



One Planet Wales

Pathways towards a
sustainable future

A report to WWF Cymru
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Status of this report

This is the first edition of this report and should be viewed as a working document to stimulate further debate and research.

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‘One Planet Wales’ – pathways towards a sustainable future

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1 Summary

1.1 THE CHALLENGE

One Planet Wales looks at ways for the nation to live and prosper on the resources of ‘one planet’, in an ecologically sustainable economy. It looks ahead at the prospects for Wales up to the year 2050, with all the problems and opportunities that this may bring. It links these prospects to the bigger picture – global climate change, resource efficiency, and the overall ‘footprint’ of human activity.

One Planet Wales looks at the potential for wholesale transformation of each sector, towards low impact, high value added performance. This means action across the board – transformation of markets and supply chains, investment and tax policy, social enterprise and so on – in housing, transport, food supplies, and almost every branch of consumption and production. This is no small challenge.

In turn, this has implications for the Welsh Assembly Government – in particular, *what* should be its objectives: *how* to achieve them: and *who* does it need to work with. This also involves many other parts of the public sector – local authorities, government agencies, public services, infrastructure providers and so on.

1.1.1 This report

This report is a small introduction to a huge topic. It cannot cover every sector in detail - rather, it aims to show signposts and stimulate further debate and research. The method is based on the national reports on the ‘*One Planet Economy Network*’, and the ‘*Ecological Budget UK*’ methods and tools. The evidence also builds on the 2005 report ‘*Footprint Wales*’ by SEI, and the current updating of that in late 2007. The whole programme is part of the WWF One Planet programme, which was launched by David Milliband in 2007: further information is on www.ecologicalbudget.org.uk and www.oneplaneteconomyetwork.org. Comments and feedback are welcome.

This report sets out an outline for each of 8 ‘key sectors’. Wherever possible it links these to cross-cutting themes such as tourism, community development and urban regeneration. It aims to link the general UK / EU pathway towards a One Planet future, with the particular problems and opportunities for Wales in each sector:

- Outline of the sector and its resource profile
- Main pathways and opportunities for a One Planet transformation
- The Wales agenda and policy responses
- Summary questions and policy table, to be completed by the consultation programme.

The overall implications are presented separately in the summary report ‘One Planet Wales’.

1.1.2 Towards a One Planet Wales

The One Planet theme is very simple. Whether we are managing a corner shop, a multi-national corporation, or Wales, we need to manage our assets and liabilities, and be aware of future risks and opportunities. We need to think both short and long term, be responsible to suppliers and customers, and look after employees and stakeholders, local and global. This is the way to live well on 'One Planet', rather than squandering the resources of three or four.

This agenda is often put in terms of carbon emissions and climate change, but the real problem is much wider. It is not only carbon but other climate change effects: it is not only climate change but other kinds of resource use: and for cities in affluent nations, it is not so much what they *produce*, as what they *consume* from other parts of the world. For these wider effects, the *ecological footprint* is a counterpart to the carbon footprint:

- The *ecological footprint* measure shows that consumption by residents of Wales (5.25 global hectares per person) is using up the earth's limited resources of *bio-productive* land area, at over 3 times their per capita share (and rising).
- As a service-led economy Wales is now *exporting its environmental impacts*, by importing more from overseas, even while local environments are cleaner & greener.
- To reduce the current footprint of Wales residents to the world average 'fair share' of bio-productive land area in 2050, would need at least a **Factor of Four** increase in resource efficiency (given that population is rising and bio-productive land area is reducing).
- Such resource efficiency improvement can be both cause and effect of economic *development* and *social progress*.
- To achieve this by 2050 would take a resource efficiency increase of about 3.5%, year on year, right across the board – transport, housing, industry and so on. This is the fundamental 'One Planet' benchmark, which can be applied to products, lifestyles, policies and so on.
- Assuming that economic growth continues at around 2.5%, and overall footprint reduces at around 3.5%, the overall '*decoupling*' of economy from environmental impact would be about 6% - over twice the rate in recent years.

1.1.3 Added value of the One Planet agenda

It is fair to say that Wales is one of the leaders in the sustainable development field, and it is also true that climate change and carbon policy is more topical than ever before. So what is the added value of the One Planet Wales programme?

