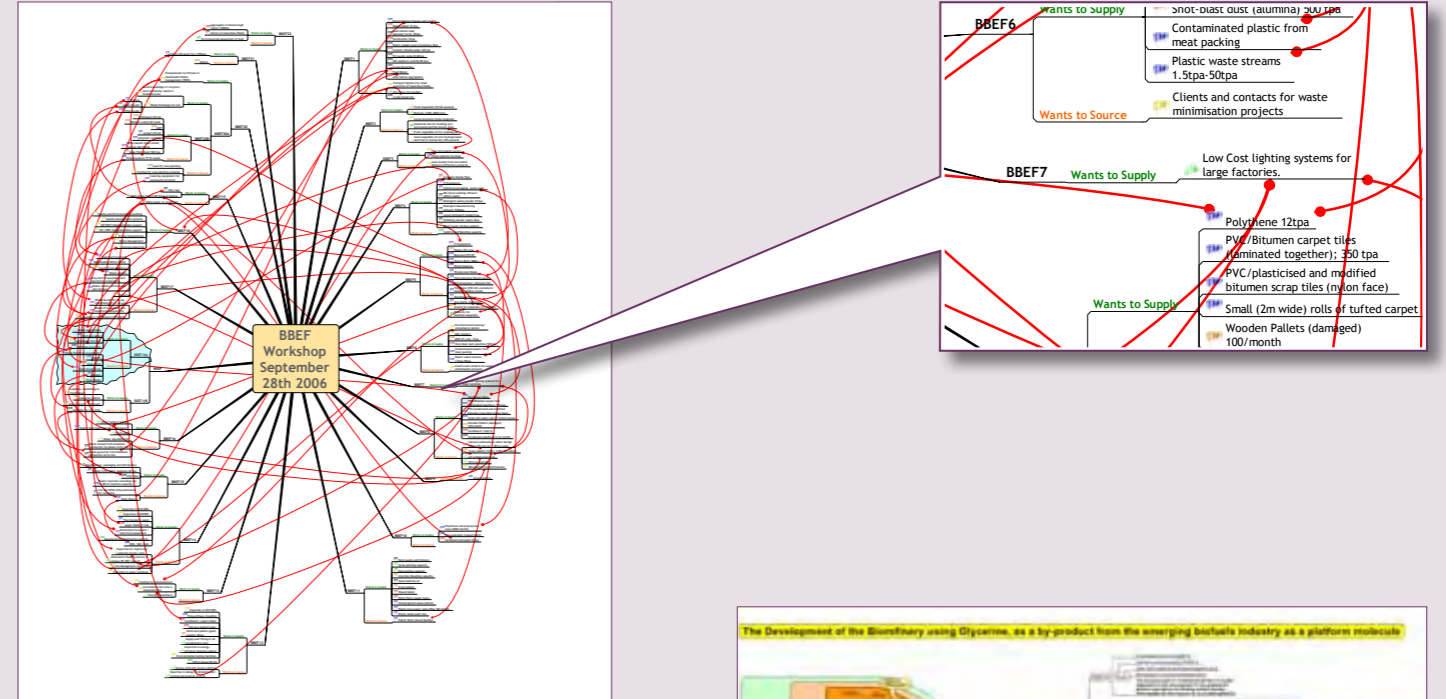


Tools and Data Handling

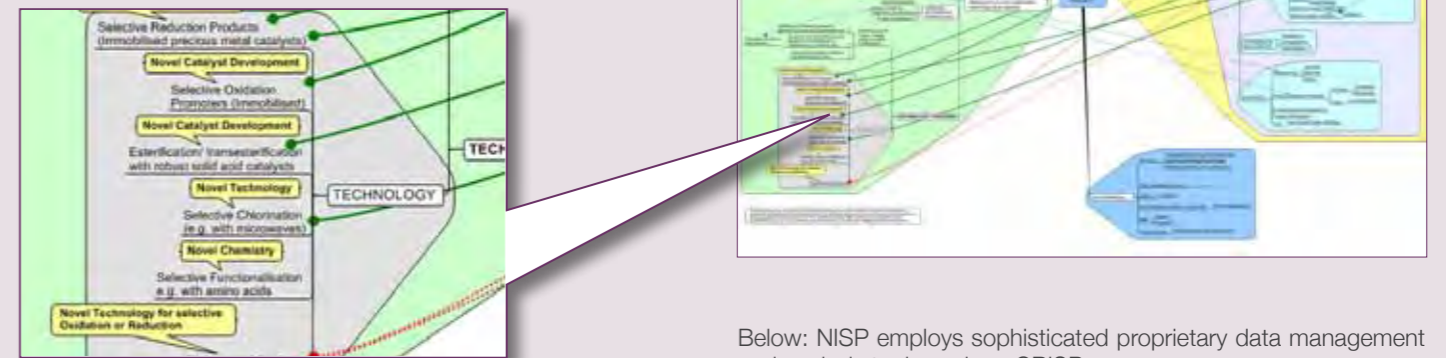
Over the last five years, NISP has developed a range of tools available for use by the regional practitioner teams. These include a diverse range of training materials and courses; a robust and proven framework for delivering NISP facilitated workshops (pictured) and best practice sharing events. NISP also manages a national resource stream monitoring system and data analysis tool - Central Resource for Industrial Symbiosis Practitioners (CRISP). CRISP assists practitioners to identify current synergies and also provides a pipeline of potential synergies stretching out several years into the future, thus giving confidence for predicting future achievement.



Below: Companies attending NISP interactive workshops identify their 'haves' and 'wants', the practitioners are then able to pinpoint potential connections (synergies).



Right: NISP workshops can be designed to find solutions to specific problems by bringing together producers, users and solution providers. In this case the workshop looked at identifying ways in which to recover and reuse Glycerine.



Below: NISP employs sophisticated proprietary data management and analysis tools such as CRISP.





Leadership

Business is embedded in NISP and vice versa. NISP is demand led by business with input and guidance from business. Each of NISP's regional teams has a Programme Advisory Group (PAG) made up of key business people from each region who know, trust and work closely with the NISP teams. Over the last five years these senior business people have committed a great deal of their time to the development and success of NISP.

The cross-sector PAGs act in a steering capacity, guiding the direction of NISP through regular review meetings. They ensure NISP maintains a sharp business focus and adapts to the changing requirements of business, the economy and environment. The Environment Agency, Scottish Environment Protection Agency and Northern Ireland Environment Agency also provide excellent support to the PAGs.

"We believe that NISP's unique approach will bring significant environmental and business benefits to all participating companies in the East of England."

Paul Greenly, Director, Kier Eastern



What our Programme Advisory Group Chairs Say About NISP



Paul Whitby

Environmental Manager
Corus Group

Chairman NISP Yorkshire & Humber PAG

“NISP came into being during positive economic times and it was easy to commit time and effort to make the programme a success. However there was a rapid decent into recession and this is exactly the time when NISP demonstrates its true value. Resource management, as much as for economic as well as environmental reasons, is a must. And as shown at a recent event in Leeds there is still very strong commitment from industry, regulators and programme staff to achieve challenging goals.”

“The recovery and reuse of surplus materials is fundamental to resource management and makes important contributions to both preservation of natural resources and climate change mitigation. Returning such resources to productive use is becoming an integral part of economic activity. It is vital, therefore, that businesses have knowledge of what is available and can trade such resources easily. I can think of no better platform for this than that provided by NISP. NISP has a huge database of companies and surplus resources, and their workshops bring companies together in a constructive and impartial way. Industrial symbiosis are big words, but NISP makes it simple and straightforward in a friendly and supportive atmosphere.”

Keith Riley

Managing Director - Technical Services Director
Veolia Environmental Services

Chairman NISP South East PAG



“Manufacturing industry in Northern Ireland has particular challenges related to both incoming and outgoing transport costs, high energy costs and high waste costs. All of which have a negative effect on competitiveness. I am delighted to be able to give some of my time to NISP, which through its activities, is making a real contribution to reducing these burdens and also producing real environmental benefits”

Brian Lewis

Director
RSK (Ireland) Ltd

Chairman NISP Northern Ireland PAG



Richard Laxton

Work & Environment Compliance Adviser
Arla Foods

Chairman NISP East Midlands' PAG

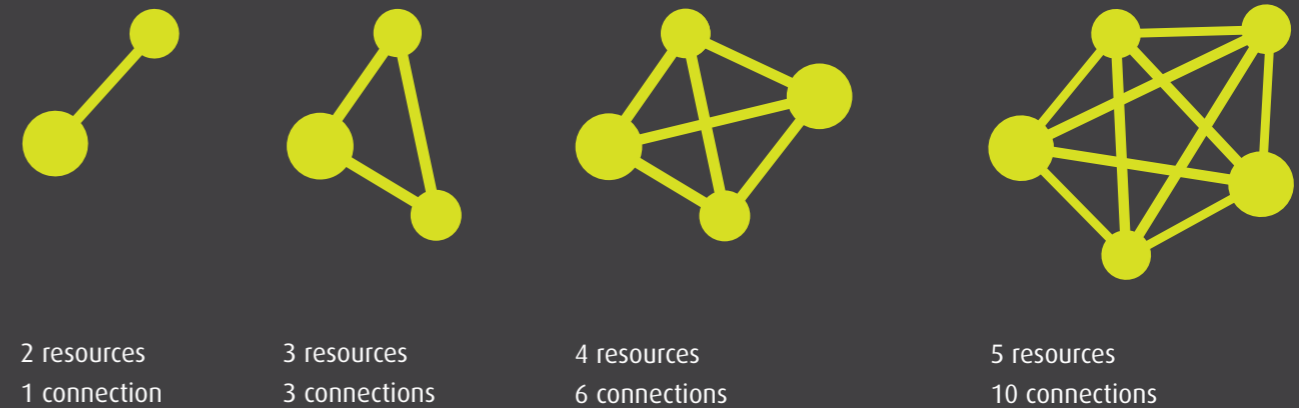


“Being part of the NISP network means we're able to tap into some of the UK's best expertise on reducing business waste. NISP connects people and businesses and opens up previously unimagined possibilities. While Arla Foods has realised some synergies, the huge benefit that NISP has provided is the lead into other solutions. For me, NISP represents opportunity. For every ten ideas, one works – and when it does it can have a huge impact, not just in financial terms, but also in challenging accepted thought and changing the way people look at what was once seen as waste.”

Scalability

To date NISP practitioners see no diminishing returns for their efforts. On the contrary, they believe that they are only just “scratching the surface” as to the potential of the IS approach. For example, of the 428 million tonnes of waste being sent to landfill each year in the UK, a huge proportion of this has the potential to be a recoverable and reusable resource. One can see from the NISP growth model below, that putting additional effort into NISP would provide a disproportionately higher return.

Growth Model



...doubling resources will allow NISP to quadruple business opportunity

The above model was the origin of NISP's strapline – **Connecting Industry, Creating Opportunity** and provides the mechanisms needed to create horizontal supply chains that are necessary for a sustainable economy.



05

Industrial Symbiosis in Action - Synergy Examples

In moving towards a low carbon, sustainable economy, NISP offers a blueprint that is uniquely successful. Critically NISP enjoys the full support of industry with input from its PAGs and links with leading trade bodies and associations. This high level of industry support is also evident by the number of businesses undertaking the implementation of the synergies identified and facilitated by the programme teams.

It is NISP's holistic approach that reduces industrial carbon dioxide, landfilling of materials, hazardous waste streams and industrial use of water. It also dramatically reduces the demand on natural virgin resources and generates cost savings, new sales, jobs and new business start-ups.

The following pages provide a snapshot of some of the thousands of NISP facilitated synergies implemented by our member companies over the last five years.

Although these synergies are categorised into specific headings, such as landfill diversion and water reduction, virtually all of NISP facilitated synergies achieve a much wider, positive impact on each of the pillars of sustainability – economy, environment and society. NISP generates economic growth, while reducing the adverse environmental impacts of industrial activity, thus achieving the elusive win-win of decoupling growth from environmental degradation.

The results shown in the synergy case study examples in the following pages are all stated without persistence and refer to the outputs in the first year of the synergy.

Carbon Dioxide Reduction and Energy Production

In 1981, a New York Times report by Phillip Shabecoff reported that national and international energy policies must immediately address climate change. Although the world's perception of the problem has evolved substantially, the methods of implementation are still hotly debated today. Some proposed solutions are very invasive - like earth engineering for carbon capture - and very uncertain in the benefits they will deliver and in what timescale.

Five years ago we predicted the NISP approach could help combat climate change. In the intervening period we've been proven right. What we didn't foresee was exactly how high those levels of carbon dioxide reductions would be.

Since April 2005, NISP has made a tremendous and overwhelming contribution to reducing the UK's carbon dioxide emissions. In fact, having helped its members collectively reduce their emissions by over 6 million tonnes (30 million tonnes lifetime benefit under Scenario 2).

All of this has been achieved at a cost of just 65 pence per tonne of carbon dioxide reduction, while persistence based lifetime savings of carbon dioxide are as low as 13 pence to 22 pence per tonne. This makes NISP the most successful programme receiving government funding at removing carbon dioxide in absolute terms and at the lowest cost. The types of carbon dioxide reductions are highlighted in Table 1 and the resource streams with particularly high embedded energy are detailed in Figure 1.

