Eco-Region NW

A BIFFAWARD MASS BALANCE PROJECT

An interactive system for waste & resource productivity modeling & benchmarking in the North West region.

WORK PROGRAMME

draft v.1.0:
project commencement stage

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A Biffaward project on Sustainable Resource Use

Eco-Region: work programme

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1 Summary

1.1.1 The project

The Eco-Region sets a new standard for analysis of waste and material flows at the regional scale. It provides a 'joined up' information system which measures environmental performance at both the regional level and the firm level.

Eco-Region is developed from a national research programme of waste / resource flow analysis at the regional scale. The result is an interactive information system for benchmarking waste minimization and resource productivity. This system helps to make the links between different levels – the region, industrial sectors, firms, households and key products.

This information system also makes links between the flows of resources and wastes, and their causes in production and consumption. It also connects a 'top-down' analysis at the regional level, with a 'bottom-up' environmental report template at the firm level.

The Eco-Region prototype in the North West is based on current work in the South East region, and is also linked to similar research around the UK.

1.1.2 Project objectives

The aim of the Eco-Region is to develop a pilot regional information system for waste / materials management and strategic assessment, using the North West region as the demonstration. This will be both a basis for further development of waste management information systems: and a template for wider application across the UK and EU. The specific project objectives include:

- ***Databasing:*** develop a comprehensive data system on regional resource and waste flows: including sources, destinations, balances and ecological footprints.
- ***Modelling***: develop an integrated model to analyse future trends and scenarios, in resource flows, strategic waste management, and assessment of BPEO.
- ***Benchmarking:*** develop and test a benchmarking / reporting system for waste minimization and resource productivity in sectors, firms and products.
- ***Business applications:*** apply the model / database system to waste / resource management in business strategy, focusing on the case study of the construction industry.
- ***Policy & public applications:*** use the database / modelling system to analyse regional policy for their effect on the ecological footprint and resource productivity.

1.1.3 Applications

The project aims to produce not only static information, but an interactive tool and communications platform, aimed at businessses, policy makers and consumers. The benefits include:

- ***Businesses*** can use the Eco-Region system to benchmark waste minimization performance against the sectoral and regional profile, within their environmental management systems.
- ***Industrial sectors*** can make the link between the waste minimization performance of their firms, and the environmental pressures and opportunities they face.
- ***Waste management*** and materials supply industries, can assess more accurately where their problems, risks and opportunities are coming from.
- ***Regional policy-makers*** in waste management, utilities, transport, planning and economic development can get direct feedback on the environmental impacts of their decisions.
- ***Households*** can assess their consumption choices and work out the best way towards ecological lifestyles.

1.1.4 Outputs

In summary the Eco-Region project will deliver:

- ***An interactive website*** which builds up a library of waste minimization data at the firm level, with minimization benchmarks built up in real time.
- ***A full report*** with digital databases on the regional waste programmes and resource productivity benchmarks
- A ***national toolkit*** prototype for business- environmental reporting, based on the CBI model, using the results from the business-environment pilot trials.

The result as a whole aims to provide a practical foundation for an integrated resource productivity strategy in the North West region, and a demonstration of best practice for others.

1.1.5 Project partnership

The project concept has been developed by the Centre for Urban & Regional Ecology, with the Stockholm Environment Institute (York), and in collaboration with a partnership working group managed by Sustainability North West. The appendix contains organization and staff details. The project partnership at present involves representatives of the Government Office NW, NW Development Agency, NW Regional Assembly, Environment Agency, Merseyside and Greater Manchester Waste Disposal Authorities, Merseyside Business-Environment Network, Confederation of British Industry, and White Young Green Environmental.

The project is funded via the 'Biffaward' landfill tax scheme, and is due to start in September 2003. It is planned to complete in 18 months, and report to a broad-based steering group of users and stakeholder organizations.

2 Context

'Waste Minimization' and 'Resource Productivity' are now seen as one of the drivers of economic competitiveness and modernization.

Most industrial sectors now have some kind of strategy for sustainability or corporate responsibility. These highlight both risks and opportunities, on environment / health / safety issues, plus the wider agenda of stakeholder or corporate responsibility.

There has also been rapid take-up of business environmental management and reporting schemes, with 49% of the FTSE100 firms now preparing full environmental reports. So far most of these are focused on management processes i.e. policies and monitoring, rather than the outcomes i.e. environmental throughputs and impacts. Meanwhile government and public services at every level are developing methods for appraisal, indicators, target-setting and reporting, at every stage of the policy process.

One topical issue is that of waste management. With increasing waste arisings, and narrowing options for disposal, there is a clear need to look 'upstream' at where the waste is coming from, and the opportunities for minimization at source. Current information systems do not cover this wider picture very effectively.

At present these different areas of intelligence are generally separate and unconnected – with the risk that benefits in one area, such as business growth, lead to problems in another, such as growing waste mountains. Behind the rhetoric of joined-up government, there is an urgent need to link up between the various information systems.

For this the internet has huge potential, as the main medium for data management, visualization, and interactive searches. But there are now thousands of websites which offer an ocean of information to anyone who looks for it.

So there are three underlying themes which guide the development of the Eco-Region – benchmarking: metabolism: and linkages.

The concept of ***'benchmarks'*** is crucial; to set targets and thresholds: to compare and contrast: and to provide waste management intelligence for operations large and small. The Eco-Region focuses on benchmarks for waste minimization and resource productivity, and makes connections between the regional scale, industrial sectors, firms, and households.

A second theme is that of ***'metabolism'*** – behind the benchmarks and monitoring systems, developing an understanding of waste and the resources and the activities which produce it – a model of economy-environment interactions, in the same way that understanding the human metabolism is essential to health care.

The final theme is that of ***'linkages'***– the ways to translate the raw numbers and long range scenarios into present day opportunities, threats, strengths and weaknesses for sectors and businesses. Again the website format is ideal for building an interactive library of business cases which grow over time.

3 Outline of the project

(including extracts from the Biffaward application form)

3.1.1 Landfill Tax Regulation

The project meets the following approved objects of the Landfill Tax Regulations:

- ***Object C: 'research, development and education, and promotion of sustainable waste management'***.

3.1.2 Need for the project

The needs have been identified by the project steering group, which includes the NW Region Environment Agency, Government Office, Regional Assembly, Development Agency, together with Sustainability NW. The steering group also includes the Centre for Urban & Regional Ecology (CURE) at the University of Manchester, the Stockholm Environment Institute (SEI) at the University of York, and White Young Green Environmental.

Each of the research teams involved have also carried out or collaborated on recent landmark projects including the Regional & Welsh Appraisal of Resource Productivity & Development (REWARD): 'Taking Stock – a mass balance study of the SE region': 'Great Britain plc': 'Resource Flow Audit': 'Regional Interactive Sustainability Atlas': 'Integrated Sustainable Cities Assessment Method': 'Eco-Footprint Analysis of Liverpool': 'Island State' and others. Each of these projects also confirms the need for a comprehensive study on resource flows and ecological footprint at the regional level. The following themes are particularly relevant:

- Need to look at waste minimization in terms of the wider picture of resource flows, by looking upstream and downstream at where the waste comes from and goes to.
- Need for coordinated waste management information & data access systems, with integration between economic, planning, transport & waste strategies
- Need to relate regional trends and targets in waste and material flows, to those of firms and economic sectors, through a comprehensive framework of 'benchmarking'
- Need to make full use of information technology to enable interactive analysis and communication of the results
- Need to reach beyond the policy and research spheres, to engage especially with businesses, trade organizations and economic development organizations.

3.2 Project objectives

The aim of the Eco-Region is to develop a pilot regional information system for waste / materials management and strategic assessment, using the North West region as the demonstration. This will be both a basis for further development of waste management information systems: and a template for wider application across the UK and EU. The specific project objectives include:

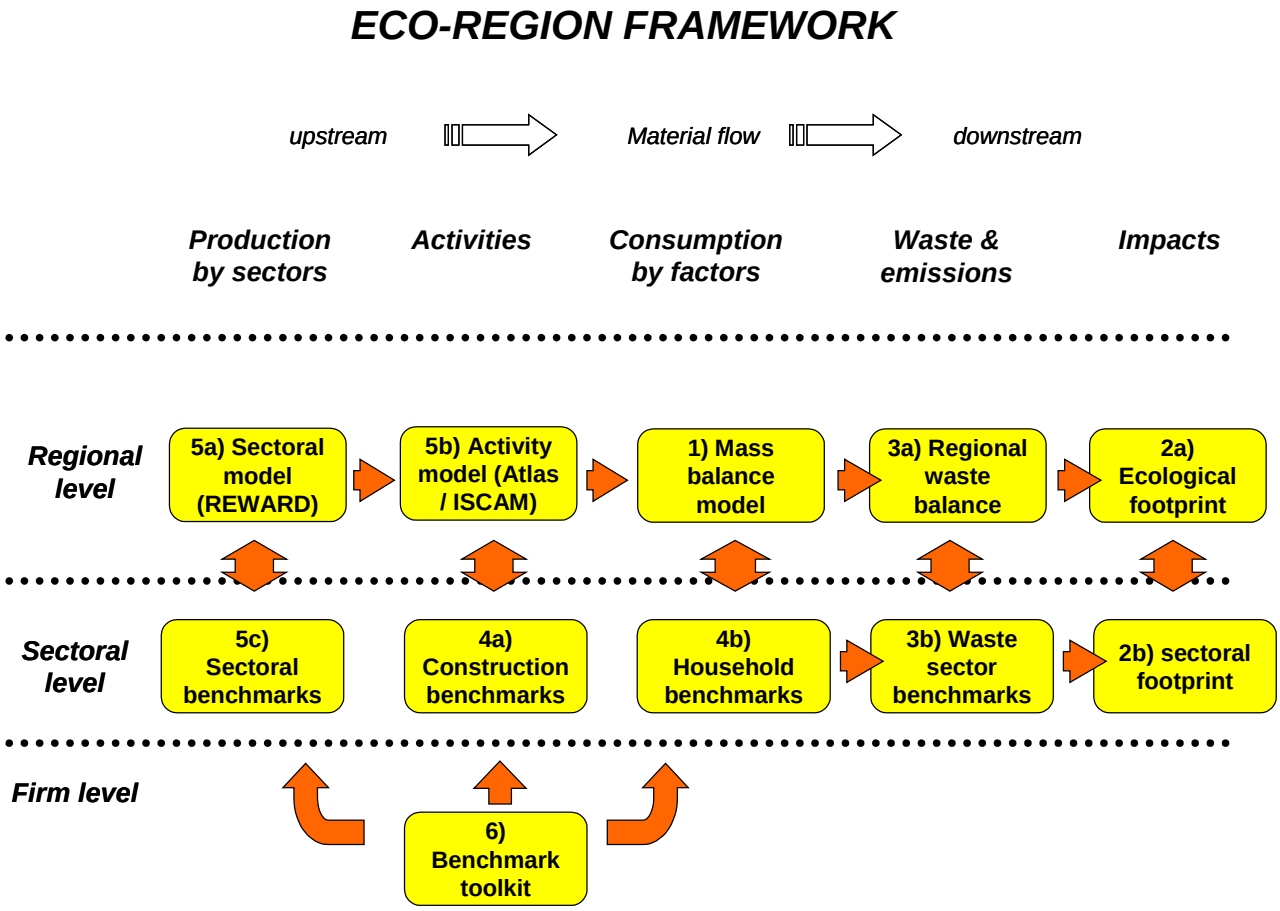
- ***Databasing:*** develop a comprehensive data system on regional resource and waste flows: including sources, destinations, balances and ecological footprints.
- ***Modelling***: develop an integrated model to analyse future trends and scenarios, in resource flows, strategic waste management, and assessment of BPEO.
- ***Benchmarking:*** develop and test a benchmarking / reporting system for waste minimization and resource productivity in sectors, firms and products.
- ***Business applications:*** apply the model / database system to waste / resource management in business strategy, focusing on the construction industry as a main case study.
- ***Policy & public applications:*** use the database / modelling system to analyse regional policy for their effect on the ecological footprint and resource productivity.