- Focus on the impacts of *consumption* as well as *production*, by looking at the whole of the supply chain.
- Looking beyond the '*end of pipe*' focus of most carbon and climate change policy
- Setting out a '*transformation*' strategy, and 'investment case / business plan' for key sectors.

The One Planet targets and decoupling rates are the ultimate measure of any sustainability initiative in policy or business. The use of 'ecological footprint' is a measure of total impact rather

than the impact within the national boundary, and this includes embodied energy and carbon, on both supply sides and demand sides. Just as the One Planet Living programme shows how low-impact lifestyles are an opportunity for enhanced quality of life – the One Planet Economy programme shows how low impact economies are an opportunity for competitiveness and real prosperity.

In summary, the One Planet agenda comprises the ‘gold standard’ of sustainability initiatives.

1.1.4 Scenarios for 2050

Scenarios aim to show alternative versions of the future. They can focus either on what might be *probable*; what might be *preferable*; or other possibilities which might be *plausible*. In One Planet Wales we explore a scenario of ‘pathways’ for achieving the One Planet targets, which has two main variations – supply side and demand side, or ‘top-down’ and ‘bottom-up’:¹

- **‘One Planet Wales’ – supply side approach (F4a):** this looks at the One Planet targets from a globalizing, big business, advanced technology, supply side perspective.
- **‘One Planet Wales’ – demand side approach (F4b):** this looks at the One Planet targets, in the context of a localizing, community enterprise, lifestyle change perspective.

These are contrasted as far as possible with:

- **‘Business as usual’ scenario (F1):** this is a trend-based ‘reference’ scenario projection, based on EU, UK and Wales policies as at March 2007, as far as possible. In practice it is not straightforward to define this, as policy and markets change very fast. The UK Energy White Paper 2007, and related climate change policy, has been taken as a reference point as far as 2020.

The ‘F4’ refers to the target Factor Four reductions in resource use and impact. Both these F4 scenarios show a combination of aspiration and practicality: they assume that conditions at regional, UK and EU are generally favourable, but that Wales has to take initiative and make headway, as a pro-active player in its aspirations to sustainable development. The general context for these scenarios includes:

- full scale resource efficiency drive, decarbonisation and waste-resource management.
- more ‘sustainable communities’ through neighbourhood clustering, supported by high efficiency integrated public transport.
- The Wales economy prospers with high employment and investment levels, as a self-determined nation.
- The Wales neighbourhood economy & social enterprise takes off, and starts to replace the demand for increased material consumption.
- For public service delivery, Wales maintains active partnerships and compacts to ensure quality provision for all.
- Neighbourhood social cohesion, ethnic diversity, gender equality etc, are all enhanced, thus enabling the One Planet goals.

¹ In the ‘One Planet Economy Pathways’ project these scenarios are expanded to further variations, to include for public sector / private sector dynamics: (see www.oneplaneconomynetwork.org.uk)

The point of looking at multiple One Planet scenarios is to highlight possible contradictions and conflicts. For instance, one view on commercial services would see a future in which hypermarkets and neighbourhood shops exist side by side: another view would see them as totally incompatible. We do not try to pre-judge that debate here, rather we look at both sides, and see what actions may fit in both kinds of future.

1.1.5 Key sectors

The One Planet Wales strategy is focused on eight key activity sectors, as in the following sections. Each involves a set of supply chains linking production activities (supply sectors) and consumption activities (demand types). It has to be said, in the light of current trends, that the goals of a Factor Four transformation are extremely challenging, although technically quite possible. The next sections provide more details, but the overall shape is emerging:

- **Food:** a rapid shift towards more low-impact, local, clean and healthy food.
- **Shelter:** household carbon quotas as part of the tax and benefits system; investment in high-efficiency housing and construction.
- **Transport:** investment in high-efficiency low-impact vehicles, fuel and travel modes, funded by air and road fuel levies.
- **Products:** a coordinated framework of incentives for low-impact production and consumption.
- **Services:** strong financial and market incentives for sustainable tourism, leisure, retail etc; particular focus on financial services as the key to all other sectors.
- **Public:** best possible practice in low-impact health, education and other services, using the immense power of public procurement as the main mechanism.
- **Energy:** rapidly accelerated investment in renewable sources, funded via quotas and levies.
- **Waste:** accelerated investment in reused and recycling technologies, funded by disposal levies.

In each of these sectors and their many sub-sectors, there is an agenda for integrated asset management, a business case for reinvestment for innovation, and the potential for full-scale industrial evolution across supply and demand sides. This strategic approach underlies the day to day challenge of changing policy and business on the ground.