30 million

NISP has helped its members collectively reduce their carbon dioxide emissions by over 30 million tonnes



Table 1

Types of CO₂ Emissions Savings

| | |
|--------------------------|---|
| Input savings | Lower embedded energy in processing recycled materials than virgin raw materials |
| Process savings | Savings in gas, electricity or other fuel use by one of the synergy partners principally through innovation |
| Fuel substitution | Replacing fossil fuels with other non fossil fuel sources in industrial processes |
| Transport savings | Reduction in transport directly associated with synergies |
| Disposal savings | Reduction in biodegradable material sent to landfill |
| Energy Savings | Production of energy through, for example, anaerobic digestion and utilisation of waste heat |

NISP is able to identify underutilised energy streams and redirect them creating an input source for a new industrial process. For example, NISP projects involve reusing waste steam from a factory to supply a tomato growing greenhouse, using commercial food waste to power the national grid and using sewerage sludge to run a combined heat and power plant.

The government is introducing the Carbon Reduction Commitment (CRC) which comes into force in April 2010 and will initially impact on some 5000 organisations as determined by their electricity use. The CRC aims to reduce carbon dioxide emissions by 1.2 million tonnes a year by 2020, this will inevitably involve substantial set up, monitoring, compliance, policing and administrative costs.

Whilst industry has cautiously welcomed this mandatory move, it does not have the potential of the NISP approach which has been identified by the EU "as an innovative approach for tackling climate change". Across the Atlantic, the North America Free Trade Agreement Commission for Environmental Cooperation is currently considering IS as part of its developing climate change strategy for North America.

It is against this contextual background - the relative ineffectiveness of the Kyoto Protocol and the already pessimistic predictions surrounding the United Nations Climate Change Conference in Copenhagen (COP15) - that highlight the urgency of adopting NISP as a proven carbon reduction vehicle.

When the world's principle negotiators around climate change gather in Copenhagen in December 2009, we hope they consider the achievements and stimulus created by the first observed example of IS in Kalundborg, just a few miles away from where they will be meeting. Even moderate success at COP15 will require international agreements, sophisticated cap and trade, offsets, further Cleaner Development Mechanisms, costly auditing and compliance. A proven, effective NISP model is available for implementation today

and can be scaled up, in the UK and across the world, tomorrow.

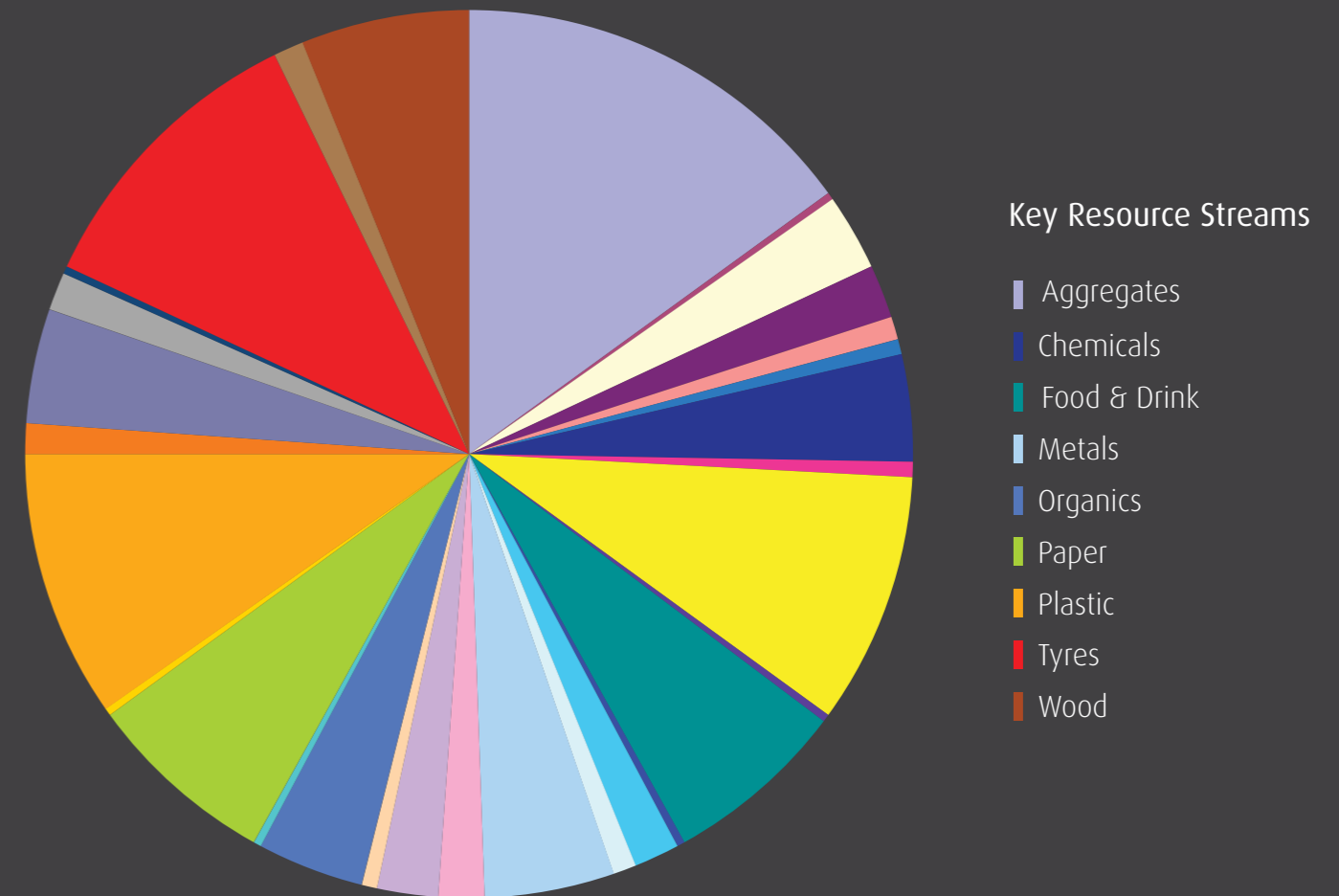
There is no single solution to climate change. However, given the high levels of environmental benefits generated by NISP, it makes sense to increase investment in this area. We know that NISP has the support of industry and provides governments with substantial tax revenues that could, if ringfenced, be used to fund some of the encouraging but unproven technologies addressing climate change. In addition, it may also be time to consider that carbon dioxide reduction aggregated under NISP networks should itself be eligible for carbon offset/trading.

We are still only scratching the surface of possibility with NISP and may yet uncover other innovative ways of addressing climate change, which is why NISP has entitled this, its 2009 five year review:

'The Pathway to a Low Carbon Sustainable Economy.'

Figure 1

Resource Streams Yielding CO₂ Savings (based on tonnes of CO₂ saved through NISP)



Resource Streams and CO₂ Reduction

| | | | | | |
|--------------|--------------|--------------|-------------------|----------------|-------------|
| Aggregates | Ashes | Automotive | Building Products | Cardboard | Carpet |
| Ceramic | Chemicals | Compost | Fabric | Filter Cake | Filter Dust |
| Food & Drink | Foundry Sand | Glass | Glycerol | Innovation | Logistics |
| Machinery | Metals | Mixed | MSW | New Technology | Organics |
| Packaging | Paper | Plasterboard | Plastics | PVB Glass | Rubber |
| Sludge | Soil | Straw | Tyres | WEEE | Wood |

David Hopkins, Chemicals & Utilities Director, Terra Nitrogen (UK) Ltd said:
"This project has put Billingham on the map and is an exciting opportunity for Terra Nitrogen and the local business community. Utilising carbon dioxide and steam from our site is not only helping to reduce industrial emissions, but is also boosting British agriculture."

Case Study - A Fruitful Collaboration

Organisations involved: Terra Nitrogen (UK) Ltd and John Baarda Ltd

NISP's North East team facilitated one of the programme's most fruitful collaborations; bringing together an international nitrogen producer and a small scale vegetable farmer in a scheme which recovers, redirects and reuses 12,500 tonnes of carbon dioxide a year.

NISP member, Terra Nitrogen (UK) Ltd, a leading international producer of nitrogen products and methanol was looking to reuse the carbon dioxide and steam it generated through its process of manufacturing ammonia.

Another of the programme's members, John Baarda Ltd, a small-scale vegetable grower had informed the team that it was keen to expand its operations with the aim of producing substantial quantities of vegetables, including tomatoes, to sell to leading retailers and supermarket chains.

NISP brought the two companies together and facilitated a deal which sees 12,500 tonnes of carbon dioxide from Terra Nitrogen's site being recovered, and pumped to power a record-breaking 38 acre greenhouse in Billingham, which cultivates 300,000 tomato plants throughout the year for Sainsbury's. The greenhouse, the largest complex in the UK, is the first to use waste by-products as its primary power source. The carbon dioxide is pumped into the greenhouse where it is a key ingredient for plant growth, boosting production by up to 50%, while at the same time cutting industry emissions. Steam generated from Terra Nitrogen's site and normally discharged from a nearby factory is instead being converted to hot water and used to heat the 38 acres of greenhouse – approximately the size of 23 football pitches.

John Baarda are also benefiting from cheap rate electricity for the facility, helping to cut costs further and ensuring crop production is cost effective throughout the winter months providing the first ever over-wintered tomatoes. This project is providing a real boost for British agriculture, as tomatoes would normally be imported from Spain during the colder months.

The Results Include

- Carbon dioxide reduced: 12,500 tonnes
- Jobs created: 80
- Private investment: £15,000,000
- Large reduction in 'food air miles' leading to greater carbon dioxide savings (not quantified)



Martin Pointon, Joint Managing Director, John Pointon & Sons said:
“Working with NISP has proved vital to our ongoing commercial development as it provides innovative thinking, opportunities and solutions to a greater extent than any other organisation that we have engaged with.”

Case Study - Making a Meat and Bone Meal of It

Organisations involved: John Pointon & Sons Ltd and a number of cement manufacturers

Meat and bone meal processed from animal by-products is now being used to fuel cement kilns in an innovative synergy between two NISP West Midlands’ members that has seen carbon dioxide reduced by more than 275,000 tonnes.

John Pointon & Sons Ltd, based in Staffordshire, is the largest single site animal renderer in the UK. The company safely converts a wide range of animal by-products (ABP) into useful products, eliminating potential sources of pollution, contamination and disease.

NISP West Midlands instigated a trial with John Pointon and a leading cement manufacturer to see if one of these derived products, meat and bone meal (MBM), was a suitable alternative fuel source for the cement company’s kiln operations.

The trial found that MBM, a product previously sent to landfill, provided an ideal fuel source because of its high calorific value. In addition, the combustion of MBM generated significant quantities of calcium salts that can also be used as a raw material replacement. The trials were a resounding success with 300,000 tonnes of animal by-products being processed, generating 70,000 tonnes of MBM.

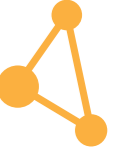
Since the original trial, the operation has expanded with even more MBM being used as an new input fuel source for a number of cement companies. John Pointon plans to process 500,000 tonnes of animal by-products to produce 150,000 tonnes of MBM. This represents an increase of 80,000 tonnes from the amount produced during 2005.

The Results Include

- Carbon dioxide reduced: 277,217 tonnes (based on 150,000 tonnes ABP diverted to alternative fuel)
- Diversion from landfill: 150,000 tonnes
- Jobs created: 10



Right: Aerial view of John Pointon & Sons plant, Staffordshire



Mark Lovett, Health Safety and Environment Manager, Apetito said:
“The connection with NISP has directly led to Apetito reducing the amount of waste sent to landfill and has saved the company a significant amount of money.”

Case Study - All Puffed up with Pastry Power

Organisations involved: Andigestion and Apetito

NISP’s South West team cooked up an exciting synergy between two of its members that not only generated carbon dioxide savings of more than 6,500 tonnes but also collectively saved the companies thousands of pounds.

Apetito Ltd based in Trowbridge, is a leading supplier of frozen food and catering solutions all over Europe. In a drive to improve waste management on its site Apetito contacted the NISP South West team to help identify an alternative disposal route for its pastry waste that was being sent to landfill.

Andigestion Ltd operate a plant at Holsworthy in Devon where they generate electricity by treating a range of organic waste streams through an anaerobic digestion process. Andigestion was keen to increase electricity production at the site and contacted NISP to source additional streams for input into the plant.

The NISP team’s knowledge of regional resource streams and flows led them to foster a link between the two companies having identified that Andigestion would be an ideal outlet for the waste produced by Apetito.

Subsequent negotiations between the companies highlighted that Andigestion could help Apetito with some of its other waste streams such as animal by-products and process effluent in addition to the pastry waste.

An agreement was quickly reached between the companies that had clear benefits for both parties, including reduced waste disposal costs, increased sales and a reliable source of waste for the Andigestion plant.