These objectives are to be applied through various 'frameworks' as in the sections below:

- A ***technical framework*** which links and integrates different information systems
- An ***applications framework***, which connects to uses and users in policy, business and households.

The overall aim is to promote waste minimization and resource productivity, as part of regional competitiveness and sustainable development. This focuses on different kinds of linkages:

- Linkage between waste / resource flows and economic activity.
- Linkage between waste / resource flows at different levels: regional, sub-regional, sectoral, and firm levels.
- Linkage between static information, and interactive benchmarking / signposting.



3.3 Technical framework

The project framework, as in the diagram above, is organized around the flow of materials, from 'cradle to grave', i.e. from extraction, to production, to consumption, to waste. It is also organized on different levels which link from the regional to the firm level. Each of these components corresponds roughly to one or more workstages (numbered 1-7):

1) Mass balance model (MB)
The mass balance (MB) is a set of consolidated accounts which track the total inputs, processes and outputs in the region. These are broken down into many hundreds of components, materials and products, each with a set of stocks and flows. The mass balance then extends to energy and land as the other key environmental factors.

2) Ecological footprint model (EF)
With the MB data in spreadsheet form, analysis then highlights the total environmental impact of all activity on the ***consumption*** or ***demand*** side, using the 'ecological footprint' approach (EF). This method calculates the land area required to supply resources and absorb pollution for the key components of household consumption. An extension to the EF module then applies the EF concept to key sectors and consumption activities, incorporating life cycle use data where practical.

3) Waste / material management MB and benchmarks:

Working from primary waste arising data, this constructs a set of more detailed 'satellite accounts' which links the main MB-EF to the sources and end-fates of each of the main waste streams, including compositions and sectoral breakdowns. The spreadsheet analysis can then track the imports, stocks, and exports for key products and substances, together with energy, land and other environmental pressures. This can then be extended to look at waste trends and disposal options, and also to the 'benchmarking' concept below.

4) Construction sector analysis & benchmarks

To explore the MB-EF potential further, a case study approach looks at the construction sector, the largest single user of materials in the regional economy. This workstage constructs a set of satellite accounts: explores future trends and spatial development scenarios: examines the effect of design & specification options: constructs a series of benchmarks and performance indicators: and links to appraisal methods such as BREEAM and similar.

4b) Consumption analysis & benchmarks

The Eco-Region also contains much data on the 'consumption' side of the construction industry's 'production'. Data on several hundred household items, such as cars, appliances and furniture, can be linked to the production side to give a total picture of spatial development impacts. In a future development of the Eco-Region, consumers will be able to access data on the life-cycle effects of their lifestyle, and try different options for lightening their environmental load.

5) Integrated model: economy-environment model (REWARD)

The Eco-Region will be linked to a detailed picture of the regional economy and its environmental pressures on the ***production*** or ***supply*** side. Based on the Environment Agency 'REWARD' modelling and research programme, this model is constructed around an economic input-output format, which tracks direct / indirect waste arisings, and other environmental impacts.

5b) Activity model (Atlas / ISCAM)

This 'activity model' connects the production side with consumption, in two parts. The 'Integrated Sustainable Cities Assessment Method' is a spreadsheet system for scenario modelling, which focuses on the 'activity' – e.g. numbers of houses, distances travelled etc. The 'Atlas NW' is an interactive map-based system which enables users to construct and visualize possible futures for their region. Each of these systems has been developed over the last 5 years, and are now available as the linking platform for the Eco-Region.

5c) Sectoral benchmarks in waste / resource productivity

The recent Cabinet Office report highlighted ***'resource productivity',*** i.e. the added value per unit of consumption, as a driver of both economic competitiveness and environmental sustainability. The Eco-Region model and the REWARD system between them provide a detailed set of resource productivity benchmarks for the region and for economic sectors. These measure key economic indicators such as value added, GDP and employment against key environmental indicators such as transport, energy and waste.

6) Business benchmarking:

The Eco-Region system will remain as dry data, until it is put into interactive form and delivered to those who can use it to make a difference. The Eco-Region is working alongside the Merseyside Business-Environment Network to develop a more advanced version of the CBI 'Contour' framework for corporate reporting on waste minimization, environment, health

and safety. This will enable the pilot programme of construction firms to benchmark themselves against regional profiles for each sector.

7) Applications and dissemination
The project workstages are each based around these modules, in an approximate time order. There is also one further workstage, which brings each of the above together into a policy-focused web-based communications framework, including with materials and events.

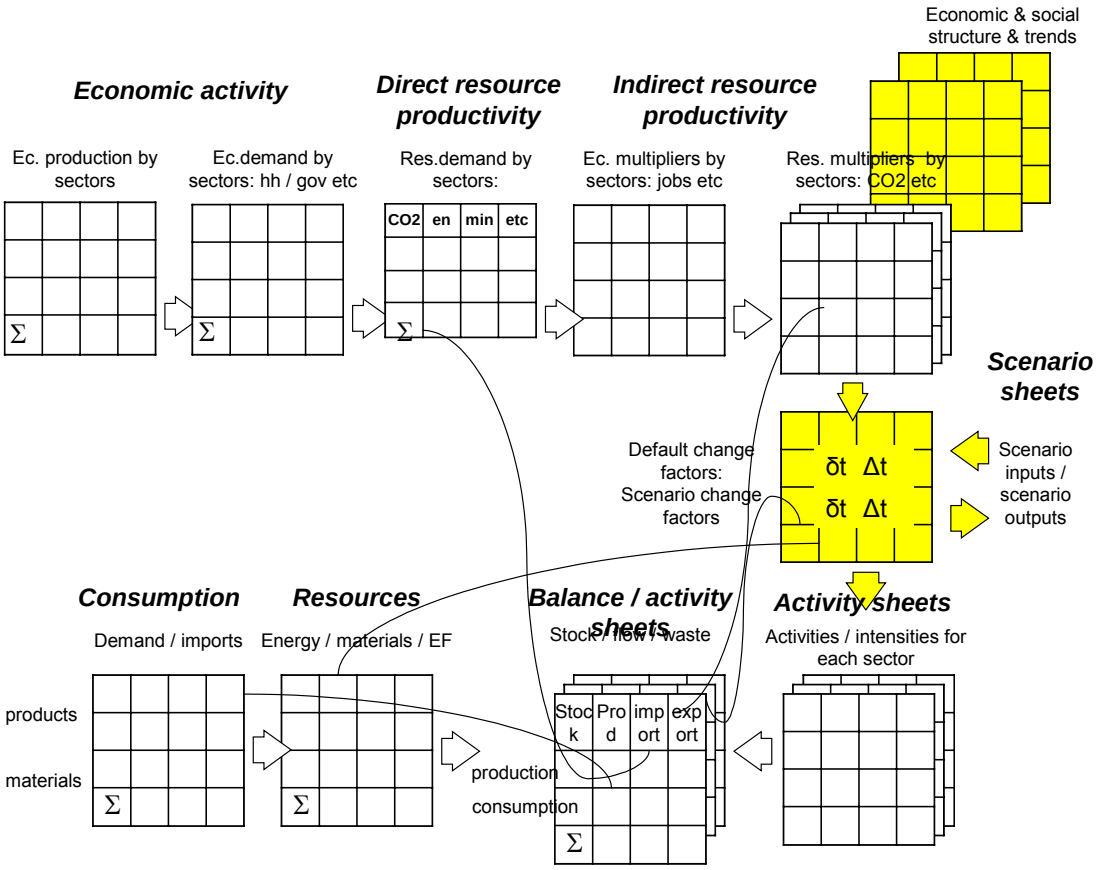
3.4 Modelling framework

3.4.1 Integrated model

The overall structure of the integrated environment- economy modeling framework is shown below. Detailed notes are shown in the appendix. The modelling framework includes:

- a regional economy-environment IO model: (based on the Cambridge Econometrics LEFM, as developed through the Environment Agency 'WRERP' project).
- a large database on consumption of goods and materials, resource flow and embodied energy: (Stockholm Environment Institute / Mass Balance Club)
- an accounting framework of regional energy and resource balances (CURE)
- an 'activity' model designed for scenario choices and inputs from business, policy or consumers). (CURE)

ECO-REGION: MODELLING FRAMEWORK



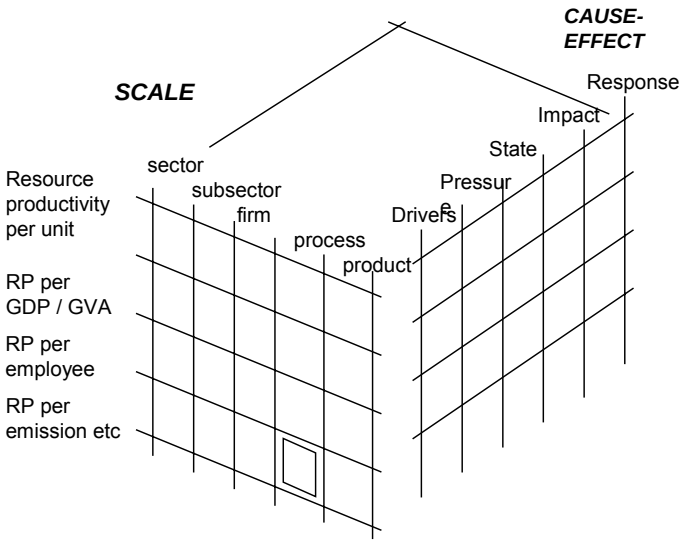
3.4.2 Benchmarking framework

The concept of benchmarks is to set out a framework for the interaction of economic activity with environmental impact / resource consumption. This would contain, as per the 'cube' visualization below:

- Environmental factors in waste, materials, transport, energy, water, minerals, toxicity burden if known etc
- Economic / social factors: GDP / turnover, GVA, employees, capital investment, other EHS / corporate responsibility
- average / best practice for similar firms / products
- average / worst / best practice for the sector and sub-sector
- comparison with regional pressure points, limits, goals and targets

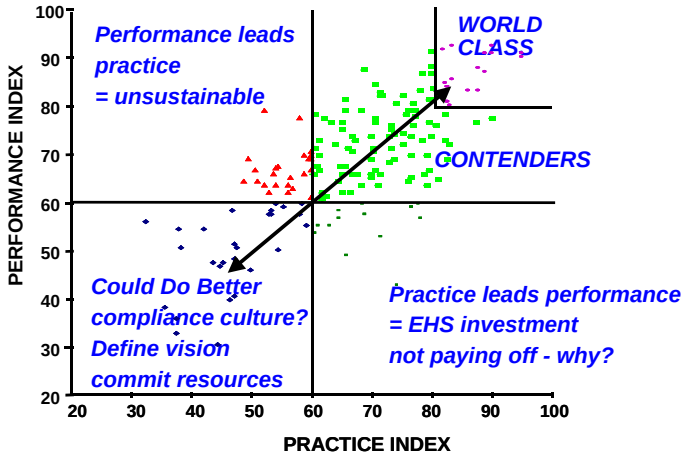
For many of these issues a close link to Environment Agency information systems on major processes would be essential.