Scenario box: Wales 2050

How would a One Planet Wales look in 2050? We can envisage a vastly more efficient economy, where energy and materials are used to maximum effect. Shops will no longer need to advertize useless goods to make profits for distant multi-nationals, and waste mountains would be a thing of the past. Buildings will use nano-tech components to produce structures of elegance and efficiency, responding to the climate and producing their own energy needs. Innovation in science and technology becomes everyday practice in all branches of industry.

There is an equal and opposite agenda on the consumption side - consumers demand low impact products and services, and share cars or equipment where possible. They actively prefer products which are adaptable, long-lived, and designed for re-manufacture. The principle of stewardship ensures that resources are shared according to need, rather than squandered in conspicuous consumption.

To achieve such a One Planet Economy in a globalizing world did not have to change the whole of the world with it, although international trade did adjust rapidly. Many other countries were learning the hard way about limits to resources and eco-systems, and they were leaning in the One Planet Economy direction, even as populations grew and eco-systems started to collapse. Wales, as one of the birthplaces of the industrial revolution, was able in a modest way to point the way towards an **industrial evolution**.

1.2 KEY SECTORS

1.2.1 Food & agriculture

At present 75% of all food eaten in Wales comes through the supermarkets, where consumers are faced with 20,000 products, with sophisticated packaging and advertising. There is a huge challenge in raising the food chain resource efficiency by a Factor of Four. But there may be little alternative in the longer run – the current food industry is driven by oil for fertilizers, machinery and distribution, and in a future of reducing oil and increasing climate impacts, cheap food may be a thing of the past.

We need to transform the food system at each stage of the supply chain – from farming, processing, distribution, packaging, to the catering and retail sectors. There are big issues – in CAP reform, marginal land, tourism, and public health – and some alternative directions. From the supply side, high-tech intensive cultivation and precision farming could reduce inputs of fertilizers, pesticides and packaging. From the demand side, there is a ‘lifestyle / community’ agenda: increase in local cultivation to near self-sufficiency in rural Wales; and social enterprise uses urban ‘permaculture’ for organic cultivation.

Overall, the Wales contribution to a One Planet food programme will include public procurement, food processing innovation, rural diversification, and incentives for local / niche / organic cultivation, all encouraged by healthy diet programmes.

Food & agriculture – summary recommendations

- Food imports to be 100% ethical and fair trade:
- Organic farming conversion strategy for all viable areas, under ‘stewardship’ schemes
- Integrated environmental management in food processing and distribution:
- Packaging designed for 100% re-use and recycling:
- Public procurement for sustainable and low-impact food for all catering.

1.2.2 Construction & built environment

A Factor 4 efficiency transformation in the built environment is a challenge – at present, most ‘sustainable construction’ activity is tinkering at the margins. But there is potential at each stage of the chain: low impact materials, strategic management of the building stock, energy upgrading, and demand side management in households and organizations. There are examples of near zero-carbon and zero-waste buildings, and the property market needs to provide incentives to encourage these.

Even in 2007 much of the Wales housing stock has low efficiency, and much commercial property is difficult to upgrade. The construction industry has a major role in the economy, but often resists

changes in labour and skills. From the supply side we can see a high-tech innovation approach, based on national / global carbon trading. On the consumer side there is demand side management, community enterprise, and local carbon saving initiatives.

The combination could be achieved through public procurement, progressive incentives, and tariffs on energy demand and supply, and localized innovation programmes in the construction and materials industries. At present there are new initiatives such as the emerging markets for carbon trading, offsets or other incentives, but there are many open questions in how to make these work.

Built environment – summary recommendations

- Sustainable material supplies, with majority re-use / recycling
- ‘Sustainable construction’ policy, with market transformation via innovation, capacity building, fiscal incentives, planning & building regulations.
- Major efficiency upgrading of the entire building stock, using the carbon levies / trading for investment.
- Procurement of ‘carbon neutral’ buildings on full-life costing basis for all public buildings and contracts: (as per WAG aspiration by 2011).

1.2.3 Transport & communications

Transport is a key to economic growth and social welfare – but also the fastest growing source of climate and resource impacts. On the supply side, there is an EU agenda for vehicle efficiency, and the possibility of hydrogen or renewable bio-fuels. On the infrastructure side there is scope to improve the life cycle of vehicle manufacture – again a national / EU level agenda, where the role of Wales is mainly to promote and facilitate.