The Results Include

- Carbon dioxide reduced: 6,842 tonnes
- Diversion from landfill: 1,700 tonnes
- Virgin materials saved: 2,800 tonnes





Landfill Diversion

There are approximately 2,250 landfill sites across the UK, of varying size and capacity. If the UK continues to produce the high levels of waste it has in recent years, existing landfill capacity will run out within the next ten years.

In addition, the levels of carbon dioxide produced as a result of burying so much waste, and transporting our waste to be buried, means that a reduction in the amount of materials sent to landfill can achieve huge carbon dioxide savings and make an impact on climate change. The increase in landfill tax of £8 per tonne per year is encouraging businesses to look at alternatives to sending their waste to landfill.

Since April 2005, NISP has helped its members collectively reduce the amount of business waste sent to landfill by over 7 million tonnes (35 million tonnes lifetime benefit under Scenario 2). Its knowledge of regional and national resource flows, combined with insight into available technologies for the extraction, treatment and processing of resource streams sees NISP identifying how and where resources can be recovered, reprocessed and reused in the industrial network and not just in the waste industry.

NISP also plays an instrumental role in the market development for recyclables and reprocessed materials, as well as finding markets for materials now banned from landfill sites. NISP creates innovative sourcing of material input streams for a host of industrial processes, as well as adding value to non-product material outputs.

NISP works across the entire waste 'hierarchy' often helping design out waste and improving industrial processes. Waste is a word rarely used across NISP as we see resource potential in almost everything that becomes a candidate for landfill.

35 million

NISP has helped its members collectively reduce the amount of business waste sent to landfill by over 35 million tonnes

Alan Young, Head of Waste at Thames Water said:
“The concept of NISP is an excellent format for companies such as Thames Water to benefit from and the introductions to companies brokered by the South East team have allowed far reaching relationships to be formed that will ensure cost benefits for years to come.”

Case Study - Engineering a New Life for Hoo Island

Organisations involved: Thames Water, Medway Ports, H. Sivyer and GPS Marine

NISP’s South East team facilitated a complex collaboration between four of its member companies which sees 100,000 tonnes of clay and spoil material from Thames Water’s Victorian mains replacement works being recovered, reprocessed, transported down the Thames by barge and reused to inject new life into an old deposition site near Chatham Docks.

Hoo Island covers an area of 160 acres and lies in the River Medway in Kent. Its owners, Medway Ports, recently began works to transform the area and upgrade the deposition site facilities. The company turned to NISP to help source recovered aggregate materials that could be used to enhance the infrastructure of the facility.

Having worked with Thames Water for a number of years NISP began discussions as to the feasibility of using excavated material from the company’s Victorian mains replacement works. London based reprocessing company H. Sivyer were contacted to reprocess the material, having processed a significant amount of Thames Waters’ recovered aggregate from other sites.

Another company who worked with Thames Water to haul aggregates on a number of its projects, is contracting firm GPS Marine, who provided the final piece of the puzzle. GPS Marine were brought in to transport the excavated and reprocessed material down the Thames by barge and deposit it at Hoo Island ready to be used to develop the infrastructure of the new facility.

This complex four way synergy has seen approximately 100,000 tonnes of materials processed for use at Hoo Island, with 12,000 tonnes of carbon dioxide saved as a result of virgin raw materials being substituted, including the transportation of materials via barge rather than truck haulage to landfill.

As well as providing full time work for 2 reprocessing operators at H. Sivyer, the scheme will generate significant additional sales for H. Sivyer, GPS Marine and Medway Ports.

This project was awarded the 2008 CIWM Award for Environmental Excellence for best sustainable product use.

The Results Include

- Diversion from landfill: 100,000 tonnes
- Carbon dioxide reduced: 12,152 tonnes
- Additional sales generated: £1,620,000
- Jobs saved: 2





Ben Arrowsmith, Commercial Director, Befesa Salt Slags Ltd said:
“The assistance from NISP in introducing Befesa to potential customers, and the technical backup, especially connected to environmental issues since then has been vital.”

Case Study - From Salt to the Earth

Organisations involved: Befesa Salt Slags Ltd and Various Foundries

Thanks to NISP West Midlands more than 10,000 tonnes of waste foundry sand is no longer being sent to landfill, but instead reused to manufacture concrete blocks, bricks and associated products.

As a result of NISP's links with the Cast Metal Federation, a number of West Midlands foundries contacted the NISP West Midlands, team to identify alternative and sustainable ways to reuse the growing amounts of spent foundry sand they were producing as a by-product of their process.

Using its regional knowledge and unique resource flow and data monitoring system, the NISP team was able to link the foundries with one of its members, Befesa Salt Slags, in a synergy generating cost savings for the foundries and new sales for Befesa.

Befesa Salt Slags, based in Shropshire, operates a purpose built facility that treats waste streams produced by the primary, secondary and associated aluminium and iron industry sectors. Over the last few years, as the capacity of the plant increased, the company has been looking at other waste streams generated by the foundry industries in order to be able to offer an alternative to landfill.

The Results Include

- Diversion from landfill: 10,000 tonnes
- Carbon dioxide reduced: 1,020 tonnes
- Virgin Materials saved: 10,000 tonnes
- Additional sales: £200,000
- Cost savings: £300,000



Debbie Neely on behalf of TEG Environmental said:
“Being a member of NISP Scotland has increased the profitability of our business by identifying new input streams, often from unusual sources but which can significantly improve the quality of our compost product.”

Case Study - CORE Collection Tackles Fife Food Waste

Organisations involved: Cyrenian Organic Recycling Enterprises, ACE Eco-Partnerships, TEG Environmental, Diageo, Kingdom Shopping Centre, S M Baynes, St. Andrew’s University and Fife Green Business Network

It is estimated that over a million tonnes of commercial food waste is thrown away every year in the UK. The majority of this food waste is sent straight to landfill where it produces methane gas, which is a much more damaging green house gas than carbon dioxide.

Keen to tackle this growing mountain of food waste, NISP Scotland helped coordinate a complex synergy that has brought together eight different organisations and established a novel and effective food waste collection and reprocessing service in Fife, that is diverting more than 360 tonnes of food waste from landfill a year.

Since 2007, NISP Scotland has worked closely with the Fife Green Business Network, many of whom benefit from being NISP members. A number of the companies asked NISP to identify how they could begin diverting their food waste from landfill. It has taken almost two years to find the right commercial partners for this scheme; the companies generating food waste, a company to collect and transport the waste and another organisation to provide a sustainable outlet for it.

NISP got in touch with Cyrenian Organic Recycling Enterprises (CORE), who they had already been working with closely to help establish a food waste collection round from businesses based in and around Edinburgh. CORE were keen to expand into Fife, but there were a number of aspects where they needed assistance to get the project off the ground.

Following initial interest, NISP facilitated meetings between CORE, Fife Green Business Network, TEG Environmental and ACE Eco-partnerships, (all NISP members), to discuss a trial collection round. NISP developed the infrastructure of the pilot round, which would collect food preparation and canteen waste from four companies in

the Fife area; Diageo, Kingdom Shopping Centre, S M Baynes and St. Andrew’s University.

The food waste was collected and transported by CORE to TEG Environmental’s In-Vessel composting facility in Glenfarg, where it was processed, with the high quality PAS-100 compost product being sold into local markets. Other companies such as The Fairmount Hotel in St Andrew’s, Quaker Oats and Innovate Foods are also now getting on board with the collection round. These additions will increase the amount of food waste diverted to more than 480 tonnes a year. As the pilot has been such a success, CORE is now in the process of establishing a separate base in Fife with the purchase of a new collection vehicle and creating a position for a new full time employee.

The CORE business model has shown that local collections of commercial food wastes are viable, and that there are considerable benefits to businesses.

The Results Include

- Diversion from landfill: 364 tonnes
- Jobs created: 1
- Businesses assisted: 8



Innovation and Knowledge Transfer

In 2005 the University of Birmingham instigated a strategic regional and national knowledge transfer infrastructure in the UK between NISP and the Resource Efficiency Knowledge Transfer Network (REKTN).*

The REKTN, funded by the Technology Strategy Board, provides companies with the support they need to identify and resolve business resource efficiency issues through applying technology. NISP provided the vehicle to stimulate the innovation potential of companies nationwide to become more resource efficient.

As a result of this unique collaboration Innovation Managers (IMs) were embedded into each of the NISP regional teams. The IMs provided the connectivity for any company in the UK to be networked into local and national resource efficiency innovation capability.

The IM's were drawn from a breadth of technological backgrounds, where they went beyond the boundary of traditional waste management technologies to draw on innovation opportunities from across all industrial sectors.

NISP's approach to building relationships and partnerships with companies to help them to identify immediate business opportunities and to maximise the value of their resources, provided the ideal foundation upon which the IM's could then work with companies, universities and research and technology organisations to develop new innovative solutions.

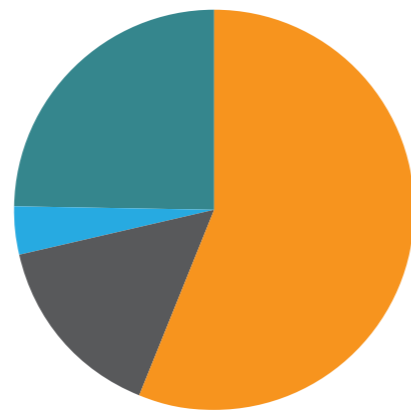
The hands-on-approach by the regional NISP teams was instrumental in the success of the collaborations, which contributed significantly to a growth in the REKTN's research and development project portfolio to over £50m by August 2009.

In 2007, an innovation review assessed the level of innovation in NISP's activities. The member companies participating accounted for 32 market sectors, including: Aerospace, Medical, Metals, Automotive and Chemicals and the technologies developed or utilised, were characterised into 13 groups.

The level of innovation in NISP's activities included utilising established technology, development of a new technology through combining existing technologies or pure research for the development of a new technology (Figure 2).

Figure 2

Level of innovation as a percentage of all case studies



| | |
|-----------------------------|-------|
| Established technology | 56.8% |
| Development | 15.2% |
| Research | 4.0% |
| No innovation or technology | 24.8% |



This embedded knowledge of IM's and the sources of funding that could be accessed by companies, ensured NISP and the REKTN were able to provide complete solution support to companies across the country.

Almost two thirds (56.8%) of the case studies included in the innovation review utilised established best available technologies with another 19.2% utilising some degree of technology development or pure research, which typically reached the market in under 12 months. Less than a quarter (24.8%) of case studies reviewed involved no innovation.

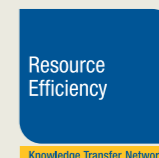
A fine example is the development of an innovative energy resource centre by John Pointon and Sons Ltd, a rendering company who were looking to optimise the use of some of their by-products to produce electricity for the national grid. The University of Birmingham currently has a Knowledge Transfer Partnership with the John Pointon to optimise a system that will deliver their exciting vision.

The value of the innovative activities supported through NISP was recognised in 2007 by the European Commission's Environmental Technologies Action Plan (ETAP) when it became an Eco-Innovation Exemplar project and the REKTN and NISP continue to support each other's activity to this day.

It is anticipated that the study on the innovation of NISP activities will be updated by the University of Birmingham in early 2010 based on a much expanded data bank of case studies.

NISP's three Northern regions (North East, North West and Yorkshire and Humber) have been working together to identify novel solutions for chemical streams. This project involved running two MSc course projects in 2009 with the renowned Green Chemistry department at the University of York, focusing on the inventory of chemical arisings in the North of England. NISP are currently in the process of establishing a consortium to include feedstock providers and market leaders to further investigate and facilitate the potential business opportunities that have arisen as a result of this developing work with Green Chemistry.

*As of 1st September 2009, the Resource Efficiency KTN and the Environmental KTN merged to form the new Environmental Sustainability KTN.



Chris Page, Director, Native Island Ltd said:
"Since the introduction of the new Landfill Directive regulations some treated timber products have become hazardous and must be disposed of correctly and safely. Thanks to NISP and one of our principle partners we have cracked this problem."

Case Study - CCA Treated Timber No Longer a Hazard

Organisations involved: Hamon UK Ltd and Native Island Ltd

Copper chromium arsenic (CCA) treatment of timber was developed in the 1950s to preserve timbers that needed to be highly resistant to insect and fungal attack such as telegraph poles, motorway fencing, timber decking and cooling towers.

At the end of its life, this CCA treated material was sent to landfill. Following changes to the regulations, this type of timber was classified as being a hazardous waste because of the high levels of residual arsenic and chromium it contained.

NISP member, Hamon UK, is one of the country's leading dismantlers and refurbishers of cooling towers, and was faced with the difficult and costly task of what to do with the high volumes of CCA treated timber it was extracting from its various contracts.

On learning of Hamon UK's plight, the NISP Yorkshire & Humber team linked them with another member, Native Island Ltd and their technical partners CSG Lanstar, who had developed a chemical remediation technology to detoxify CCA treated timber, rendering it safe and suitable for non-hazardous landfill.

The technology developed by CSG Lanstar, meets all Environment Agency requirements, and is both more environmentally appropriate and cheaper than hazardous incineration, the only currently commercial alternative available.