ECO-REGION: BENCHMARK FRAMEWORK



An example of the benchmarking outputs is shown below from the Contour developmenmt programme.

CONTOUR Results Model
Practice Versus Performance



3.5 Applications framework

Regional strategy and policy-making is not often a straightforward business, and UK regional government itself is in a state of rapid change. The Eco-Region applications programme will explore in some depth the question of when and how to apply the model and database system.

3.5.1 Who is it for

- ***Regional policy-makers*** in waste management, utilities, transport, planning and economic development, can get direct feedback on the environmental impacts of their decisions.
- ***Businesses*** can use the Eco-Region system to benchmark waste minimization performance against the sectoral and regional profile, within their environmental management systems.
- ***Industrial sectors*** can make the link between the waste minimization performance of their firms, and the environmental pressures and opportunities they face.
- ***Waste management*** and materials supply industries, can assess more accurately where their problems, risks and opportunities are coming from.
- ***Construction industries*** can see more clearly the trends and opportunities in regional environmental strategy, and develop intelligent ways of tracking their performance and its overall impact.
- ***Households*** can assess their consumption choices and work out the best way towards waste minimization and eco-efficient lifestyles.

3.5.2 Policy applications

For policy makers and related bodies there are likely to be general applications:

- ***Foresight and future studies***: assessing the general strengths and weaknesses of the regional economy in the light of external changes, and the implications of growth trends and future scenarios for emissions and resource use.
- ***Assessing strategic options***: testing overall strategies, policies and programmes for options for environmental effects. (e.g. promotion of certain sectors, small business support, cluster development etc).
- ***Assessing sectoral policies:*** more detailed analysis of particular sectors with environmental effects (e.g. agriculture, chemicals or energy production).
- ***Identifying limits and pressure points:*** evaluating the environmental effects of economic policies at the local / regional level (e.g. waste disposal, major development sites).

In particular there are two key applications which are now required for most strategic policies and programmes in the UK:

- ***Strategic environmental assessment***: the EcoRegion can provide very specific information for a range of environmental themes.
- ***Sustainability appraisal***: The EcoRegion can provide the foundation for integrated appraisal of plans, policies and programes: other more complex issues can then be linked to this.

3.5.3 Business applications

The Eco-Region is designed primarily as a real time applications system. It generates long range scenario functions, but puts the emphasis on linking this to present day risks and opportunities:

- Firms can benchmark their performance against the sectoral and regional profile, as part of their environmental management systems.
- Industrial sectors can make the link between the performance of their firms, and the environmental pressures and opportunities they face.
- Environmental sectors, such as waste management and materials supply, can assess more accurately where their problems, risks and opportunities are coming from.

3.5.4 Household applications

The household applications take the 'average' household consumption of a wide range of goods and products and services in the region. Drawing on UK/ EU databases of imports / exports, embodied energy, transport and waste generation, a detailed database of 400+ goods is produced. This can be further disaggregated by sub-regions / counties, by socio-economic groups and so on.

- Resource productivity benchmarking of goods and products can compare the performance of goods consumed by households (often imported), to goods produced by businesses (often exported).
- Households can assess their consumption choices and work out the best way towards ecological lifestyles.

3.5.5 Communications framework

The 'inter-activity' framework for sectors, firms, households and products, includes:

- Joint development of next generation environmental management systems, (in conjunction with the Contour CBI –backed project with a pilot on 4000 firms, and a neural network development of 'smart' management systems):
- Interactive uploading / downloading of performance benchmark data:
- Active signposts to risks and opportunities for key sectors.

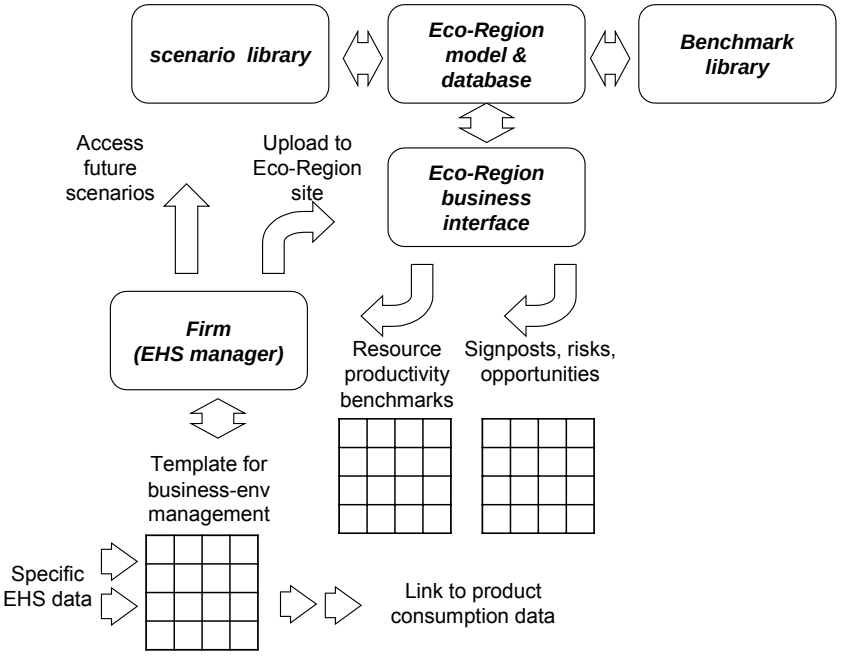
3.5.6 Interactive website operation

The EcoRegion is designed to operate in website format, to enable rapid uploading / downloading of information from firms and sectors. A typical operation would be as follows, and in the diagram below:

- A firm uploads its data in a reporting template to the Eco-Region business interface
- The Eco-Region produces a series of 'benchmarks' for waste / resource flows, compared to the sectoral average and the regional throughput.

- For each of these there is also a set of signposts towards 'risks and opportunities' specific to each sectors.
- A firm or any other user can also access the future scenarios for the region directly from the Eco-Region library.
- Where possible, links can also followed between production data and consumption data.

ECO-REGION: INTER-ACTIVITY



3.6 Research framework

The Eco-Region is not only a practical information system which underpins any kind of environmental reporting or sustainability framework: it is also a foundation for many avenues of research on environment – economy interactions. This 'research / analysis' framework includes:

- Analysis of performance benchmarks based on real time data from sectors, firms and product lines.
- Analysis of technological change / risks / opportunities.
- Analysis of consumer behaviour / signals / incentives.
- Meta-analysis of the 'inter-activity' modelling approach.

3.6.1 Research innovation and added value

The prototype of the Eco-Region is at present under development in a parallel project in the SE region. This regional level offers close connections to policy, industry and consumer issues. Recent stakeholder feedback suggests interactive modelling focused on policy / business agendas, in parallel with 'expert-driven' long-run scenario analysis. The Eco-Region takes this 'inter-activity' modelling approach, with web-based real-time uploading /

downloading of data for benchmarks and signposts. Key added value and innovation factors include:

- Continuous data assembly on innovation & eco-efficiency in firms and products, (based on the pilot programme of 370 firms and the CBI project).
- Direct connections to regional policy & programmes on innovation, clusters, training, infrastructure etc.
- Direct connection to consumption patterns / preferences for a wide range of specific goods and products.
- Such evidence then feeds back to model parameters, e.g. rate of technological change or consumption patterns.

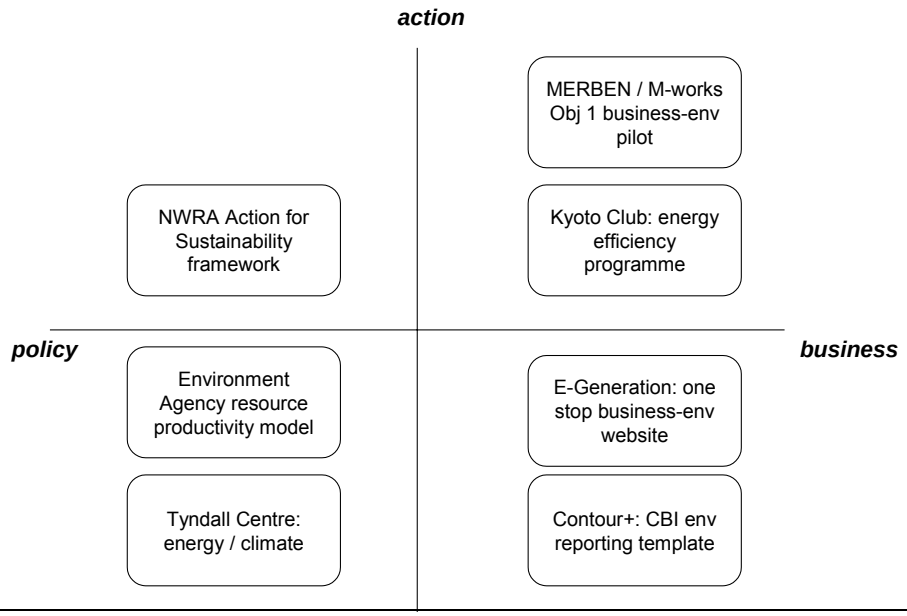
Overall, such 'inter-activity' modelling extends '***scenario'*** modelling, towards the ***'foresight'*** approach, i.e. linking future studies, decision-making and capacity building.

3.7 Collaborations

There is a practical focus on uses and users in the fields of waste management, utilities, minerals etc. This includes a range of collaborative partnerships built into the current scheme:

- REWARD 'resource productivity' scenario modeling project
- NWRA Action for Sustainability Framework
- MERBEN and the parallel development of the ASSESS benchmarking tool.
- EnWorks business-environment pilot programme
- E-Generation: web-based one-stop shop business-environment signposts
- Kyoto Club: major businesses accelerating the drive towards energy efficiency
- Tyndall Centre research consortium on energy & climate change.
- PERFORM sustainability benchmarking system (Univ of Sussex)
- Eco-budget UK: a national scheme for coordinating regional MB-EF studies.

ECO-REGION: COLLABORATIONS



3.7.1 Environment Agency 'resource productivity' project

The 'Regional & Welsh Appraisal of Resource Productivity & Development' (REWARD) project is building a computer model for the economy and environment, for the North West, 5 other regions and Wales. This model is titled the **'Regional Economy-Environment Input-Output' model (REEIO).** The REEIO is a new and powerful computer tool for regional strategy and policy appraisal. The finished package, due to be completed in 2004, will contain for each of the partner regions:

- A detailed model of the regional economy in input-output format: this allows tracking of direct and indirect effects to the regional economy of policies, programmes, or changes to an industry or sector.
- A set of environmental pressures which are directly caused by economic activity: including energy, air emissions, transport demand, water demand and solid waste.

This project is funded by a partnership of the Environment Agency, 5 Regional Development Agencies[1] (RDAs) and the National Assembly of Wales. It also involves DEFRA, DTI, ODPM, ONS, English Nature and RSPB, as key external stakeholders with relevant expertise.

The REEIO is based on a detailed 'input-output' model of each regional economy:

- This is arranged in 49 sectors, each of which makes transactions with each other sector. The economic data and trends are consistent with regional / UK forecasts.
- There are 6 types of employment and 25 types of occupation.
- Economic and labour market results are generated with assumptions for macro-economic growth and population change. Economic 'supply-side' strategies are not modelled directly, but can be represented as providing growth opportunities within the relevant sectors.

The REEIO then makes links with key environmental and resource pressures:

- Transport sector: demand is related to households and economic activity: supply is by occupancy, modal split, and vehicle efficiency.
- Energy sector: final demand is related to households, transport, industrial and commercial activity: energy supply is by 13 economic sectors, 6 fuels, with special treatment of power generation.
- Air emissions: including greenhouse gases, SO_x, $N0_x$, VOCs, PM.
- Waste sector: arisings include household, industrial / commercial, sewage, power station ash /slag, incineration ash and other: waste disposal includes landfill (active / inactive), incineration, recycling / re-use.
- Water sector: final demand is related to households and economic activity: also with a regional supply / demand balance.

The overall result is an evidence-based assessment of the environmental effects of economic strategies.

[1] One North East Development Agency, South West of England Development Agency, South East Economic Development Agency, East Midlands Development Agency and East of England Development Agency.

3.7.2 Action for Sustainability Framework

The AfS is undergoing a review, both in technical terms and in terms of its applications and linkage to policy. There is great potential for linking the Eco-Region to an enhanced AfS information system and website. The possible scope of an indicators framework includes:

a). A framework structure for AfS indicators:

- Coordinating as far as possible with the related datasets in RPG, RES, BQOL, LQOL, ACQoL, urban indices etc.
- Generally following the 'DPSIR' framework where relevant (section 3;
- Including combined indices, statistical measures, time / space details;

b). There are then two main modes of operation envisaged:

- The ***technical framework*** aims at providing the baseline information in an efficient, structured and updateable format;
- The ***communications framework*** aims at a multi-media approach to non-specialists, focusing on visualization of the indicators in relation to targets, objectives and actions.

c). the applications relate to the roles and functions of the AfS initiative:

- ***Monitoring***: the first application is simply in reporting and monitoring the various datasets, grouped by the AFS themes. This would include where possible the trends over time, and the spatial distribution.
- ***Target development***: where possible each of the indicators would be shown in relation to selected targets. This should make clear the range of targets for short, medium and long term, for national or regional levels, and for programme targets or aspirational goals.
- ***Appraisal***: in principle, the appraisal function compares monitoring information with relevant targets to arrive at an evaluation. In practice, data is scarce and targets are often fuzzy. A more intelligent appraisal system will be more flexible and responsive to user needs and interests.
- ***Marketing and communications***: finally there is a communications function which includes awareness raising, linkage to action, and linkage to further information. This will require close coordination with other information systems and other policy initiatives in parallel with AFS.

3.7.3 Tyndall Centre collaboration

The Tyndall Centre is an international research network with advanced research programmes on integrated modeling, decarbonization, climate impacts and the coastal zone. Eco-region is forming a collaborative arrangement which could potentially provide to the Tyndall Centre and its integrated modeling programme:

- A regional level analysis / modelling framework to link between global, UK and urban scales
- Real time bottom-up data and benchmarking analysis from firms and sectors
- Pilot of an 'inter-activity' modelling approach

- Spin-offs in social simulation, agent-based modeling etc

CIAM could potentially provide to Eco-region:

- Access to a wider modelling framework and national / global scales.
- Incorporation of climate & environmental data model parameters.
- Primary data and research directions for agent-based, decision analysis and social simulation modelling.

3.7.4 Contour development project

The CBI contour development project is developing a next-generation template for business environmental management systems. This is being managed by White Young Green Environmental on behalf of the CBI. The key points include:

- Demand for a common criteria to help measure EHS practice & performance
- CBI practical management tool to spread best practice and demonstrate business voluntary action to Government, regulators and community
- 250 benchmarks to date, including blue chip companies BAE Systems, Allied Domecq, Transco

The development programme is being trialled with a pilot programme of 4000 firms on Merseyside, under the Objective 1-funded MERBEN scheme. Features include:

- Development of a generic environmental reporting template system, which operates a common database with a range of different reports for different purposes: EMAS, 14001, BiE, Acorn etc
- Pilot programme of firms for road testing of environmental reporting templates
- Links to business-environment signposts and outreach programmes
- Link to ‘neural networking’ development of ‘smart’ systems for business-environment feedback, in terms of diagnostics and signposts.

3.7.5 Kyoto club & others

Details to follow.

4 Work stages and packages

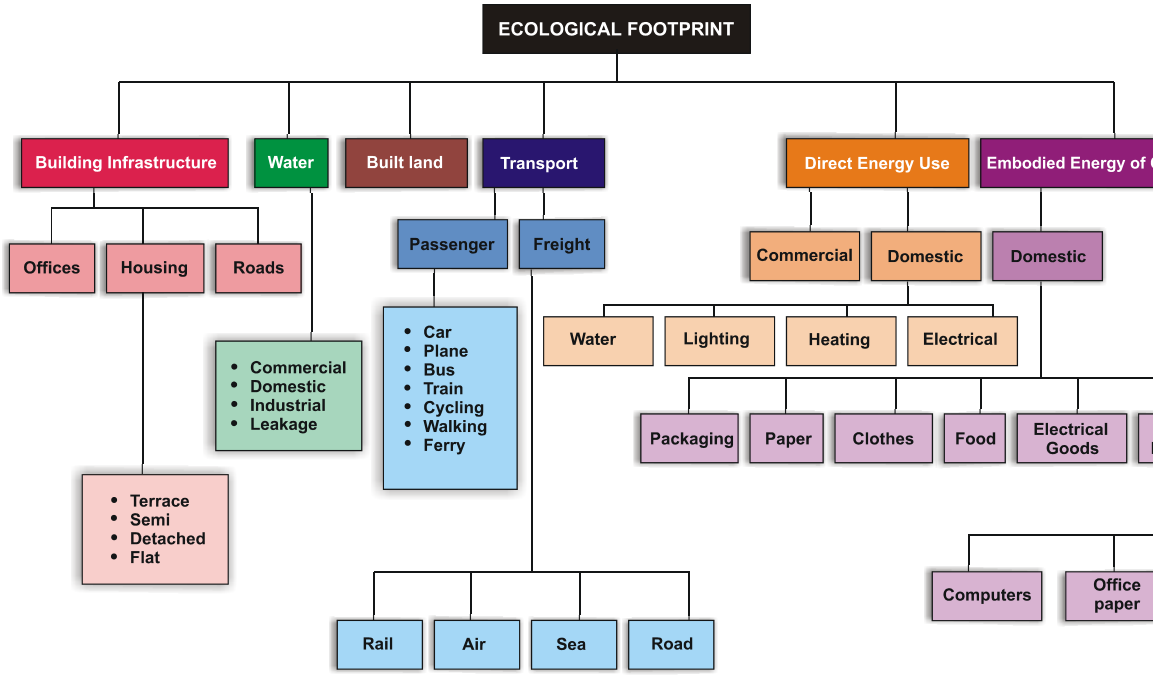
4.1 Workstage 1: Waste / resource mass balance

The aim of the initial workstages is to build up a comprehensive picture of the inputs, outputs and impacts of the regional material metabolism. Fig 2 shows the main components of Workstage 1 (resource-waste analysis) in relation to Workstage 2 (footprint –impacts analysis).

OUTPUTS & DELIVERABLES	*REPORT*	*DATA BASE*	*MODEL*	*TOOLKIT*	*WEB SITE*	*EVENT*
WS1: resource-waste analysis Lead SEI	Interim report	Resource DB				

4.1.1 Material inputs (WP 1.1)

The inputs will be divided into broad categories of biomass, minerals, fuels, energy, water, and intermediate/final manufactured goods, . These input categories will distinguish between biomass (agricultural harvest and timber harvest), mineral materials (ores, clay, industrial minerals, sand, gravel and crushed stone), and fossil materials (coal, natural gas, and crude oil). A fourth main category of input covers materials that are mainly manufactured. These materials are very often a mix of the above raw material categories: where possible the main material flows will be disaggregated, leaving the many combinations of materials in a 'manufactured goods' category. For each of these categories, the accounting framework includes: imports, regional produce, storage, and contribution to fixed stocks.



The practicality of the data gathering process will be guided by several principles. First of all, we will focus on periodically available data supplied by official statistical bodies. Secondly, a wide range of research papers will be assembled at regional, national and EU level. Thirdly, this data will be compared where feasible with “bottom-up” data collected from the largest manufacturers and retailers within the Northwest. For most manufactured goods regional data is not available, so for this category national data will be adjusted by the regional economic structure and consumer profile to provide proxy regional data. A further category is the ‘hidden flows’ behind material production, including translocated materials and geomorphological flows.

4.1.2 Waste outputs (WP 1.2)

This characterizes the regional waste arisings, not only in terms of municipal and commercial categories, but in terms of composition by substance types, energy content and environmental media. This will draw from County and regional waste management assessment work, and place it in context of a comprehensive approach to material flows and destinations. A range of common air pollutants will be calculated including emissions of carbon dioxide, N20, CH4, SO2, PM and VOCs. Water will include precipitation, run-off and common effluents.