Native Island's contractors are able to reprocess CCA treated timber from the project site at their facility in the North West of England. At present the cleaned timber is being sent to non-hazardous landfill, however, the process is being developed to allow recycling of the recovered wood that has the potential to generate additional sales for Hamon UK in the region of £5.5 million.

The Results Include

- Hazardous waste: 600 tonnes
- Cost savings: £300,000
- Jobs created: 19
- Jobs safe guarded: 20
- Private investment: £250,000





Virgin Materials

The world's natural resources are diminishing at an astonishing rate. If we are to avert a global material supply crisis, it is imperative governments across the globe embrace methodologies that are proven to reduce the industrial burden on virgin material supply.

Effectively reducing industry's reliance on virgin materials will help contribute towards establishing material security - an issue that is increasingly finding its way on to both political and boardroom agendas. Material security relates to access to and availability of raw materials for industrial processes. The limited short term availability of some raw materials can be attributed to a number of factors; widespread price increases for certain raw materials, traditional linear industrial structures and processes and a dependence on a limited number of sometimes politically unstable countries as sources for key materials. Materials are most insecure when lack of substitutability in critical applications is combined with the above factors.

We have the evidence to prove that NISP is an effective means of reducing industry's reliance on the use of virgin materials and can therefore play a role in establishing long term material security. Virgin materials are also associated with large embedded energy costs inherent in extracting and refining such materials, including the transport costs and associated carbon dioxide from the use of fossil fuels. Since April 2005, NISP has helped its members collectively reduce industry use of virgin materials by over 9.7 million tonnes (48 million tonnes lifetime benefit under Scenario 2).

48 million

NISP has helped its members collectively reduce the industry of virgin materials by over 48 million tonnes



Simon Whalley, Project Manager for BAM Nuttall, said:

“NISP has come up trumps again sourcing materials through their many contacts and assisting us with relevant Environment Agency paperwork – greatly appreciated.”

Case Study - Guided Busway Never Tyres of Being Green

Organisations involved: BAM Nuttall Ltd and the McGrath Group

NISP’s expertise helped BAM Nuttall to win an award at the 2008 Chartered Institute of Wastes Management Environment Excellence Awards for the innovative use of materials in a construction project.

Cambridgeshire County Council contracted BAM Nuttall to design and build the Cambridgeshire Guided Busway scheme, which once complete is set to be the world’s longest busway covering a distance of more than 26km.

Having already sourced 3,000 tonnes of crushed concrete for BAM Nuttall to use in the project, the company called on NISP’s expertise once more, to help source 40,000 m³ of an alternative material to be used as infill for the full length of the guideway ladder beams, in place of virgin aggregate.

NISP’s East of England team explored a number of reprocessed material alternatives, including recycled crushed glass, crushed concrete, natural gravels and rubber tyre shred.

BAM Nuttall opted to use the rubber tyre shred, and NISP linked them with another member, the McGrath Group, who could supply tyre shred conforming to PAS 107, the appropriate specification for highway works. NISP also contacted the Environment Agency on BAM Nuttall’s behalf to progress their Paragraph 15 exemption to allow them to use this alternative material.

The tyres provide fantastic drainage, are in plentiful supply, must be recycled by law, and were therefore a very green choice. Approximately 45 used tyres were needed per cubic metre for drainage – in total around 1.8 million tyres have been recycled and used for the construction of the Guided Busway. A mixture of soil, seed and ballast was then added to help the grass grow.

The use of tyre shred in place of virgin material costs significantly less, saving the scheme many thousands of pounds. To meet the project’s requirements more than 60,000 tonnes of virgin aggregate would have been required, by using a sustainable alternative the scheme has also reduced harmful greenhouse gas emissions – something that both BAM Nuttall and its client were keen to effect.

The Results Include

- Virgin materials saved: 60,000 tonnes
- Carbon dioxide reduced: 6,120 tonnes
- Water saved: 1,440 tonnes
- Significant project cost savings





NISP Means Business - Economic Impact

NISP is first and foremost a business opportunity programme. It was established with the aim of increasing profitability for industry by means of incorporating IS into their everyday business activities. The fact that this approach yields environmental and social benefits as a consequence of putting business opportunity first is real additionality.

Since April 2005, NISP has helped its members collectively reduce their costs by £131 million (£780 million lifetime benefit under Scenario 2) as well as increase their sales by £151 million (£880 million lifetime benefit under Scenario 2). NISP's role in this varies from company to company but often involves identifying and sourcing new and novel input streams for industrial processes.

Some of NISP's members have boosted their sales as a result of diversifying their business activities, with input and guidance from NISP. NISP's ability to pinpoint potential input streams for a host of applications such as anaerobic digestion or aluminium recycling can play a fundamental role in helping businesses to increase their capacity with minimal risk.

The economic stimulus that NISP creates leads directly to both job creation and new business start ups. The excellent achievements of NISP in this area provides the evidence base for the proposal that NISP be embedded in future government economic policy.

NISP's facilitative role in establishing joint ventures between companies has resulted in **over 8,770 jobs being created and safeguarded** in the last five years; an important factor in today's economic climate where the national unemployment rate is increasing on a monthly basis. NISP

has helped with both inward investment and finding export markets for companies with environmental technologies.

There are areas of business that NISP positively benefits that aren't so obvious; for example NISP has provided information to companies to give them the confidence to invest £131million. In addition we have increased asset utilisation, improved logistics and transfer of knowledge and expertise, all of which have impacted positively on the bottom line for businesses, whilst generating environmental improvements.

£770 million

NISP has helped its members collectively reduce their costs by £770 million

£880 million

NISP has helped its members collectively increase their sales by £880 million



Robert Brocklesby, Managing Director, Double Green Ltd said:
"It was only through the NISP Yorkshire and Humber team's efforts to develop the contact and fatty acid synergy with Greenergy, that we could have formed Double Green, and therefore NISP has played a fundamental role in the company's excellent performance in its first year of operation."

Case Study - Slick Synergy Generates New Business, Jobs and Investment

Organisations involved: Brocklesby Ltd, Greenergy and Double Green Ltd

A slick synergy involving fatty acids being reprocessed into biodiesel sees one of NISP's longest serving member companies creating a new business with a projected turnover of approximately £5 million over the next two years.

The Results Include

- Inward investment: £1,000,000
- Jobs created: 6
- Additional sales: £5,000,000

Brocklesby Ltd has been a member of NISP since the Yorkshire and Humber region began as a pilot programme in 2003. The company set up a subsidiary, Double Green Ltd, in 2007 after NISP facilitated a working partnership with another of its members, a company called Greenergy, one of the fastest growing biofuels producers in the UK.

Greenergy produces over 100,000 tonnes of biodiesel at its plant in Immingham, generating up to 3,000 tonnes of fatty acid residues as a by-product. After assessing the commercial feasibility of collecting and reprocessing Greenergy's fatty acids into biodiesel, Brocklesby invested over £1 million to build a reprocessing plant which employs 6 staff and contributes significantly to the parent company's profitability and bottom line performance (circa £5 million in turnover).

Greenergy is finalising plans to double the production capacity at the Immingham plant, and is continuing to work with NISP to develop further commercial partnerships with other companies in the future.



Vincent McCoy, Erne Group Managing Director, Erne Group said:
“Attendance at the NISP Synergy Workshop provided me with the introductions I needed to allow me to source PVC regrind and processing capacity. I would recommend NISP to any business seeking to establish collaborative networks.”

Case Study - A Window of Opportunity for Erne Plas

Organisations involved: Erne Plas and Reduction Plastics

NISP’s national network approach has helped one of Ireland’s largest PVC and aluminium building products distributors, Erne Plas, cut its reliance on importing PVC construction products from England and Europe in a scheme that has boosted the company’s sales by £1.2 million.

Erne Plas imported most of its PVC construction products but was keen to reduce costs and its reliance on external suppliers by manufacturing these products in-house. The company also wanted to improve its overall environmental performance and offer a 100% recycled PVC product to its customers.

Managing Director of Erne Plas, Vincent McCoy, attended a workshop organised by NISP’s Northern Ireland team specifically for businesses working in the plastics sector. At the workshop Vincent was introduced to reprocessing companies from across the UK who could supply PVC regrind to manufacture into products on site in Lisnaskea, Co Fermanagh.

The workshop also provided the opportunity for Vincent to meet a local Irish reprocessing company, Reduction Plastics, who had the capacity and capability to grind PVC into the powder form necessary for extrusion.

Having secured this source of PVC, Erne Plas proceeded to install extrusion lines following an investment of £1 million so it could manufacture a range of PVC profiles in white and coloured finishes at the plant.

Working with NISP and its members has allowed Erne Plas to cut costs by £37,500 by reducing its reliance on imported products and sourcing local input streams for its new 100% recycled manufacturing process. It has also generated over £1.2 million in new sales from

the products. NISP, is part funded by Invest Northern Ireland and continues to work with Erne Plas to identify local sources of post production and post consumer PVC which is suitable for recycling.

The Results Include

- New sales: £1,200,000
- Cost savings: £37,500





Case Study - There's No Place like Foam

Organisations involved: Sekisui Alveo and Globally Greener Solutions

Thanks to NISP Wales' facilitative role in bringing together two of its members, previously landfilled foam products are being recovered, reprocessed and reused to build low cost, sustainable housing with the companies involved generating costs savings of more than £25,000.

Sekisui Alveo is Europe's leading manufacturer of high quality cross-linked polyolefin foams. The company's manufacturing facility in Merthyr Tydfil, South Wales produces a range of foam products for the automotive sector including acoustic water shields and instrument or door panels.

Any off-spec or edge trim material is reused in the company's manufacturing process to minimise waste. However, material that has been through the cross-linking process, cannot be reused due to its composition and fire-retardant properties and is compacted and landfilled at a cost to the company.

Having been a member of NISP Wales for over a year, the NISP team was involved in exploring several possible opportunities for reusing this material.

Swansea based Globally Greener Solutions (GGS) then became a member of NISP Wales in 2008. The company showed NISP its low energy, cost effective, portable or static reprocessing unit they had developed. The unit reduces the size of the input waste material, then mixes and moulds it into an inert material called GLOWASOL, which can be reused in a host of manufacturing processes including panels for building low cost, sustainable housing.

The NISP Wales' team immediately identified the potential synergy between the two companies and arranged for samples to be exchanged and trials began.

GGS then worked with Sekisui Alveo to engineer a new improved waste handling system to prepare the material ready for transport and use at their Swansea manufacturing facility.

GGS is now reprocessing up to 400 tonnes of previously un reusable plastic waste, while Sekisui Alveo is saving on disposal costs and further improved its environmental performance.

The Results Include

- Cost savings: £25,000
- Carbon dioxide reduced: 6,389 tonnes
- Landfill diverted: 500 tonnes
- Virgin materials saved: 500 tonnes





Water

Water is an exceptionally valuable resource and businesses from all sectors use it as part of their everyday activities. Those producing metals, wood, paper products, chemicals and oils are just some of the largest industrial users of water.

The application of NISP into business activities doesn't simply encourage businesses to use water more efficiently. It looks at the industrial processes involved in each business and identifies where waste water (effluent) can be captured or in some cases treated and then reused elsewhere by the same company or by another.

This ensures that businesses use and pay for less water than before, which generates cost savings and reduces the industrial burden on the nation's water supply. Since April 2005, NISP has helped its members collectively reduce industrial use of water by over 9.6 million tonnes (47 million tonnes lifetime benefit under Scenario 2); the equivalent of filling over 19,000 Olympic sized swimming pools, and has instigated a number of innovative and novel trials to test the feasibility of using effluent water.

During 2006, NISP worked alongside the Environment Agency and Masters' students from Cranfield University to explore the NISP potential of water used in the metals and food and drink sectors. The final report illustrated the massive potential for water savings in both sectors and this information has been fed into the market intelligence work currently being undertaken in the West Midlands' region (see Section 08).

47 million

NISP has helped its members collectively reduce industrial use of water by over 47 million tonnes

Mr Who, Managing Director, Anglian Water Services said:
“NISP instigated this whole review process by raising the potential of collaborative use of water treatment facilities in the South Humber Bank. Their insight has enabled the region to benefit from significant economic and environmental benefits.”

Case Study - Making a Splash in Humberside

Organisations involved: Anglian Water Services, ConocoPhillips, North Lincolnshire Council and Yorkshire Forward

NISP’s Yorkshire and Humber team, working on behalf of industry and local government in the region, carried out a detailed review of the water supply to businesses in the South Humber Bank, to consider the feasibility of establishing a cooperative water sharing and distribution scheme for industry in the region.

The review, instigated by NISP, followed the development of a Combined Heat and Power plant in Immingham. The plant, the largest in Europe, provides an output of 750 mega watts of power each year – fulfilling its own energy needs, as well as providing electricity and steam to neighboring companies.

NISP explored the potential for collaborative use of water treatment facilities to release 3 million m³ of non-potable water for the businesses in the area. The NISP team held discussions with most of the large water users on the Humber Bank and reviewed the use of potable, non-potable and borehole water. Other issues such as effluent treatment, impact of Integrated Pollution Prevention and Control and water supply profiles were also investigated as part of the review.