This workpackage will provide an more detailed overview of the waste & materials management sector. This is the sector most concerned with movements of material as such, but also where policy choices revolve around impacts on transport, emissions, and land-use. The issues in waste disposal, recycling and minimization are complex, and therefore the aim of this module is simply to relate the key problems and opportunities in waste management to the overall regional mass balance / footprint. The mass balance framework will build on the methods and tools of the recently completed ‘Resource Flow Audit’ of construction minerals / wastes in the NW (CURE, 2001). This framework will be extended to consider (in outline) other major waste streams such as: material streams including paper / board, food / organic, metals and glass: major waste-producing industries, such as water or agriculture: particular impacts of waste management, such as land-use or transport.

The non-waste outputs are calculated in categories including biomass, minerals, water, intermediate and final manufactured products. This data is often difficult to access at regional level, hence national import / export data and major inter-regional movements will be used to derive coefficients which are then modified by regional industrial quotients.

4.1.3 Regional energy / resource balance: (WP 1.3)

This provides an outline balance of energy imports, production and exports. Energy categories will include coal, gas, oil, nuclear, waste, renewables, direct heat, and power imports via the grid. Demand categories will include domestic, commercial, industrial, transport, agriculture. Drawing from published data, the aim here is to provide an energy balance in a compatible format with the rest of the mass balance accounting framework. This will enable cross-checking of materials data, interpolation from national to regional, and interpolation of hidden flows and embodied energy.

4.1.4 Regional land-use & cover balance: (WP 1.4)

Urbanization, land-use changes, land reclamation, land-cover and vegetation changes are all linked to the footprint calculation. This set of accounts will draw from local and county data, together with NLUD, DEFRA and other agency data to provide a balanced account of the rate of land-use impacts due to human activity.

In each of the above, the data is assembled as far as possible with an inter-regional import-export breakdown, and also an economic sectoral breakdown, in terms of a modified ONS 49 sector classification as far as possible. A comprehensive picture (in outline) of inputs and outputs resource-waste flow, energy and land balance for each economic sector is then assembled from the above. Much of the data will be cross-tabulated via national proxies, again using regional industrial quotients to provide the regional sectoral breakdown.

4.2 Workstage 2: component ecological footprint

The component-based approach, first documented by Simmons, Lewis and Barrett (2000) and Barrett (2001) is a different approach to ecological footprinting. Instead of considering the consumption of raw materials, it considers the effect of transport, energy, water and waste. It has a more simplistic and educative structure with more significance to the regional level. This is mainly because it is built around activities that are part of everyday life for consumers and businesses.

OUTPUTS & DELIVERABLES	***REPORT***	***DATA BASE***	***MODEL***	***TOOLKIT***	***WEB SITE***	***EVENT***
WS2: eco-footprint analysis ***Lead SEI***	Interim report	Footprint DB				Workshop

4.2.1 Data Collection (WP 2.1)

Most of the data required for the calculation of the component ecological footprint will be taken from work package 1 (the mass balance analysis). However, there will still need to be some further data collection to fulfill all the data requirements for the component footprint. This includes transport (both passenger and freight), housing stock and built land and energy consumption (domestic and commercial). All the data will be collected at the county level to allow for comparisons of the different components. All the five counties in the Northwest will be considered (Merseyside, Cheshire, Greater Manchester, Lancashire and Cumbria).

4.2.2 Component Footprint Conversion Factors (WP 2.2)

The SEI has recently completed a project entitled, "A Component Ecological Footprint of Liverpool: a detailed examination of ecological sustainability". In the course of this research many of the conversion factors for the component footprint have already been calculated. However, these figures will need to be verified and adjusted for the Northwest region.

4.2.3 Component Ecological Footprint (WP 2.3)

For each component of the ecological footprint a detailed analysis and calculation procedure will be undertaken. Details have been given below of the analysis for each component.

A: Waste analysis -

- The ecological footprint of commercial, household, inert and industrial waste;
- Comparing consumption with disposal provision;
- An analysis of the recycling within the Northwest and the ecological impact of recycling;
- Comparisons with national performance;
- Considering the impact of transporting waste and associated this to the waste footprint.

B: Transport analysis:

- Calculating the ecological footprint of the car, ferry, bus and train services.
- Placing the impact of these services within a global context (referring to CO2 emissions);
- An evaluation of time series data for passenger travel in the Northwest;
- The calculation and explanation of freight transport movements within the Northwest.

C: Bio resources analysis -

- The ecological footprint of providing the Northwest with all its food, clothing, timber and raw material;
- Combining these findings with the ecological footprint of the freight movement above.

D: Water analysis:

- Calculate the ecological footprint of supplying water to the Northwest for public and commercial use. This is done by establishing the embodied energy of water by considering the total energy requirements for water supply;
- The ecological footprint of water loss for the Northwest;
- The ecological footprint of wastewater treatment.

E: Energy analysis:

- Calculate the ecological footprint of domestic, commercial and industrial energy;

- An analysis of the footprint of energy by various sectors.

F: Housing Stock analysis:
- The ecological footprint of housing stock;
- The changes in the ecological footprint of housing.

G: Built land -
- The analysis of the built land within the region.

In each of these modules, a component ecological footprint of the five counties will be calculated wherever possible. This provides the opportunity to compare the five counties, and to explore the differences in consumption, wealth and footprint. An ecological footprint of both freight and passenger transport will form part of the analysis, and the impact of the movement of goods from the various counties will be considered. There is an issue on passenger transport, where the impact of commuting to the major cities to and from the counties will be determined.

4.2.4 Other impacts and burdens: (WP 2.4)

This module aims to capture some of the key environmental, economic and social impacts outside the scope of the footprint methodology.

Environmental impacts will include pressure on wildlife habitats: landuse change, landscape change and disruption: ecological toxicity and geno-disruption. This will be carried out at a highly aggregated level, in the framework of the SETAC life-cycle analysis characterization and normalization methods.

An economic assessment draws from the framework of Full Cost Accounting, and aims to provide material for the 'triple bottom line' approach to business sustainability. Again this will take place on a highly aggregated level. The various techniques of 'sustainability gap' assessment, waste opportunity cost and resource replacement cost each shed a little light on the economic impacts of resource flows. These can then be compared to the added value per GDP, per unit of capital, and per employee, in terms of of energy, emissions, effluent, resource depletion and land use.

The general scale of health impacts can be characterized in some if not all cases, generally using statistical mortality and morbidity factors. This will also draw on recent work in health impact assessment, which classifies possible environment-health linkages in terms of significant, probable, possible and speculative.

4.3 Workstage 3: Waste management sector

This workstage will focus the regional mass / footprint data on a detailed analysis of the waste and materials management sector. This is the sector most concerned with movements of material as such, but also where policy choices revolve around impacts on transport, emissions, and land-use. The issues in waste disposal, recycling and minimization are complex, and therefore the aim of this module is to link the key problems and opportunities in waste management to the overall regional mass balance / footprint.

The role of sub-regional analysis by counties and by urban /rural divisions also comes to the fore, as waste management is a highly localized business.

This workstage is intended to be carried out in close collaboration with the Merseyside Waste Disposal Authority, as a key potential user. The results of this are intended to be a pilot demonstration with scope for general application anywhere in the UK.

OUTPUTS & DELIVERABLES ***Lead BRE***	***REPORT***	***DATA BASE***	***MODEL***	***TOOLKIT***	***WEB SITE***	***EVENT***
WS3: waste management analysis	Interim report	Waste satellite account	Input to model			Workshop

4.3.1 Analysis of county / urban / rural profiles (WP 3.1)

A breakdown of the mass balance of the five counties / other city-region groupings will be calculated wherever possible. This will allow comparisons to be made for the various components of the ecological footprint.

The method here will use a combination of 'top-down' regional data, with 'bottom-up' local / county data. The latter is generally available for various waste arising streams and disposal routes, but little else. The top-down data is adjusted as far as possible for population, economic activity, industrial profile, household income / expenditure, levels of urbanization, transport activity land-use patterns, and any other particular features. Where possible the results of this interpolation method should be compared with local / county actual data.

There are further refinements to be made, in accounting for economic sector breakdown, travel patterns, and inter-county transfers of waste, minerals and aggregates. Some if not all of these can be indicated in outline form.

An ecological footprint of both freight and passenger transport will form part of the analysis. The impact of the movement of goods from the various counties will be considered. For passenger transport, the impact of commuting to the major cities in the various counties will be determined.

As the ecological footprint will be calculated at the county level it will be possible to examine why certain counties have achieved a lower ecological footprint under the different components. For example, looking at the results of a previous SEI study, why does Merseyside have a lower ecological footprint for domestic waste than Cheshire?

4.3.2 Mass balance of waste & materials management (WP 3.2)

The mass balance framework will build on the methods and tools of the recently completed 'Resource Flow Audit' of construction minerals / wastes in the NW (CURE, 2001). This framework will be extended to consider (in outline):

- other major waste streams such as paper / board, food / organic, metals and glass:
- major waste-producing industries, such as water or agriculture:
- waste disposal options i.e. landfill, incineration, composting:
- other impacts of waste management, such as land-use or transport.

4.3.3 Ecological footprint of waste / materials management (WP 3.3)

This will feed back the results of the component footprint analysis to the waste sector, in terms of energy, transport fraction, emissions, effluent, lost resources and land use. This can then be combined with the sub-regional analysis to produce a set of ecological footprints for waste management at the county level.

4.3.4 Strategic assessment of waste arisings (WP 3.4)

A typical regional waste management study tends to assume in the absence of further evidence, constant growth rates (2-3% per annum) in waste arisings. The available data on time series and forward trends is generally not sufficient for any greater detail. One major contribution of the Eco-Region project will be to assess in much greater resolution the alternative possibilities for different rates of growth in waste arisings of different types.

This will use the integrated economy-environment modeling system from Workstage 5, to generate alternative economic development paths, with a range of values for the waste arisings which would result from them. Such waste arising trajectories will generally be subject to the following variables:

- Sectoral shift
- Technological change
- Waste management practices
- Consumer lifestyles
- Shift in balances of imports / consumption and exports / production

Lastly the implication is that such waste arisings are subject to influence by policy at the local, regional and national levels. This offers the potential to take strategic waste management options to a much greater degree of policy engagement, where economic development, spatial strategy, infrastructure and environmental policy are all part of an integrated picture.