NISP evaluated the possible use of these large amounts of non-potable water, including the potential use of water from the local municipal water treatment facility to supply water to the Humber Bank industries, following further tertiary treatment. As a direct result of this overall review, Anglian Water Services identified a way to release the non-potable water that would help to further support the development of industry along the South Humber Bank.





Hazardous Waste

Very few UK landfill sites are permitted to handle hazardous waste streams. This means that businesses producing hazardous waste are paying high storage, transport and disposal costs.

Although tonnage diversion figures for hazardous waste are relatively small compared to general industrial waste, it is an important area of focus for NISP, as this type of waste is invariably toxic, more persistent and inherently dangerous. Although NISP invests a greater proportion of its time in identifying solutions for hazardous waste, the rewards are greater in terms of reduced environmental impact and cost savings.

Since April 2005, NISP has helped its members collectively divert over 363,600 tonnes (1.8 million tonnes lifetime benefit under Scenario 2) of hazardous material from disposal into productive use.

1.8 million

NISP has helped its members collectively divert over 1.8 million tonnes of hazardous material from disposal into productive use



Manel Roura, DENSO Manufacturing UK Environment Officer, DENSO said:
“DENSO is continuously looking to improve its commercial and environmental performance – and thanks to NISP we are able to do both.”

Case Study - A Wheel Innovation for Denso Manufacturing

Organisations involved: Denso Manufacturing UK Ltd and Mil-Ver Metals

Creating diverse yet profitable links between companies is what NISP does best. There's no better example of this than the link facilitated between Telford based DENSO Manufacturing UK Ltd and Coventry based Mil-Ver Metals, that sees hazardous waste being recovered and reused to manufacture aluminium alloy wheels for cars.

DENSO produces air conditioning units and engine cooling systems for the automotive industry. A waste generated in this manufacturing process is a Potassium Aluminium Fluoride based material, which is classified by the Environment Agency as a hazardous waste and therefore is subject to high disposal costs and must be handled with the utmost care.

Having implemented a zero waste policy at the site, DENSO was keen to explore sustainable ways in which this hazardous material could be reused, especially as it was costing the company £30,000 to dispose of the 15 tonnes of the material collected each year.

DENSO has been a member of NISP since early 2007 and alerted the West Midlands' team to its problem. The NISP team searched through its national resource monitoring database and found a potential link with Mil-Ver Metals, a leading producer of primary base and secondary aluminium alloy ingot.

A series of meetings involving the two companies and NISP took place to investigate the feasibility and logistics of transporting and reusing the material. Mil-Ver Metals' foundry has the very latest in rotary furnace melting technology placing the company at the forefront of European aluminium recycling. Subsequently, NISP facilitated the scheme which sees Mil-Ver Metals collecting and reprocessing the 15 tonnes of hazardous material from DENSO into

aluminium ingot, which is then sold on and used to manufacture high quality alloy wheels.

The Results Include

- Hazardous waste diverted from landfill: 15 tonnes
- Cost savings: £30,000



Case Study - Diageo Aspiration for Sustainable Label

Organisations involved: Diageo Northern Ireland and ISL Waste Management

Diageo has been a member of NISP Northern Ireland since 2007. Its environmental policy states that it should operate as a sustainable business and cause no long-term degradation of natural resources.

Although Diageo were making steady improvements year on year with the recycling of materials such as plastic and cardboard, the company wasn't able to find alternative uses or treatments for the small amounts of hazardous waste it was producing, such as waste labels removed from bottles using a corrosive agent.

The NISP Northern Ireland team partnered Diageo with another NISP member, ISL Waste Management (ISL), an expert at finding alternative recycling solutions. ISL, through collaboration with others, was able to identify a means to neutralise the hazardous labels with the resulting product from this process being a non-hazardous compost which has commercial value.

The Results Include

- Hazardous waste diverted from landfill: 70 tonnes
- Cost savings: £4,200
- Virgin material saved: 50 tonnes



“Our involvement with NISP has given us a great networking and benchmarking opportunity. This has not only enhanced our environmental performance, but has allowed us to develop partnerships with other local businesses. These partnerships have proven to be mutually beneficial from both business and cost perspectives.”

Joanne Doak, Compliance Manager, Diageo Global Supply, Belfast

06

NISP - Coordinated Nationally, Delivered Regionally

One of the reasons for NISP's overwhelming success in the UK is the way in which it is managed and delivered. The programme has a nationally coordinated operational focus that is underpinned by a regional delivery structure. It is the regional teams' knowledge and insight into specific regional agendas on the economy and environment that enables NISP to make such a positive impact across the UK.

NISP has teams in the devolved administrations of Scotland, Northern Ireland and Wales. These programmes are funded by the Scottish Government and Invest Northern Ireland, while in Wales it is delivered under a subcontract arrangement. Each of the devolved administrations acknowledges the added value and benefit of being part of a UK national programme delivering direct benefits in-country.

In addition, there are nine regional NISP teams in England funded by Defra, namely Yorkshire & Humber, North East, North West, East of England, East Midlands, West Midlands, London, South East and South West. This delivery structure ensures that NISP's aims can be regionally aligned according to relevant key economic and environmental objectives.

Providing this flexible but highly targeted approach demonstrates NISP's insight into what works best for industry. This includes an understanding that businesses do not recognise 'artificial' administrative boundaries, but prefer to be a part of an all encompassing, adaptable and UK-wide programme that works best for them.

There are further benefits of NISP being a UK-wide programme. The regional teams are made up of expert practitioners from a range of technical, academic and industry backgrounds across all sectors. Because of the unique way the regional teams are connected, for example through the use of a common database and communications platform, the expertise does not have to be replicated in each region as the practitioners' skills and expertise are available to the entire network. It has not been uncommon in NISP for industry problems to be identified in one region and a solution fashioned in another, with the resulting benefits occurring in many regions. Thus NISP is a highly efficient way of transferring knowledge and innovation.

NISP in England

For brevity we have only mentioned a few of the nine English regional NISP teams, however, all nine English regions are highly successful and have excellent, experienced and expert practitioners.

Pioneering 'joined up thinking' and collaboration

In the North East, North West and Yorkshire & Humber regions for example, NISP is heavily involved in helping the Regional Development Agencies (RDAs) meet the aims of the Northern Way, a unique initiative bringing together the cities and regions of the North of England to improve the sustainable economic development of the North. The Northern Way initiative aims to influence policy and delivery at a local, city, regional and national level; to join up thinking and encourage collaboration – an approach that NISP has been pioneering since day one.

Delivering flagship projects throughout the capital

In London, the work of NISP is very much aligned to the aims of the London Development Agency to deliver the Mayor's vision for London, as well as working closely with the London Waste and Recycling Board (LWARB). NISP is working with companies delivering flagship projects throughout the capital. NISP London's involvement in strategic projects has demonstrated NISP's ability to provide solutions to London's marketplace, particularly for logistics management. Pioneering the re-introduction of barge transport, NISP's member companies are using rivers and canals to transport construction materials, reducing congestion on road and rail links, and providing cost-effective and flexible solutions. NISP is also working closely with the largest dedicated food waste processor in London to identify suitable locally viable input streams for its new food waste processing facility in south London.

World class knowledge base, creativity and enterprise

NISP East of England is based in Cambridge, a hub of academic innovation, technology and manufacturing and at the centre of the UK's most research and development-intensive region. Key national and international businesses such as BAM Nuttall find the market intelligence and innovative solutions they need through their interaction with NISP, generating cost savings, ensuring competitive advantage and reducing their impact upon the environment. Here NISP works with the East of England Development Agency (EEDA), helping it to realise its vision to create a leading economy founded on a world class knowledge base, creativity and enterprise; by providing tangible, measurable benefits to businesses in all sectors through IS.

NISP is the basis for the region's hugely successful Construction, Utilities and Aggregates Working Group (CUAWG) meetings which typically see 50+ members meeting for 2-3 hours of intense resource utilisation discussions. The resulting synergies from these unique meetings can top 300 on the day and lead to significant business benefits, job creation and investment outcomes that contribute to EEDA's Regional Economic Strategy. NISP also works closely with leading academic institutions in the region, enabling researchers to bring their innovative solutions to businesses. R&D departments in manufacturing organisations, such as the automotive and paper sectors are also able to meet and collaborate with new business partners outside of their own industry sectors, encouraging further innovation and cross-fertilisation of ideas.

Steering the region towards a low carbon, sustainable economy

NISP West Midlands was one of the first regional pilots back in 2003 and has been working hand in hand with the RDA Advantage West Midlands (AWM) ever since, to deliver its key regional economic objectives and more latterly to steer the region towards a low carbon, sustainable economy.

NISP West Midlands is now involved in the next phase in NISP's evolution - intelligence based IS. It has been commissioned by AWM to carry out a market intelligence project looking at two of the region's key industrial sectors, Food & Drink and Metals. The project uses traditional NISP methodology, but also incorporates the use of regional environmental performance data to identify opportunities for the two sectors. Further analysis and modelling of available regional resource data then informs and identifies the major resource flows and waste streams in the region, which is used to identify industrial areas prime for cluster development and inward investment. The report on this exciting programme development will be available December 2009. This is a first step to adding predictive modelling to supplement NISP's demand led approach (please see Section 08 on RED IBIS for more detail).



Paul McPherson from Maltwood said:
“As a new business it’s critical to make every penny count. Working with NISP has made an incredible difference to our bottom line in a very short time.”

NISP in Scotland

NISP Scotland has been operational since 2003 and was one of the three original NISP pilots. The region plays a key role in helping turn the government’s vision for a ‘Zero Waste’ society into reality.

In the last year alone, NISP Scotland helped companies across the country divert over 72,000 tonnes of industrial waste from landfill. This significantly exceeded the target set by the government and contributed to reducing Scotland’s industrial carbon dioxide by more than 21,000 tonnes in the same period.

NISP Scotland currently works with over 1,500 businesses from all industrial sectors, with a focus on addressing ‘difficult’ material streams such as contaminated commercial food, fish wastes, drilling mud, decommissioned oil rigs and industrial plastics.

The region’s industry led PAG meets every three months and provides valuable input into NISP Scotland and on the ground knowledge and experience of Scotland’s key industrial sectors. The PAG also receives excellent support from the Scottish Environment Protection Agency.

NISP Scotland’s insight into regional resource streams has enabled it to generate sizeable benefits for a range of member companies. These include TEG Environmental, a national environmental composter who has completed five synergies to date and is working on another three potential opportunities, and a new business start up from Fife called, Maltwood, that uses staves from old whisky barrels to make ‘dram’ fine firewood. Maltwood is already saving £20,000 a year as a direct result of a NISP facilitated link.

| Outputs | Total April 2007 - September 2009 |
|---------------------------------|-----------------------------------|
| Landfill diversion | 190,219 |
| CO ₂ reduction | 86,766 |
| Additional sales | £1,106,841 |
| Cost savings to industry | £1,724,983 |
| Private investment in recycling | £1,095,000 |

Below: Nigel Holmes, NISP Director for Scotland, Kim Fellows, Waste and Pollution Reduction Division Deputy Director, Scottish Government and Peter Laybourn, NISP Programme Director.



Richard Leonard, Environment Manager, Corus Strip Products said:
“We have been a member of NISP Wales since the programme started and we continue to benefit from a series of innovative solutions that have enabled us to divert by products from landfill, contributing to both environmental and financial performance.”

NISP in Wales

Diverting waste from landfill is a major priority for the Welsh Assembly Government. The draft Waste Strategy for Wales outlines targets to achieve zero waste by 2050, with an interim target of 70% reuse and recycling of waste by 2025. These targets are linked in with Wales’ Sustainable Development policy - One Wales: One Planet.

NISP’s work in Wales is closely aligned with these aims and the programme is already successfully working with industry across the country to make significant reductions in industrial wastes being sent to landfill.

Members across Wales range from SMEs (that make up 99% of the businesses in Wales) to large blue chip multinationals, including Dow Corning, Kronospan, UPM Kymmene, Kimberly Clark, Knauf Insulation, and RWE Power International.

The diversity of business types, size and sectors has played a key role in the success of NISP in Wales. This is evident in a synergy facilitated by NISP, which sees foam products from an international automotive company being innovatively reprocessed and reused to input into the manufacturing process for sustainable low cost housing.

A highlight of our work in Wales has been realising the advantages of being part of a UK-wide programme. NISP breaks down traditional barriers, and maximises the opportunities that exist between Wales and its neighboring English regions.

When a company from Wales becomes a part of NISP, they benefit not only from the experience of the team in Wales, but that of a growing network across the UK and beyond. NISP is currently delivering IS in Wales under a sub-contracting arrangement.



Olive Hill, Director of Technology and Process Development, Invest Northern Ireland said:

"During the current economic downturn, companies can make significant savings on their operating costs by collaborating with others in the use of resources. NISP, in association with INI, offers practical support to assist businesses implement such measures and realise these efficiencies in order to maintain their profitability under difficult trading conditions."

Brian Lockhart, Director, Wilson's Country Ltd said:

"Wilson's Country Ltd has been very impressed with the level of advice given. This has helped us to improve our profitability and reduce our environmental impact. Wilson's Country look forward to continued help and guidance from NISP in the future."

NISP in Northern Ireland

NISP has been working closely with its funder, Invest Northern Ireland (INI), since February 2007 to deliver the country's waste strategy - Towards Resource Management - which emphasises the drive to achieve sustainable consumption and production, in turn, leading to improved resource efficiency across all business sectors.

Since its launch, NISP Northern Ireland's work has been instrumental in creating and safeguarding more than 30 jobs and boosting its members' profits by £2 million. The programme has also worked with its members to reduce Northern Ireland's industrial carbon dioxide emissions by 40,000 tonnes and divert more than 10,000 tonnes of waste from landfill.

With over 500 business members, NISP Northern Ireland's team is strengthened by a proactive PAG that includes senior representatives from company's such as Michelin, Invista, Bombardier, Moy Park and Glenfarm. NISP Northern Ireland is also aligned with a number of key trade bodies such as the Northern Ireland Polymers Association, the All-Ireland Polymers & Plastics Network, Northern Ireland Manufacturing, Construction Employers Federation and the Quarry Products Association. These relationships, along with links to local universities and the Northern Ireland Environment Agency are key ingredients in making NISP Northern Ireland successful.

NISP Northern Ireland works with businesses of all sizes and across all industry sectors and has had particular success with the plastics, food & drink, engineering and construction sectors, all of which are vital to the local economy. In its first full year of operation, the NISP Northern Ireland team identified over 600,000 tonnes of material and resources prime for recovery and reuse, with the potential to generate cost savings of more than £30 million.

To round off a successful year, NISP Northern Ireland scooped the Environmental and Recycling Award at the 2008 Portadown Chamber of Commerce Awards, having impressed the judges with its innovative approach to helping businesses improve both financial and environmental performance.



07

NISP - A Global Phenomenon

The idea behind NISP came from a chance meeting in 1999 between Andy Mangan of the United States Business Council for Sustainable Development (US BCSD) and Peter Laybourn, NISP's founder and Programme Director. When working as a consultant for Shell Exploration and Production in Aberdeen, Peter was introduced to Andy who explained the By-Product Synergy (BPS) Programme that they had set up in Tampico, Mexico in 1997. This idea inspired Peter to develop the IS model that has become NISP as we know it today.

Ever since that meeting, NISP has remained in close contact with the US BCSD, and we are delighted that Andy has contributed a progress report on the BPS Programme in the United States and comments on the continued collaboration with NISP.

It is significant that many other individuals and organisations across the world are arriving at the same conclusions as we did some years ago; that NISP impacts positively on the economy while substantially addressing environmental issues, notably on the climate change agenda. We are therefore grateful for Tracy Casavant's contribution on Sustainable Economic Development Zones (SEDZ) in Canada, later in this section. These SEDZ have evolved from a planning approach subsequently enhanced by embracing engagement with industry – this is not too dissimilar to RED IBIS currently being implemented by NISP (Section 08), which initiated from industry, but realises the important role planning plays in moving towards a low carbon economy.

You will see from Professor Roland Clift's excellent piece on academic underpinning (Section 09) that there is a very healthy worldwide academic network that NISP has both engaged with, and has, as a result of being the world's only national IS programme, become the object of study itself. Our next objective is to stimulate

the development of a worldwide network for practitioners by creating an International Centre for Applied IS which would further increase knowledge, expertise and understanding of the benefits of demand-led and intelligence based IS.

In Europe we are extremely grateful for the level of continued support from the European Commission (EC) through its Environmental Technology Action Plan (ETAP) and in the short term we are looking forward to working with the Lower Saxony area of Germany, in addition to Romania and Hungary where programmes are under way funded from the EC's LIFE+ programme.

As well as providing funding to NISP in England, Defra has also recognised the wider international importance of NISP through its Sustainable Development Dialogues (SDDs), with NISP projects now being implemented in Brazil, China and Mexico with Defra support.

Over the last five years NISP has had the privilege of hosting delegations of senior policy makers and companies from countries including China, Korea, Australia, Denmark, Turkey, Germany, Mexico, Brazil and the USA and welcomes this international interest and dialogue. NISP has been invited to present in Turkey by

invitation of the United Nations Development Programme and also to the World Bank.

The NISP website has, in the last year, been visited by people from 147 nations from Australia to Zambia with the United States of America and Indonesia providing the most 'hits'; we take this as further evidence of the growing interest worldwide in NISP.

There are numerous other examples of IS across the world and we would have been delighted to have featured all of them. We do, however, wish them every success and hope that they too develop into national programmes like NISP, bringing so many additional benefits.



Ian Clark Head of ETAP, who spoke at Green Week in Brussels in 2009:

"NISP provides a win-win situation combining resource efficiency and reduced costs, opening up new markets and new products, and helping implement EU and national policies."

NISP in Europe

The Environmental Technologies Action Plan (ETAP), was introduced by the European Commission (EC) to make eco-innovation an everyday reality throughout Europe. The plan was adopted by the EC in 2004 to cover a wide range of activities promoting eco-innovation and use of environmental technologies. Its objective is to improve European competitiveness in this area, and enable the European Union (EU) to become the recognised world leader in promoting a sustainable future. Eco-innovation is crucial to the economic competitiveness of Europe and its future well being. Eco-friendly technologies are good for business, reduce pressure on the environment and help create new jobs.

In 2007, ETAP introduced eco-innovation roadmaps across almost all EU countries, aiming to show how environmental technologies can contribute to a nation's innovation and competitiveness. An analysis of the roadmaps by ETAP highlighted a number of exemplar schemes from which other member states could learn from and that had the potential to be rolled out across the whole of the EU. NISP is one of only a handful of European wide initiatives that has been accredited by ETAP as an Exemplar of Eco-Innovation.

This high level of acknowledgement and support from ETAP should serve as the stimulus to encourage governments and their agencies across Europe to implement sub-regional and regional NISP programmes, leading eventually to national and cross border programmes.

It is encouraging to see the speed with which NISP is spreading across Europe. Aside from the UK, Romania and Hungary are some of the first to embrace NISP, and have subsequently stimulated interest in the nearby countries of Poland, Bulgaria and Slovakia. A three-year regional NISP programme commenced in Romania in 2009, which sees NISP's international team working alongside Romania's Ministry of Environment and Sustainable Development to establish a NISP network in Suceava, one of the country's largest industrial areas. The predominant industries in Suceava include wood, food, construction and textiles making it an ideal location for the country's first IS project.

Both the Romanian and Hungarian programmes are being financed by the EC through its LIFE+ programme, which aims to contribute to the implementation, updating and development of community environmental policy and legislation.

In approving these programmes, the EC has specifically identified NISP as an innovative approach for tackling climate change.

In March 2005, the re-launched Lisbon Strategy focused around 4 core themes:

- Unlocking Business Potential
- Energy and Climate Change
- Investing in Knowledge and Innovation
- Investing in People

NISP contributes in significant measure to all the above themes and in addition has been **cited as best practice in the European Commission's 2009 Guidelines on Waste Reduction Programmes.**



Sustainable Development Dialogues (SDDs) in China, Mexico and Brazil

The prevalence of NISP in Defra's SDD projects indicates that NISP is steadily beginning to make a global impact. The SDDs are led by Defra in collaboration with the Foreign Commonwealth Office and the Department for International Development as a cross-government initiative aimed at mutual learning on how to incorporate sustainable development values into worldwide government policy.

NISP is currently working in three of the five Dialogue countries – China, Brazil and Mexico and hopes to be commissioned to lead NISP projects in India and South Africa in the near future. Phil Callaghan, Defra's Head of SDDs, comments:

"The Sustainable Development Dialogues build on existing co-operation between countries and provide a coherent framework for new and innovative collaboration to take place."

The economies of China, India, Brazil, South Africa and Mexico are significant because they are key regional players with expanding economies and rising expectations, who are now experiencing significant environmental and social pressures."

The success of a pilot circular economy project, led by NISP and completed in 2008 in the Yunnan Province of South West China, has led to an unprecedented partnership between NISP and the Tianjin Economic-Development Area (TEDA), the world's largest industrial park.

With the assistance of funding from the EC's Switch Asia and Defra's SDD programmes, TEDA and NISP will be establishing a NISP network in the park starting in February 2010.

NISP Mexico, another SDD project, continues to develop on a national scale. The country's first pilot project began in the Toluca-Lerma region of Mexico State in 2008. There are now no fewer than five other states (including Guanajuato which will start in December 2009), expressing interest in joining NISP Mexico. This progression replicates the implementation and development pattern of NISP in the UK - from regional to national.

When NISP UK commenced in 2003 it was on a small-scale. However the exceptional success of each of the regional projects contributed to the programme exploding in both size and complexity. As with NISP Mexico, there is a real appetite from those involved in NISP Brazil to develop it into an integrated national programme with all the concomitant benefits.

Below: Zhang Jun, Vice Chairman of TEDA Administrative Commission, Lynne Jones MP, Selly Oak and Peter Laybourn, Programme Director, NISP





Collaboration with the United States Business Council for Sustainable Development (US BCSD)

Cross-Atlantic cooperation: US BCSD and NISP join forces to advance By-Product Synergy/IS worldwide

The US BCSD is a non-profit association of businesses that, since 1993, has been working on collaborative projects to advance sustainable development. One of its signature approaches is By-Product Synergy (BPS), a process that matches under-valued waste or by-product streams from one facility with potential users at another to create new revenues or savings with potential social and environmental benefits. These synergies reduce waste, promote the efficient use of natural resources, and create a legally protected forum in which companies can explore reuse options. BPS also reduces climate-changing greenhouse gas emissions.

The replicable BPS process, piloted by the US BCSD in Tampico, Mexico in 1997, has since been applied to a growing number of networks the Council has helped establish across the United States. It also inspired development in 1999 of the United Kingdom's National Industrial Symbiosis Program (NISP), which has grown over the years into a strong cross-Atlantic collaboration. While the British and American synergy programs differ in some respects, their core approach and results are very similar.

The BPS process introduces public and private participants to one another as reuse partners and enables them to establish an ongoing collaborative network. On another level, BPS offers a shift from a waste disposal to a reuse model based on regional industry and community collaboration. This leads to solutions across a number of key areas including energy, waste, water, carbon, resource management, research and education and corporate social responsibility.

Since 2005, the US BCSD has watched with admiration as the original NISP initiative grew from Yorkshire and Humber and the West Midlands into a national program covering all of England, Scotland, Northern Ireland and Wales – producing ever stronger numeric

results that prove its worth in sustainability, efficiency, and climate change terms. NISP has been an inspiration to the US BCSD's synergy efforts across the Atlantic.

In the United States, the US BCSD is seeking to scale its BPS program to the national level as well, to achieve similar success in green collar job creation, renewable energy, waste diversion, waste disposal cost savings, and new revenue generation. Its successful programs in Chicago, Kansas City, New Jersey, the Gulf Coast, and Puget Sound and those emerging in New England, New Orleans, Mobile and Ohio provide a good basis for this objective.

Based on their strong history and expanding future opportunities, the US BCSD and NISP have formally agreed to work together in pursuing IS/BPS in the United States and further afield. By collaborating, these two like-minded organizations seek to expand their networks, learn from their shared experiences, and establish synergy networks worldwide. An example can be seen in the UK government's funding to establish NISP programs in Mexico, Brazil, and China.

Perhaps the biggest driver for BPS and NISP in the future will be the regulation of greenhouse gas emissions at national and international levels. Many companies facing the daunting challenge of mandated greenhouse gas emission reductions will see BPS as a lifeline that allows them to move beyond their fence lines to community collaborations. This is something senior business and government officials are starting to understand and support.



Andy Mangan
Executive Director
United Business Council for Sustainable Development

Email: mangan@usbcsd.org
www.usbcsd.org/byproductsynergy.asp

Keys to Success

BPS programs share four principal secrets of success:

- **Diversity:** Participants represent a wide variety of industries and organizations, thereby broadening the markets in which participants can find opportunities.
- **Communication:** BPS provides a safe forum to share ideas without fear of legal, regulatory or other threats. The process stimulates thinking beyond fence lines.
- **Partnerships:** By leveraging technical consultants, regulatory agencies, research organizations and funding sources, barriers to implementing the synergies are reduced.
- **Quantifiable Benefits:** BPS programs carefully track and measure the variety of environmental, economic and social benefits.

The North American Free Trade Agreement (NAFTA) for Environmental Cooperation is considering By-Product Synergy as part of its developing climate-change strategy for North America.



**United States Business Council
For Sustainable Development**



Collaboration with Canada - Sustainable Economic Development Zones

For the past eight years, Eco-Industrial Solutions Ltd has been using the concepts of industrial ecology to plan and develop Canadian Eco-Industrial Parks (EIPs) and eco-business regions. These sustainable economic development zones can be compared to some of the Regional Economic Development (RED) initiatives undertaken by NISP; however, the majority of our projects involve municipal government, leveraging local policy-making as a tool to promote sustainable development, green buildings, and business synergies. We apply these concepts to both greenfield and retrofit eco-industrial projects.