4.3.5 Assessment of waste management options (WP3.5)

The forward options in the regional and county level waste strategies consider the various combinations of landfill replacement, with incineration, composting, pyrolysis and other new technologies. There are also different combinations of recycling, minimisation and secondary uses. A comparitive mass balance / footprint analysis for each of these options in the light of projected waste streams will inform a comprehensive investigation of strategic options in waste and materials management. The particular contribution of the Eco-Region, as above, is to provide greater resolution and clarity on cross-cutting issues:

- Potential for coordination of economic development / spatial development strategy with waste management options:

- Linking the regional level with greater detail on specific sectors, e.g renewable energy sources, housing construction etc.
- Potential for critical mass by coordination between waste streams for municipal, commercial / industrial, construction / demolition wastes
- Assessment of special waste streams in the light of regional economic development e.g. tyres, vehicles etc.

4.3.6 Waste management information systems (WP 3.6)

There are many possible applications of a sub/regional mass-balance / footprint database to existing waste management practices. Some of the most common applications would include:

- Analysis by stock-flow modellijng of common material types in the waste stream. For instance, the number of end of life fridges or vehicles can be calculated with a regional spreadsheet-based model of stocks, new consumption, lifetime, recycled fraction and annual arising to waste.
- Analysis by material composition of common material types. For instance the fridges or vehicles are listed in the consumption database with approximate material composition, import fraction, distance traveled, overall ecological footprint etc.
- Analysis by social groups of the likely level of waste arisings from each ward / postcode profile
- Application of the footprint component data to the strategic waste options. For instance, the relative merits in footprint of transporting cullet for recycling can be compared against the financial costs and benefits.

Within this project it will not be possible to research every possible question. The examples here will be put up as demonstrations, using the case study of the Merseyside Waste Disposal Authority. Further research may then follow on from these demonstrations.

4.4 *Workstage 4: Construction sector*

This workstage looks at the construction sector in some detail, as the largest single user and producer of materials in the regional economy..

(*This section in note form at present)*

OUTPUTS & DELIVERABLES Lead: BRE	***REPORT***	***DATA BASE***	***MODEL***	***TOOLKIT***	***WEB SITE***	***EVENT***
WS4: construction sector	Interim report	Satellite accounts	Input to model		Input to website	

4.4.1 Construction mass balance: (WP 4.1)

- Construct satellite accounts for construction: maintenance: disposal
- Disaggregate by building type & size
- Disaggregate by design & spec
- Construct satellite account for life cycle energy / water in use

4.4.2 Construction assessment methods

- Link to Environmental Profiling system
- Link to BREEAM system
- Link to CIRIA sustainability indicators

4.4.3 Industry & firm level analysis:

- Cross reference EKPI's with firm level indicators of activity / output (numbers of dwellings, m2 floorspace etc)
- Cross reference EKPI's with material flow analysis (raw materials, processing, endues, waste etc)
- Identify small number of case studies on construction industry / regional MB linkage.

4.4.4 Construction applications:

- Analyse construction industry options & scenarios for MB-EF
- Analyse design & specification options & scenarios (supply side)
- Analyse policy options & urban development / infrastructure scenarios for MB-EF (demand side)

4.5 Workstage 5: integrated waste / resource model

Detailed notes on the integrated environment- economy modeling framework are shown in section 3.4. The waste / resource flow modelling framework here includes:

- a regional economy-environment IO model: (based on the Cambridge Econometrics LEFM, as developed through the Environment Agency REWARD project).
- a large database on consumption of goods and materials, waste / resource flow and embodied energy: (SEI / Mass Balance Club)
- an accounting framework of regional energy and resource balances (CURE)
- an 'activity' model designed for scenario choices and inputs from business, policy or consumers). (CURE)

OUTPUTS & DELIVERABLES	*REPORT*	*DATA BASE*	*MODEL*	*TOOLKIT*	*WEB SITE*	*EVENT*
WS5: modelling & databasing	Model application manual		Integrated model	Model application guide		Workshop

4.5.1 Integrated modelling framework (WP 5.1)

The framework for the integrated database model is set out as a series of steps (based on the flow chart in Section 3.4):

- Step 1: imputation of direct / indirect material inputs to *household* demand sector. This uses input-output matrices to 'impute' the flows of resources, both direct and indirect to final demand sectors.
- Step 2: imputation of direct / indirect material inputs to *government* sector: the final demand items above are attributed for the government sector.
- Step 3: develop mass / energy balances from consumption data. This includes for key themes such as energy, carbon, minerals / aggregates, water and land, a standard balance sheet format showing: stocks, production, consumption, waste, imports and exports.
- Step 4: normalize resource flow coefficient by mass / energy balances. In the same way that the economic input-output coefficients are scalable by the size of the economy, so are the resource coefficients then fitted to regional balance figures. Clearly boundary issues are crucial in the definition of what is production and consumption.
- Step 5: identify key activity intensities and sub-model disaggregations. The 'activity model' is designed as the meeting point between each component, and the point at which scenario inputs and outputs are collected.

4.5.2 Link to economy – environment model (WP 5.2)

The model / data links to the Environment Agency REWARD economy-environment model are outlined in section 3.4. This workstage develops those links, with a particular focus on cross-reference between production and consumption sides of the balance sheet. The REWARD model contains various relevant parameters which have to be explored, through bottom up data where available, and otherwise through proxies and alternative scenarios:

- Technological shift and substitution
- Material intensities by economic sector
- Effects of supply side economic development policies: e.g. IT infrastructure, SME training etc.
- Particular features of the NW economy: e.g. renewable energy potential, large areas of contaminated / derelict land.

4.5.3 User interface & reporting framework (WP 5.3)

The integrated model framework here is different to other similar initiatives from recent years. It aims to provide not only a facility for modeling of future scenarios, but a focus on

present day information and issues, via the 'benchmarking' facility in workstage 5. This involves a greater focus on interactive communications, signposts and 'implications' than is found in other more static models. The outline as in Section 3.5 will be developed to take account of the following issues:

- Definition of layers in terms of users: expert, policy, business, public etc
- Definition of applications: environment reporting, sustainability indicators, organization diagnostics etc:
- Balance of technical detail with communications content: i.e.emphasis on graphs and charts, or composite packages with graphics & narratives.
- Degree of user interactivity vs pre-formed scenarios and packages

4.5.4 Web platform for model / database (WP 5.4)

The precise form of mounting on a web platform is highly dependent on the current technology, and this is to be developed towards the end of the project programme. At the time of this proposal it is anticipated that the following options will be combined:

- Macro structure in client copy of MS Excel for downloading
- Data access pages in MS Access, including dynamic links to MS Excel
- Visualization of pre-run scenarios in active server page software

4.5.5 Website testing & calibration (WP 5.5)

The website and the model / database within it will be subject to a period of testing and calibration, including by external audiences and potential users. This will involve several layers of testing:

- Operational testing of functionality: i.e to ensure that controls are working and effective
- Calibration of the model parameters, against scenario settings: using national and EU time series and data from similar modeling exercises wherever possible.
- Cross check for consistency of policy and scenario settings.

4.5.6 Coordination with public data systems (WP 5.6)

It is crucial that the data structure, format, and classification systems are compatible and coordinated as far as possible with similar frameworks from public data providers at national and regional levels. These will include DERA, ONS, Eurostat, Environment Agency, Mass Balance Network and others at the national level: NWDA, RIU, NWRA and Environment Agency at the regional level: and various key industrial sectors such as minerals or chemicals. This WP will commence at an early stage with a review of available data frameworks. It will then develop the project database in a coordinated structure: and finally produce recommendations for relevant data providers, at regional, national and EU levels.

To validate the data collected, wherever possible, data will be obtained from various sources with a cross-checking procedure. The final results will aim at transparency in the degree of variation or uncertainty within the data. This process will lead to recommendations for the above organizations with a data management function.

The research so far will produce a large body of data which needs to be kept in a consistent format with access for different purposes. It is proposed to develop and extend the 'ISCAM' (Integrated Sustainable Cities Assessment Method), a best-practice accounting and scenario analysis spreadsheet system, which enables alternative scenarios to be quantified, compared and analysed in terms of trends and targets (Ravetz 2000a). This will be extended to provide greater detail on material flows and the balances of mass, energy and land-use.

4.6 Workstage 6: Waste / resource benchmarking

The above tools and benchmarks are then applied to compound measures of 'resource productivity' (referring back to the policy theme of the Performance & Innovation Unit 2001). A range of benchmarks will be adapted to the needs of each economic sector, in terms of 2 digit SIC class in this case. These will take the most significant and relevant of the environmental measures, against the most significant and relevant of the economic and social impact measures above.

(*This section in note form at present)*

OUTPUTS & DELIVERABLES	***REPORT***	***DATA BASE***	***MODEL***	***TOOLKIT***	***WEB SITE***	***EVENT***
WS6: benchmarking & reporting	Bench marking manual	Bench mark DB		Business report template		Workshop

4.6.1 Sectoral benchmarking systems (WP 6.1)

The motivation for the engagement of business in environmental issues can be seen in a 'push-pull' framework. Change comes via pressures: from regulation, risk ratings, supply-chains, image problems and resource / waste cost: and via opportunities in new markets, new technologies, clientele and cost savings. The general aim of this component of the project is to promote understanding of both the 'push' of risk and the 'pull' of opportunity. These sectoral RP benchmarks are intended to be a primary point of reference for any sectoral sustainability strategy and performance benchmarking system. By extension they will also apply to any firm engaged in any way with environmental / social reporting, environmental management systems, or dealings with regulators / environmental service providers.

In view of this the resource productivity benchmarks above will be developed in close consultation with relevant industrial / trade organizations. The key sectors involved are likely to include construction, transport, food / drink / catering, and various types of environmental services. The benchmarks are likely to include a range of indicators on material throughput, waste and packaging, recycling / reuse rates, energy, transport, water, land-use, toxics / carcinogens and others.

The 'resource management scenario' above will form the backdrop to assembling for each key sector an outline of key ***threats*** (i.e. the push factors above) and the key ***opportunities***

(i.e. the pull factors above). This is to be communicated via the website as part of the resource productivity profile for each sector.

4.6.2 Business benchmarking framework (WP 6.2)

On the basis that a fully effective information system has to have 2-way communication, firms and sub-sectors will be invited to submit their waste minimization / resource productivity benchmarks to be compared to the sectoral and regional benchmarks. There are now experiments in progress which utilize the spread of web access to make possible this innovation, and the technology itself is now standard.

For this the Eco-Region will benefit from the proposed collaboration with the CBI Contour development programme, managed by White Young Green Environmental on behalf of the CBI. This raises some topical issues:

- Motivation of firms to submit their data, even where this is very simple format.
- close collaboration either with industry / trade associations, or with local business clubs and forums, for enhancing motivation and guidance for their members:
- scope for working with public sector purchasing, contracting and specifying officers to increase the supply chain motivation.
- Reassurance on the handling of commercial information will also be needed.

The most likely candidates will be companies who already produce some level of environmental reporting, and who can see the benefits of extending, deepening, and publicizing across business units or in comparison with others in the supply chain. The benefit of doing this will be clear, in that this kind of real-time information then builds up an unprecedented picture of the links between the regional, sectoral and firm level performance. The links between the region and the firm will be particularly relevant:

- Where regional environmental pressures & limits are significant for firms' risks / opportunities: e.g. rising costs of landfill disposal
- Where economic development policies and subsidies are linked to environmental performance
- Where economic trends and projections are relevant to environmental pressures and RP benchmarks

4.6.3 Report & questionnaire development (WP 6.4)

The benchmarking structure above is to be used as the database structure for accumulating data from the pilot sample of construction firms. It is proposed to focus initially on a small number of key sectors, including construction, food / drink, and transport / distribution.

The questionnaire is anticipated to cover approximately 25-30 data items, focusing on environmental information, with some social and economic performance data for referencing. Each of the 25-30 questions involves consideration of the following:

- question format: i.e. how is it framed and placed in context
- response format: what kind of numerical data or other responses can be managed within the system

- recommendations: which diagnostics, signposts and other kinds of follow-up material is relevant and practical to produce, for the sector or across all sectors.

4.6.4 Database development (WP 6.4)

The database format is then uploaded into a file in the PROBE format, an application developed in MS Access. This involves testing and calibration of the reporting format, the various macros, and of the user help and guidance.

4.6.5 Reporting & output framework (WP 6.)

The reporting format and macro outputs for the 25-30 key questions will then be designed as a development of the existing Contour system. There are several stages in this, to be developed for each of the sample of 25-30 questions:

- Review, development & discussion
- Coding
- Testing
- Debugging

The reporting framework itself will need to be carefully designed in order to coordinate in several directions:

- Compatibility with the Contour template development scheme
- Coordination with the regional modeling/ database, as far as possible
- Significance to the sectoral issues, performance indicators, and particularly the sectoral 'sustainability strategies' where these exist

4.6.6 System testing & calibration (WP 6.6)

The testing is to be carried out with a selection of 30 ????? companies, drawn from the 370 on the Contour / MERBEN development programme. This involves a series of steps:

- Demonstration on site of the prototype system
- Discussion of the application to the firm's management reporting system
- Development and refinement of the data and reporting system
- Further stage of iteration if needed.

4.7 Applications & dissemination

The Eco-Region is an information system of potentially far reaching significance: within its limited resources its main aim is to provide

- A basis for further development in the pilot of the NW region
- A template for other regional information systems around the UK / EU

In that light the reporting and dissemination stage is focused on both of these objectives: i.e. not only to summarize the scenarios and launch the integrated modeling system, but to promote the wider implications for use by others.

OUTPUTS & DELIVERABLES	***REPORT***	***DATA BASE***	***MODEL***	***TOOLKIT***	***WEB SITE***	***EVENT***
WS7: applications & dissemination	Main report		.	Final package	Main web site	Final launch

4.7.1 Policy applications (WP 7.1)

There are at present a range of regional strategies in formation and review, and this project will aim to maximize the linkages and implications of the waste / resource / footprint analysis. The first point of reference is the NW Regional Waste Strategy, currently at the stage of consultation on Strategic Waste Management Assessment options. A detailed report has been prepared with the aid of the Wisard assessment toolkit, and the Eco-Region project will be fully linked into this work.

In addition it will link to the frameworks of regional strategies including: Action for Sustainability, Regional Waste Strategy, NW State of the Environment, Regional Planning Guidance, Regional Economic Strategy, Regional Transport Strategy, integrated appraisal initiatives and others. For each of these the research results will be focused on an evaluation of policy instruments and processes in the light of the objectives and targets identified.

The above also leads to a particular contribution to the evolving frameworks of targets, indicators and information systems at all levels of the policy process. There are several linkages to this process:

- current ongoing work on ‘integrated appraisal’ or ‘sustainability appraisal’ for policies, programmes, projects and management performance.
- Sustainability indicators, regional profiles and key performance indicators, whether in a structured framework or otherwise.
- Best Value performance monitoring framework and its added role under the local government legislation.

The scope for further research and development on this theme is large, and at this stage only an outline investigation is planned, providing the specification for further work in the anticipated follow on project.

4.7.2 Economic & sectoral applications (WP 7.2)

The regional economic strategy focuses on sectoral ‘clusters’ which are to be promoted for enhanced support and development. An outline ‘sustainability strategy’ would in principle be developed for each of these clusters, to be coordinated as follows:

- National / EU sectoral sustainability strategy
- Regional data on environmental performance and RP benchmarks
- Regional / national comparisons on RP and EHS benchmarks

- Comparisons with firm-level data where available.

The Eco-Region in principle is a major provider of data to underpin these sectoral sustainability strategies: it offers the opportunity to extend the typical aspiration-based strategy, towards some key RP benchmarks based on actual performance data from sectors and firms.

4.7.3 Consumer applications (WP 7.3)

While the limited resources of the Eco-Region project do not allow for a consumer promotions campaign, its databases are ideally suited as baseline material for use by others. Such organizations could include the regional sustainability framework and local authority initiatives, together with EnCams, WWF, Friends of the Earth and so on. This section of the reporting effort will be focused on promoting future extensions of the Eco-Region for a range of issues:

- consumer product accreditation: e.g. performance data for 'eco-appliances' compared to standard appliances.
- consumer retail campaigns: e.g. what is the effect of buying local food
- consumer lifestyle analysis: providing feedback on material flows and waste implications, in a similar way to the 'carbon calculators' in common use.

4.7.4 Synthesis report (WP 7.4)

The final reports will provide a synthesis of the project results, its implications for public, private, civic and research sectors, and a series of recommendations for future development. This will identify topical themes including:

- The implications of 'business as usual' trends on the regional environment and footprint
- The implications of a 'resource management scenario' for policy objectives & business strategy
- The implications for data providers and managers at national, regional and local levels
- The implications of developing interactive information systems, as in the 'resource productivity' facility website, for business and others.
- The implications of following a similar path and model for further applications to public sector, civic and educational users in a follow on phase.
- The implications for future research in terms of information frameworks and dissemination routes.

4.7.5 Consultation workshops (WP 7.5)

The core consultation will take place through the project steering group and a wider Advisory Group, containing up to 30 representatives from public, private, civic and educational sectors. For the latter, three key workshops will be held: one at the start of the project: one at midpoint: and one at the public launch, which focus on the implications for public policy and business strategy. This will be complemented with a series of interviews with key policy-makers and opinion-formers. For each target audience a pack of materials relating to the website will be prepared in consultation with regional organisations. The project results will

be topical and their outputs to the websites are highly visual, so contacts with print and television media will be used to gain prime coverage.

4.7.6 Launch of report & website (WP 7.6)

A launch of the results in the final month of the project will promote the results of the project and their implications to each of the stakeholder groups above. This is anticipated to take the form of a 1 day conference with invited speakers and thematic workshops.

5 Programme & resources

5.1.1 Time programme

The programme is arranged around discreet workstage modules, each with a lead research team and set of deliverables.

- Ws1 mass balance analysis
- Ws2 component ecological footprint
- Ws3 waste management sector
- Ws4 construction sector
- Ws5 integrated model
- Ws6 benchmarking & reporting systems
- Ws7 applications & dissemination

WORKSTAGES & PROGRAMME							
Months		**1-3**	**4-6**	**7-9**	**10-12**	**13-15**	**16-18**
	Lead						
WS1: resource-waste mass balance	SEI						
WS2: eco-footprint & impact analysis	SEI						
WS3: waste management sector	BRE						
WS4: construction sector	BRE						
WS5: integrated model	CURE						
WS6: benchmarking & reporting	WYG						
WS7: applications & dissemination	CURE						
Steering group meetings		*	*	*	*	*	
Workshops					Sector WS	Sector WS	launch
Key reports		Inception reports		Interim 1		Draft final	Final reports
Key milestones				MB-EF database		Sector reports	Website: Business template:

5.1.2 Summary of outputs

The outputs from each workstage of this project contain a range of materials:

- Report: summaries of the research and implications for policy
- Database: generally in MS Access / Excel format

- Model: generally in web-enabled MS Excel with VB macros
- Tools or toolkits: a coordinated package with guidance on uses and users
- Website: the main communications product.
- Event: anticipated as 4 half day focused workshops plus a half day launch at the end of the programme.

OUTPUTS & DELIVERABLES (Main deliverable in shaded)							
	LEAD	***REPORT***	***DATA BASE***	***MODEL***	***TOOLKIT***	***WEB SITE***	***EVENT***
WS1: resource-waste analysis	SEI	Input to report	**MB database**				
WS2: eco-footprint & impact analysis	SEI	Input to report	**EF database**				
WS3: waste management sector	BRE	**Sector report**	Satellite DB	Input to model		Input to website	Sector workshop
WS4: construction sector	BRE	**Sector report**	Satellite DB	Input to model		Input to website	Sector workshop
WS5: modelling & databasing	CURE	Model application manual		**Integrated model / website**	Model application guide	Input to website	Workshop
WS6: benchmarking & reporting	WYG	Bench marking manual	Bench mark DB		**Business template**		Workshop
WS7: applications & dissemination	CURE	**Main report**		.	Final package	Main web site	Final launch

5.1.3 Summary of applications and benefits

The Eco-Region is a multi-layered project, with various applications, and delivering various kinds of benefits to each of its stakeholders. Below is a summary of the ways in which each workstage contributes to the practical requirements in each policy / activity sector:

SUMMARY OF APPLICATIONS					
	Waste management & regulation	***Environmental planning / management***	***Economic development & policy***	***Business support & development***	***Spatial planning & development***
WS1: resource-waste analysis	Inventory of waste sources	Regional balance sheets for energy, land, minerals etc datasets on imports & consumption			
WS2: eco-footprint & impact analysis	LCA analysis of waste options	global impacts of imports & consumption	Sust.appraisal of economic strategies		
WS3: waste management sector	Detailed analysis of waste streams / options: incl county level & production side: DB / models on key products & materials in the waste stream	Linking waste sector to context of environmental management: incl county breakdown	Waste implications of economic strategy	Practical toolkit for waste minimization	Waste implications of spatial strategy
WS4: construction sector	DB / models of waste streams / trends / design options, for key types, products, materials:	Impact of construction on environmental management	Implications of economic strategy for construction impacts	Practical toolkit for env best practice in construction	MB-EF implications of spatial strategy
WS5: modelling & databasing	Resource productivity DB / model	Trend / scenario analysis	Sust appraisal / SEA of economic strategy	Information base for BE reporting	Sust appraisal / SEA of spatial strategy
WS6: benchmarking & reporting	Waste minimization benchmarks	Sectoral env impact analysis.	Economic sector benchmarks	Practical toolkit for waste minimization & EHS policy	
WS7: applications & dissemination	Waste data	State of environment reporting	Business competitiveness programmes: sust appraisal of regional strategy	Practical toolkit for waste minimization & EHS policy	Environmental impacts of regional strategy
PARTNER INTERESTS	Env Agency WDAs / RTAB	Env Agency English Nature Countryside Ag NWRA GONW	NWDA GONW	NWDA Merben Enworks Kyoto club	NWRA GONW Countryside Ag

5.1.4 Procurement

Selection of research teams: each of the teams has a unique and specialist knowledge and experience. Therefore competitive open tendering would not be appropriate or practical for this project.