A good example of a greenfield EIP project is the TaigaNova Eco-Industrial Park (www.taiganova.com) in Fort McMurray, Alberta, the first conventionally financed, new EIP in Canada. Under Canadian market conditions and the municipal legal framework, we aren't able to dictate who locates where in the industrial park. The types of businesses allowed are determined by local zoning bylaws, which aren't allowed to be too restrictive. In addition, because some (or all) of the water, sewer, stormwater, energy, and road infrastructure has to be constructed first before businesses can build their own facilities, it's too expensive for developers to wait for the ideal, symbiotic business to buy land. Instead, we worked with the local government to amend the zoning bylaws to help us somewhat restrict certain uses, and to ensure that businesses built 'green' buildings. We also amended the zoning bylaw so that the development permit process requires businesses to at least consider if there are any IS opportunities for them.

As with an ecological system, when developing an industrial ecosystem, we must pay attention to both the big picture goals and the small scale details. On a large development scale, TaigaNova was designed with alternative stormwater systems and incorporates utility corridors that will facilitate future development such as greywater cascading or materials transfer between businesses. On a smaller, social scale, we held a free workshop for new land owners to educate businesses about green building resources, cost savings, and design techniques. The workshop also served as a business meeting to build community and provide a base for future synergies.

Like NISP, we have also been working with existing businesses, but the emphasis has been slightly less on symbiosis and more on sustainability or 'eco-industrial retrofits'. Outside a major petrochemical cluster in Alberta, Canadian 'industry' tends to be pretty light – with lots of warehousing, logistics, and distribution. Manufacturing is not as prevalent as in other countries or not as clustered. The size of Canada means that heavy industry like a pulp mill could easily be 500-800 km from another major industrial operation. Nonetheless, there are a number of key industrial areas in each province.

Eco-Industrial Solutions and NISP will be working in the coming year to increase our knowledge exchange and share our complementary expertise. We hope to bring NISP's successful model to Canada to increase IS, which has been a challenge to obtain on any meaningful scale so far. We hope that our experience will help NISP to broaden eco-industrial activity in the UK and abroad, setting the stage for symbiotic activity to occur within businesses housed in green buildings, served by sustainable, low-impact infrastructure, and supported by innovative local planning and economic development policy.



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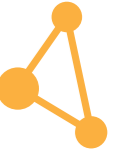


Concept plan of TaigaNova Eco-Industrial Park



TaigaNova Eco-Industrial Park under construction





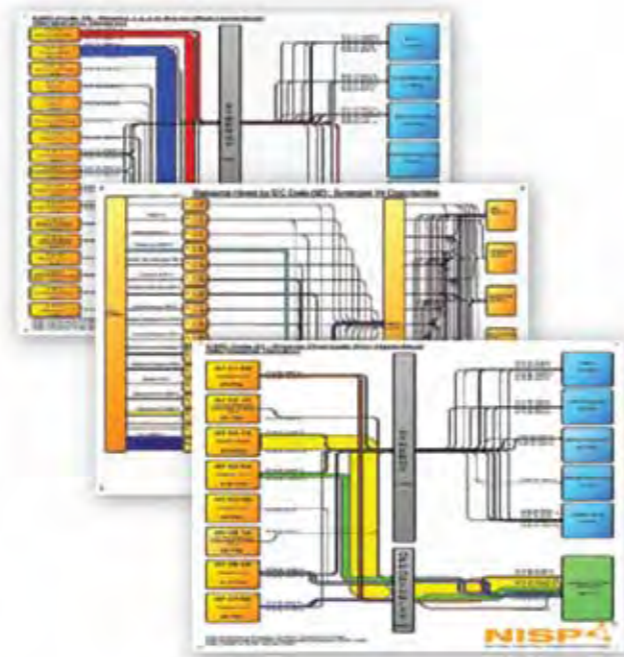
08

Regional Economic Development through Intelligence Based Industrial Symbiosis (RED IBIS)

The overwhelming success of NISP proves that it works. With many years' experience of demand led IS under our belts, we are now able to see further possibilities from this approach. The most immediate prospect is that of using intelligence based IS, to inform regional spatial planning and economic development. RED IBIS has the potential to become the next generation of IS, augmenting the demand led approach with a predictive model. As evidenced by the SEDZ in Canada, there is great potential for 'marrying' spatial planning, eco-parks, and NISP together.

How RED IBIS Works

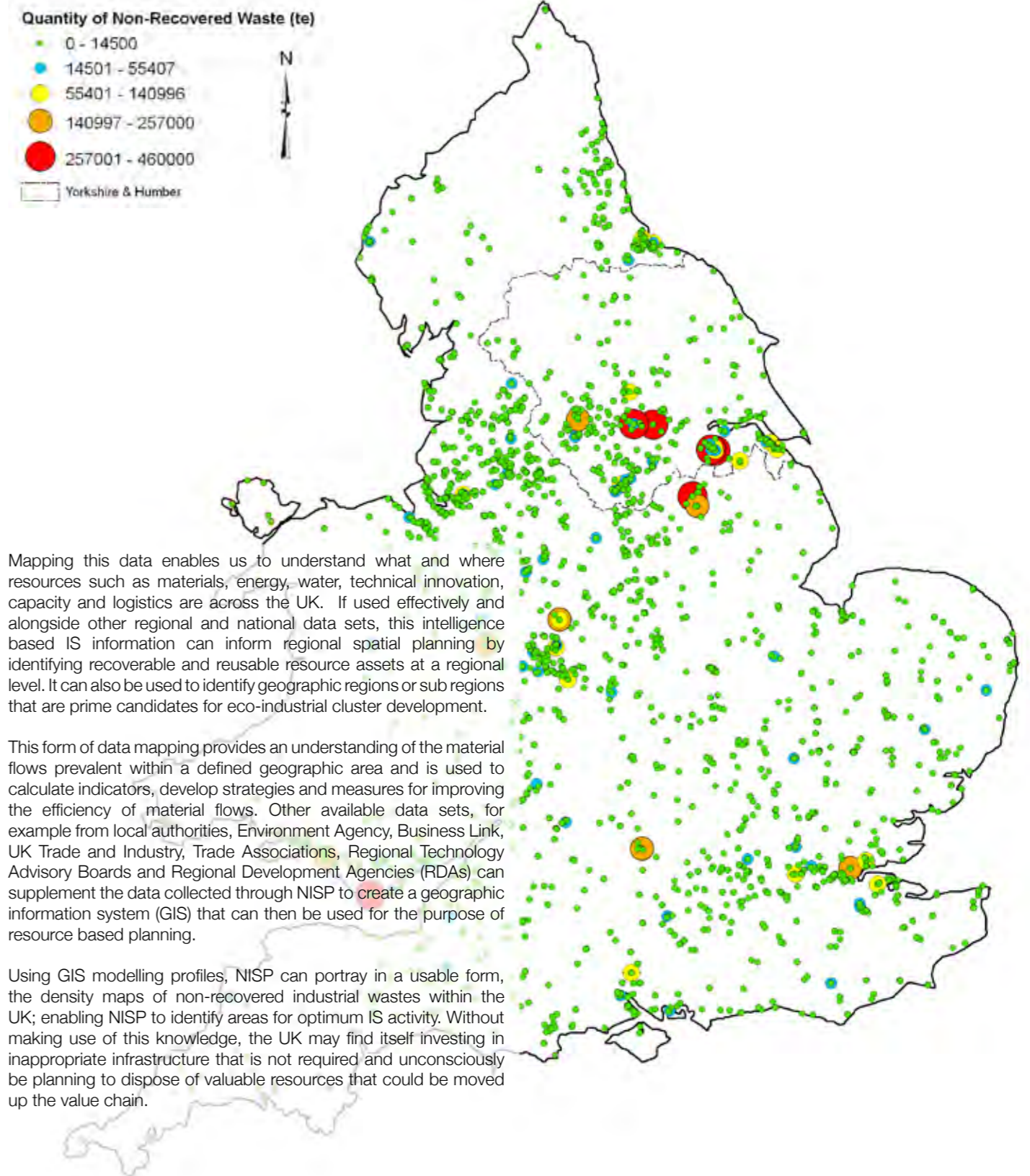
Two of the key 'by-products' generated by NISP are information and data. Over the last five years, our 12,500 members have provided information on resources they have and those they require, for their business processes. Using this data we have identified more than 80 million tonnes of potentially valuable resources available for reuse across the UK (approximately 20% of the total waste stream derived from commerce and industry in the UK).



Above: Selection of material streams

Below: Example of a thematic Dot Distribution Map

GEOGRAPHIC DISTRIBUTION OF NON-RECOVERED INDUSTRIAL WASTE



Mapping this data enables us to understand what and where resources such as materials, energy, water, technical innovation, capacity and logistics are across the UK. If used effectively and alongside other regional and national data sets, this intelligence based IS information can inform regional spatial planning by identifying recoverable and reusable resource assets at a regional level. It can also be used to identify geographic regions or sub regions that are prime candidates for eco-industrial cluster development.

This form of data mapping provides an understanding of the material flows prevalent within a defined geographic area and is used to calculate indicators, develop strategies and measures for improving the efficiency of material flows. Other available data sets, for example from local authorities, Environment Agency, Business Link, UK Trade and Industry, Trade Associations, Regional Technology Advisory Boards and Regional Development Agencies (RDAs) can supplement the data collected through NISP to create a geographic information system (GIS) that can then be used for the purpose of resource based planning.

Using GIS modelling profiles, NISP can portray in a usable form, the density maps of non-recovered industrial wastes within the UK; enabling NISP to identify areas for optimum IS activity. Without making use of this knowledge, the UK may find itself investing in inappropriate infrastructure that is not required and unconsciously be planning to dispose of valuable resources that could be moved up the value chain.



Above and right: The South Humber Bank is prime for RED IBIS

The Yorkshire and Humber region has one of the highest densities of potential resource assets hitherto regarded as wastes. Further mapping and analysis of information for the region can be used to pinpoint the areas that could be taken forward for eco industrial development. For example, land adjacent to the South Humber Bank demonstrates prime potential and is already being considered by NISP's Yorkshire and Humber team for a utilities sharing scheme. Taking both quantitative and qualitative data from NISP and adding GIS analysis layers, means we can produce suitability maps for individual waste streams that hold the greatest residual economic value and if acted upon through NISP, would lead to significant environmental and social benefits.

Advantage West Midlands was one the first RDAs to recognise the potential of a RED IBIS approach, as it was in 2003 when it became the first to fund NISP. Incorporating RED IBIS will advance the development of a regional road map to achieve a low carbon, sustainable economy. NISP is confident that the market intelligence work in the food & drink and metal sectors will be the pre-cursor for full RED IBIS implementation in the region, leading to genuinely Single Integrated Regional Strategies covering the economy, environment and spatial planning. RED IBIS will particularly contribute towards the components of enhanced inward investment and greater market penetration for environmental technology industries in the region.

NISP has evolved and will continue to evolve in the future. We have reached the point where RED IBIS is ready for rollout across the UK. Although we do not know precisely what the future stages of NISP will be, we do know it is 'future proofed' in that it reacts to optimise efficiency whatever the background environmental and economic conditions through innovation and proven techniques.

RED IBIS in Practice

The following example of inward investment, demonstrates how the RED IBIS approach can help secure inward investment and increase the prosperity of a region whilst having significant environmental benefits.



Above: A multifaceted synergy where a paper company is at the hub. The Synergy benefits many companies in the region, the region's economy and also presents a major inward investment to the UK.

From the above, it can be seen RED IBIS introduces further efficiencies into the UK economy and assists planners and policy makers with an improved evidence base. RED IBIS recognises there may be multiple options prior to making expensive investments in infrastructure that could actually take value out of the economy.

“The market intelligence project is focusing on two of the regions key growth sectors and will enable AWM and partners to use IS derived information alongside existing data sets to build a clear picture of regional industrial activity, resource streams and current levels of utilisation. The Agency and partners will then be able to use this information in a predictive way to inform economic strategies. We recognise the potential of this project and the RED IBIS approach in the region.”

Mark Pearce, Corporate Director for Economic Regeneration, Advantage West Midlands

Stages of Evolution to a Low Carbon Sustainable Economy



09

Academic Underpinning of NISP

Roland Clift CBE FREng FIChemtec
 Founding Director of the Centre for Environmental Strategy at the University of Surrey
 President of the International Society for Industrial Ecology and Member of the Science Advisory Council of Defra

Since the industrial revolution, the human economy has tended to use resources – materials and energy – once and then regard them as waste. Anyone who has looked at the rate at which we are using the planet’s resources and polluting the biosphere with emissions like greenhouse gases is acutely aware that this cannot continue. Time is running out – we have at most a decade or two to restructure the global economy or else the future for our children is bleak.

Industrial ecology (IE) is a relatively new approach to this challenge. IE asks what we can learn from natural ecosystems to guide the organisation of the industrial “ecosystem”. IS, as promoted by NISP, is an important part of this movement. Managing materials once they have become “waste” is not enough, we need to avoid materials becoming “waste” in the first place. Part of the IE approach lies in finding ways in which “waste” from one industrial activity can become a resource for another. Thus IS is central in IE.