5.1.5 Staff inputs & workstages

The table below shows the detail of staff time and cost by research partner, for each of the work packages in each work stage.

		CURE person months	*SEI person months*	*WYG person months*	*BRE person months*	*TOTAL months / costs*	*WS costs £1000*	*lead partner & % of total effort*
WS1	***WASTE / RESOURCE MASS BALANCE***							***SEI***
1.1	Material inputs: resources & other					0		
1.2	Material outputs: waste & other					0		
1.3	Regional energy / land balance					0		
	workstage staff time & cost	**1**	**3**	**0**	**1**	**5**	***18,500***	13%
WS2	***COMPONENT ECOLOGICAL FOOTPRINT***							***SEI***
2.1	Data Collection for the Component Footprint					0		
2.2	Component Footprint Conversion Factors					0		
2.3	Sectoral footprint analysis					0		
	workstage staff time & cost	**1**	**3**	**0**	**0**	**4**	***14,800***	11%
WS3	***WASTE MANAGEMENT SECTOR***							***BRE***
3.1	Waste & materials management satellite accounts					0		
3.2	Waste strategy options & scenarios					0		
3.3	Waste / materials management information systems					0		
	workstage staff time & cost	**1**	**1**	**0**	**3.5**	**5.5**	***20,350***	14%
WS4	***CONSTRUCTION SECTOR***							***BRE***
4.1	Construction sector satellite account					0		
4.2	Construction monitoring & appraisal methods					0		
4.3	Construction case studies					0		
4.4	Construction strategy options & scenarios					0		
	workstage staff time & cost	**1**	**0**	**0**	**3.5**	**4.5**	***16,650***	12%
WS5	***MODELLING & INFORMATION SYSTEMS***							***CURE***
5.1	Link to economy – environment model					0		
5.2	Link to spatial model					0		
5.3	Integrated modelling framework					0		
5.4	User interface & reporting framework					0		
5.5	Web platform for model / database					0		
	workstage staff time & cost	**5**	**1**	**0**	**0**	**6**	***22,200***	16%

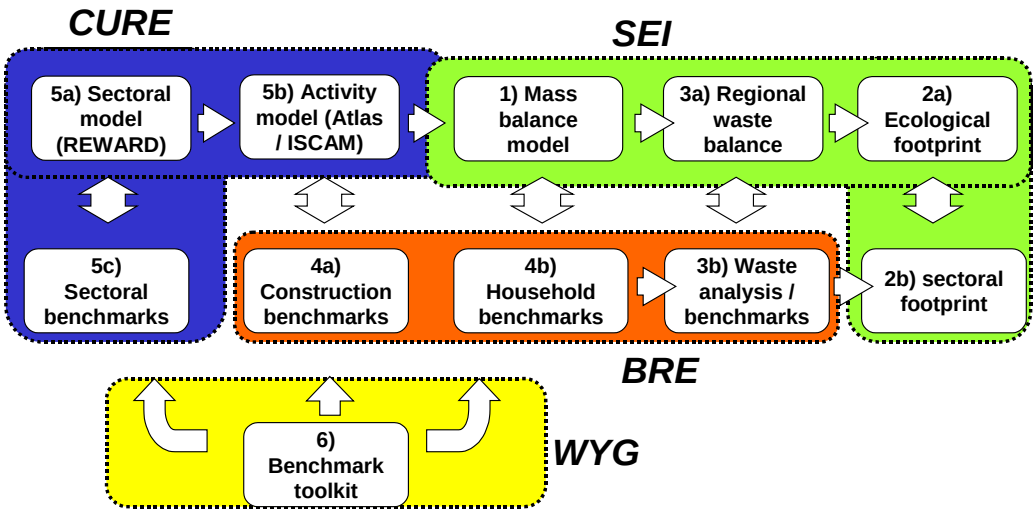
Table continued…..

		CURE person months	SEI person months	WYG person months	BRE person months	TOTAL months / costs	WS costs £1000	lead partner & % of total effort
6.1	Sectoral benchmarking systems					0		
6.2	Business benchmarking framework					0		
6.4	Report & questionnaire development					0		
6.5	Database development					0		
6.6	Reporting & output framework					0		
	workstage staff time & cost	**1**	**0**	**4**	**1**	**6**	***22,200***	15%
WS7	***APPLICATIONS & DISSEMINATION***							***CURE***
7.1	Policy applications:					0		
7.2	Economic & sectoral applications:					0		
7.3	Synthesis report					0		
7.4	Consultation workshops					0		
7.5	Launch of report & website					0		
7.6	Steering group coordination					0		
	workstage staff time & cost	**5**	**1**	**0.5**	**1.5**	**8**	***29,600***	21%
	TOTAL staff months	**15**	**9**	**4.5**	**10.5**	**39**		
	TOTAL staff costs (excl expenses)	**55,500**	**33,300**	**16,650**	**38,850**		**144,300**	

5.1.6 Allocation & communications

The pattern of allocation is shown below: however there will be considerable overlap between the workstages, and a high degree of cooperation will be needed. An internal project website will be set up with materials updated in a consistent format.

ALLOCATION OF WORK



5.1.7 Notes on staff costs

For simplicity a common costing scheme is used between the 4 selected research teams. Inclusive of all site overheads and management costs, this equates to:

- £3,700 per consultancy person-month

Negotiations will be held with each consultancy to determine the difference between 'nominal' and 'actual' person months.

This figure excludes specific items of travel and consumables, which will be reimbursed quarterly against invoices.

Staff costs: notes include the following:

- CURE project staff costs included overheads at the standard University rate of 46% of direct staff costs. The overall rates for the proposed project team (research principal, research manager and research assistant, amount to £3700 per person month inclusive.
- SEI project staff costs included overheads at the standard York University rate of 60%. The overall rates for the proposed project team (research principal, research manager and research assistant, amount to £3700 per person month inclusive.
- White Young Green project staff costs are calculated on the basis of nominal costs to equate with other project teams.
- BRE project staff costs are based on the same rate, which includes for a secondment of the lead researcher N.Lawson to CURE, part time for the project duration.

5.1.8 Notes on other costs

Dissemination costs:

- printing / design / publicity: this is based on a low-budget production of 1000 copies of the project summary report and associated 2 page summary. This would also be produced as digital pdf file for downloading on the project website.
- consultation workshop costs: 4@ £550: based on previous experience of a ½ day workshop setting for 20-30 people, in low-cost / medium quality premises, inclusive of catering, equipment etc.
- launch costs: 1 conference @ £1000: based on previous experience of full organization with venue costs & materials of a 1/2 day conference for 60-80 people, inclusive of full audio-visual, catering etc. It may be possible to find sponsorship in kind for this event.

Professional fees items:

- website / database consultancy: this is to cover the development of a website and interactive database system, using medium-level commercial packages. These

consultants are to be selected by tender on the basis of project specification and performance criteria drawn up in the relevant work package.

- economic consultancy: this is to cover specialist advice on the economic implications of waste management in relation to the waste parameters in the REWARD model. This involves the consultants Cambridge Econometrics Ltd who are the sole providers of the REWARD software, hence competitive tendering is not possible.

Other costs:

- travel & consumables @ £300 / month: based on previous experience of a project of this size.
- SNW project management @ 7.5%: based on previous experience of a project of this size: this figure excludes the project management and steering group administration functions.

Capital cost items:

- computer hardware / software: allows for 1 standard spec portable computers with standard software together with specialist visualization / development software including MS Visual Basic and Webtools.
- Web costs / server space / data licences: covers the provision of server space rental, commercial databases including NOMIS business data, and the mounting of the website for the project duration and for 1 year beyond.

Total costs and breakdown are as in the table below:

costs in GB£	**basic cost**	**VAT**	**subtotals**	**totals**
SUMMARY OF COSTS				
CURE project staff costs (incl overheads @46%)	55.500		55.500	
SEI project staff costs (incl overheads @60%)	33.300		33.300	
WYG project staff costs	16.650	2.914	19.564	
BRE-web staff costs	38.850		38.850	
SALARIES subtotal	144.300			147.214
printing / design / publicity	1.500	0.263	1.763	
launch & workshop costs:	0.500	0.088	0.588	
INFO & PROMOTION subtotal	2.000	0.350		2.350
spatial modelling consultancy	10.000	1.750	11.750	
website consultancy	7.500	1.313	8.813	
economic consultancy	2.500	0.438	2.938	
FEES subtotal	20.000	3.500		23.500
travel & consumables @ £300 / month	6.000		6.000	
SNW project management @ 7.5%	15.000		15.000	
OTHER COSTS subtotal	21.000			21.000

computer hardware / software	1.100	0.193	1.293	
server / website costs	0.500	0.088	0.588	
CAPITAL EQUIPMENT subtotal	1.600	0.280		1.880
subtotal VAT		11.174		
PROJECT COSTS				**195.944**
Entrust fee @ 2% of gross costs				**3.999**
TOTAL GROSS COSTS				**199.943**
Funding applied from Biffaward				**179.948**
Funding from third party contributors				**19.994**

5.1.9 Contracts & agreements

This project is very similar in content to the Biffaward mass balance project for the South East region, which is completing in late 2003. The Agreements constructed for this project are being adapted for the Eco-Region NW, which include:

1. Agreement for research services between Sustainability Northwest (as client) and VUM (as provider).

2. Agreement for sub-contracted research services between VUM (as client) and THE Stockholm Environment Institute (as provider).

3. Agreement for sub-contracted research services between VUM (as client) and the Building Research Establishment Scotland (as provider).

4. Agreement for sub-contracted research services between VUM (as client) and White Young Green Environmental (as provider).

There will also be further subcontracts for specific technical services, to be formed later in the programme.

5.1.10 Invoicing

Each of these agreements will be invoiced at quarterly intervals, against a record of time spent and deliverables produced: together with any specific items of expenditure.

5.1.11 Third party contributors

(There is still a need to identify a further contributor in order to spread the sponsorship commitment)

Merseyside Waste Disposal Authority
2nd Floor, North House,
17 North John Street
Liverpool
tel: 0151 255 1444
fax: 0151 227 1848
contact: Carl Beer, Director

McGrath Environmental Consultants
20 Lower John Street
Cork, N/A
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Fax: 353 21 45058
Email: environment@mcgrathqs.com

Research Methods Consultancy
106 Defoe House, Barbican
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Tel. 020 7588 6689
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