The IE agenda requires new thinking and analytical approaches which do not lie within any single academic discipline. The difficulties of trans-disciplinary research are well known and significant – not least because, not just in the UK, the current system for supporting research favours single-discipline work – but the intellectual rewards and practical benefits of trans-disciplinary research are also big. The International Society for Industrial Ecology (ISIE) was set up in 2000 to bring together practitioners and academics with the range of disciplines needed to develop the theory and practice of IE. ISIE has a number of subject sections focussing on specific aspects of IE; IS is one of these, and NISP has been one of the main contributors to this section since its formation.

NISP is recognised, not just within ISIE, as the leading organisation promoting IS, but members of ISIE are committed to supporting this development. As a research topic, IS is both challenging and important – what more could a researcher look for? Research questions include how to match organisations with unused co-products with potential users? How to categorise and quantify waste streams which could be used beneficially? How to identify and overcome barriers to such synergies? How to quantify the economic and environmental benefits of IS? Examining these questions at a basic thermodynamic, economic and societal level is intriguing and demanding. My own university has several students, including two doctoral students, already working on these questions.

Developing IS is an important part of the transition to a low-carbon, sustainable industrial economy. Although the recently published BSI approach to estimating the greenhouse gas (GHG) emissions associated with products and services (PAS 2050) does not specify explicitly how to account for GHGs in the kind of sequence of uses which embodies IS, the specification implies how this should be done. This is just one of the research themes which is being pursued in collaboration with NISP. The results show just how extraordinarily effective NISP has been.



In August 2006, NISP hosted the Third International Industrial Symbiosis Research Symposium, “Industrial Symbiosis in Action”. Co-Chaired by Professor Roland Clift from the University of Surrey and Professor Chris Rogers from the University of Birmingham.

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 PDF available for download at:
www.nisp.org.uk/publications.aspx



Roland Clift

is Emeritus Professor of Environmental Technology at the University of Surrey, and President of the International Society for Industrial Ecology. He is a past member of the Royal Commission on Environmental Pollution, and currently a member of Defra’s Science Advisory Council. He was a member of the steering group which oversaw the publication in 2008 of PAS 2050: Specification for the assessment of the life cycle greenhouse gas emissions of goods and services by British Standards Institution, Defra and the Carbon Trust.





international society for industrial ecology

Industrial Symbiosis for International Society for Industrial Ecology Members

*Where practitioners and academics
meet to advance the state of the art*

The Eco-Industrial Development (EIDC) Section is devoted to industrial symbiosis. This section brings together academics and practitioners with a passion for translating the theories of industrial ecology into practice. Section members serve as moderators for industrial symbiosis presentations at ISIE biennial conferences, gain access to a member's listserv, blog and the Industrial Symbiosis Research Symposium conference proceedings among many other resources found on the EIDC website accessible only to EIDC members.

Join the new topical section of the ISIE today.
Visit <http://is4ie.org/topicalsections> today to learn how!

**Not yet a member of the ISIE?
Consider joining today!**

New members that join the Eco Industrial/
Industrial Symbiosis Section get 30% off regular
membership until December 2009.
Visit <http://is4ie.org/join> today and use code ISIE9

ISIE supports research and applications related to the emerging field of industrial ecology.

Membership in the International Society for Industrial Ecology means membership in a community of people, from 42 countries, active in state of the art environmental research, and in developing cooperative business relationships, green products and environmental design.

The School of Forestry & Environmental Studies at Yale University serves as the international secretariat for ISIE.

Visit the ISIE website at
www.is4ie.org



“NISP is recognised, not just within ISIE, as the leading organisation promoting industrial symbiosis, but members of ISIE are committed to supporting this development.”

Professor Roland Clift, President of the International Society for Industrial Ecology and Member of the Science Advisory Council of Defra

“In my experience NISP operates the most effective methodology that has yet been developed for increasing the resource productivity of industry.”

Professor Paul Ekins, Professor of Energy and Environment Policy at the Energy Institute, University College London



10

NISP - People



We believe the people who work on NISP are very special. All have a wealth of knowledge and experience of working in industry, often at a very senior level and all share the same passion for NISP and teamwork across the UK. The following pages highlight just some of the people who have made NISP the success it is today.



NISP - Professional Profiles



Malcolm Bailey Regional Director, NISP Yorkshire & Humber, North East, North West

Eur. Ing. Malcolm Bailey
M.A. (Cantab.), C.Eng.,
F.Inst.E., M.I.Chem.E.

Malcolm heads up the Yorkshire & Humber programme, and is Director of NISP for the North of England. He specialises in energy and business development and has over 20 years industrial experience in the chemical industry. He first became involved with NISP in 2003 when he took on delivery of the Humber pilot programme. He graduated in process engineering from Cambridge University and has since worked on large capital projects, led European steering groups, and co-authored technical papers and corporate standards. Prior to 2000 he held the position of Director of a renewable energy development company and worked on behalf of a large multinational. Malcolm is a Fellow of The Energy Institute and has accreditation from the European Federation of National Engineering Associations.



Ian Aspley Commercial Director, NISP

Board Member of Proskills,
Member of the Institute of
Directors (IoD)

Ian has more than 35 years' industry experience, initially as an industrial chemist, before spending the majority of his career in the building materials arena. Ian worked in the building products sector for more than 25 years in a range of roles including quality management, health & safety, environmental control, production management, and finally as manufacturing director for Marley Eternit, a position he held for 10 years. Ian was the driving force behind much of Marley Eternit's environmental policies that resulted in the company becoming one of the first companies to be accredited under the BRE's Certified Environmental Profiles Scheme in the building industry. Ian also held the position of NISP West Midlands' Programme Advisory Group Chairman since 2003 and decided that he liked NISP so much, he joined the company! Ian is a Board member of Proskills (one of the sector skills councils).

Principal Practitioner, NISP East Midlands

Charlotte has an MSc in Environmental Diagnostics from Cranfield University. She joined NISP in May 2007 initially working in the West Midlands region before moving to manage delivery in the East Midlands. Charlotte has 15 years industry experience, including seven years in the water industry working as an environmental specialist on a variety of issues including climate change strategy, sustainability, waste strategy and managing the delivery of PPC permit applications. Charlotte has particular expertise in corporate responsibility, sustainability reporting, climate change impacts and environmental management. She joined NISP from a Group Corporate Responsibility Manager role at an environmental services group covering water, waste and analytical services.

Charlotte Harper

BSc, MSc, AIEMA



Principal Practitioner, NISP North East

Christine manages the delivery of the North East region and is an Industrial Chemist with eight years experience working in North East chemical companies. During this time she has gained experience in a number of analytical techniques including FTIR, GC-MS and Raman spectroscopy. Additionally, she worked for two years at Johnson Matthey as a pilot plant chemist designing, operating and maintaining three miniature steam reformers for the oil and gas markets. Christine now has 7 years practical experience of implementing IS.

Christine Parry

BSc (Hons)



Dr Nigel Holmes Regional Director, NISP Scotland

MA (Hons), PhD, MBA

Nigel is Regional Director for NISP Scotland. He gained a degree in Chemistry from Oxford, followed by a PhD with the CEGB at Berkeley Nuclear Laboratories. Between 1988 and 2003 he worked for BP, based at their petrochemical complex in Grangemouth, in technical and change management roles. In 2004 he completed a full-time MBA at Edinburgh University, followed by a one year stint as Business Development Manager with siGEN in the Hydrogen and Fuel Cells sector. Nigel joined NISP as RE-KTN Technology Manager for Scotland in July 2006. In April 2007 he led the relaunch of NISP Scotland and established a new team, which has seen NISP Scotland go from strength to strength with key performance targets exceeded in both 2007-08 and 2008-09.



Gary Foster Regional Director, NISP East of England, London, South East

BEng, DipMan, CMI, AIEMA

Gary joined NISP in September 2006 and now heads the Greater South East region including London, South East and East of England. He is focused on developing the team's relationship with the regions' development agencies, key stakeholders such as the Environment Agency and leading private sector organisations. Gary trained as an engineer and project manager in the aviation and wind energy industry. His extensive experience and knowledge enables him to lead a team undertaking projects looking at resource efficiency and the uptake of clean, low carbon technologies in organisations and development projects. Alongside his role in NISP, Gary has led a Carbon Management team within Scott Wilson; he has helped to improve the environmental performance of many different high profile organisations through global consultancy projects.



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The Future NISP - The Pathway to a Low Carbon Sustainable Economy

In the future we anticipate that NISP will continue to develop in a number of directions. Greater international uptake of NISP is likely to result in an increasing number of transnational synergies involving high value materials, knowledge transfer and innovation. NISP business networks will have the opportunity to connect across the world, providing a catalyst for the rapid expansion and deployment of environmental technologies, which in turn is likely to make a significant contribution to combating climate change and other areas of environmental pressure. UK PLC will continue to benefit from NISP and, as IS programmes in other countries continue to grow, NISP UK will learn from them and import relevant technology solutions.

It is our hope that governments will open themselves to the idea of using the NISP approach to help build up economies in post conflict and post disaster areas. Similarly, the World Bank and International Finance Corporation could look to incorporate NISP as an integral part of infrastructure and development projects across the developing world.

RED IBIS is currently being piloted in the West Midlands' region and we will be looking to see this 'tool' adopted across all UK regions; driving regional economies towards sustainability by focusing on regional strengths in resources and infrastructure, attracting appropriate (rather than 'any') inward investment and finding new export markets for environmental technology companies.

NISP will continue to be a driver and an accelerator for innovation. What has been abundantly clear during the last five years, is that the combined talents of industry and the research community hold the answer to many of the UK's (and indeed the world's) current environmental problems. The innovative solutions that are required may not necessarily be technological, but could also require innovation around legislation, culture, financial products and logistics.

It would be a fitting testament to all those who have worked on NISP past and present, if governments across the world were to make the radical move to establish Ministries of Industrial Ecology to embed sustainability thinking and practice across all departments, using an industrial ecology framework, of which IS is a significant part, to drive policy on the economy, climate change and the environment.

NISP has stimulated a demand for greater knowledge on IS, and we look forward to seeing a new generation of students joining industry who already have an academic grounding in IS. While experienced professionals will be able to gain an understanding of IS through a widespread programme of MBA modules and opportunities for Continuous Professional Development in this area.

There is currently no single definition or description of what 'a low carbon, sustainable economy' looks like; what we do know however, is that the widespread integration of the NISP approach into policy should play a big part in both framing the vision and helping set the pathway to achieve it.

Inevitably, NISP focuses on the production side of sustainable consumption and production and looks to governments and other organisations to set the pace on sustainable consumption, but the

gulf between production and consumption need not be so great. The thousands of companies involved in NISP are made up of individuals and many of them through IS, are influenced and informed by the scarcity of resources, the need to use them sustainably and the contributory causes and impacts of climate change.

NISP will continue to challenge governments, industry and other institutions to think holistically and more urgently about the challenges we face. NISP recognises that IS is not a panacea for all our ills, however, it does represent a low cost, immediately available, replicable and scalable way to vastly improve the status quo.

Five years ago we underestimated the economic and environmental benefits that would arise from NISP by a factor of three. We hope we have underestimated again and are confident that when 'NISP+10' is written it will look back on another five years of outstanding achievement and will be acknowledged as being a driving force to creating **The Low Carbon Sustainable Economy.**



12

Acknowledgements

There have been many individuals and institutions who have contributed to NISP over the last five years and we wish to acknowledge them:

NISP in the UK

Alan Holmes - Environment Agency

Dr Alan Whitehead MP

Anne Marsden - Scottish Environment Protection Agency

Danny Lawrence - former Lafarge Cement UK and Chair of the NISP South West PAG

Professor Jennifer Howard Grenville - University of Oregon

Lynne Jones MP

Peter Jones OBE - Ecolateral

Dr D. Rachel Lombardi - University of Birmingham

Ralph Hepworth - former Environmental Cluster Manager for Advantage West Midlands and the first recipient of the NISP award for outstanding contribution to industrial symbiosis

Assistant Professor Ray Paquin - Concordia University, Montreal

The Resource Efficiency Knowledge Transfer Network - especially Dr David Boardman, Dr Arnold Black, Dr David Gardner, Dr Adrian Whyte and Dr Andrew Rowley

Yale School of Forestry and Environmental Studies

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- **Advantage West Midlands**
- **Jonathan Hobbs** - Department for International Development

SDDs and NISP in Europe

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Antonieta Castro - British Embassy, Mexico

Ing. Carlos Benitez de la Garza - Technical Director ANPRAC, A.C., Mexico

Cătălina Teodorescu - British Embassy, Romania

Dimitri de Boer - United Nations Industrial Development Organization

Giles Paxman - former British Ambassador to Mexico

Leo Horn - United Nations Development Programme

Luis Aldrade & Luciana Carrijo - British Embassy, Brazil

M. en C. Edgar del Villar Alvelais - Coordinator for Programs, SEMARNAT, Mexico

Ing. Sandra Denisse Herrera Flores - Undersecretary for Environmental Regulation, SEMARNAT, Mexico

Xenia Tsitiridou - European Policy Adviser, West Midlands in Europe

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NISP is devised and managed by:

International Synergies
industrial ecology solutions

Specifically on this Publication

May Lee – Coordinator

Kirsty Garner – Assistant Coordinator

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