On the demand side there are many local possibilities – increasing occupancy, reducing unnecessary trips, shifting to low-impact modes, encouraging walking and cycling through urban planning etc. The overarching theme is that of **connectivity** – a combination of accessibility planning, organizational change, use of ICT, and social demand management.

The One Planet Wales transport agenda combines these with a radical approach. It promotes major vehicle efficiency changes, with a next-generation IT-enabled responsive public transport, with a range of ‘soft’ incentives for lifestyle and community. The key priorities for the public sector are for procurement for innovation in transport and connectivity: extended business rates and infrastructure charging for re-investment: carbon markets coupled with local incentives.

Transport & communications: summary recommendations

- Low impact vehicles, promoted through levy / subsidy incentives, local business rates, tradable travel / carbon quotas etc.
- Alternative fuel infrastructure & supply chain for urban / rural areas:
- Low impact buses with responsive IT-enabled networks, promoted with ‘green travel’ schemes.
- Promotion of walking & cycling via infrastructure, car clubs & soft measures.

1.2.4 Manufacturing & consumer products

While manufacturing and mining in Wales have reduced rapidly in recent decades, financial and business services and public services have climbed. Local industrial impacts are also much reduced, but in reality the problem is out-sourced and displaced to overseas.

In a One Planet Wales, the average product will be longer life and adaptable, designed for re-use and reconditioning, from lower-impact materials with higher efficiency, sourced locally or with low impact distribution, with an ‘integrated supply chain’ approach.

The reality for manufacturing and retail in Wales is as an integral part of the regional, national and EU economies. But the future of economic development in many sectors and clusters lies in low-carbon / high value added; likewise there is an agenda for social enterprise, as an alternative to private consumption. Wales needs to look closely at the potential for investment for market transformation, and link this to future emissions trading markets, as per the Carbon Reduction Commitment and similar incentives.

Manufacturing & products – summary recommendations

- Carbon trading / local levies on manufacturing, re-invested to innovation strategy.
- Low-impact goods / logistics: incentives via planning, regulation, economic development.
- Local infrastructure charges on high-impact products e.g. batteries, packaging
- Public procurement – use strategic incentives for market transformation.

1.2.5 Commercial & public services

Now that services form over 70% of economic and employment activity, the One Planet targets need to focus on this more complex agenda, where there are more ‘upstream’ and indirect effects. It is also a more political agenda – for many commercial services there is overlap or competition with public services, such as health or education.

Public services in particular are the first priority for a One Planet procurement strategy, which should use its £1.2 billion spend in Wales, to target key sectors for innovation / transformation strategies. Another priority are the financial and real estate services, with the largest turnovers of all, for their crucial role in providing incentives for all other sectors.

Not only WAG, but the entire public sector of Wales should be leading on the One Planet strategy, through pro-active procurement and contracting for public services. This in turn will stimulate change in commercial services through corporate social responsibility, environmental management, ethical trading and finance, carbon trading etc.

Commercial & public services – summary recommendations

- Tradable quotas on energy use with incentives for building efficiency.
- Accessibility incentives for commercial & public services.
- Packaging deposit / re-use levies for retail & distribution.
- Procurement for public services based on One Planet principles.
- Delivery of health and education services within a One Planet transformation strategy.

1.2.6 Energy & emissions

The One Planet energy strategy needs to work through the many uncertainties of emissions trading, technology innovation and so on, towards low risk and low impact infrastructure and technologies. On the demand side there is accelerated energy efficiency and affordable warmth – ‘powering down’ as in the *Zero-Carbon Britain* report². On the supply side Wales has excellent potential for renewable energy, particularly with onshore and off-shore wind.

The contribution of Wales needs to keep up with fast emerging UK and EU policy – there are high expectations in the draft Climate Change Bill 2007, while the actions in the Energy White Paper 2007 are as yet unclear. This suggests a rapid rate of policy innovation over the next few years, which will aim at minimum risk and maximum opportunity in the face of uncertainty. This points towards setting up a wide energy portfolio including emissions trading, micro-generation incentives, and distribution / generation partnerships. This would expand the scope of the Energy Route Map into a more strategic planning initiative.

Energy & emissions – summary recommendations

- National & local fiscal policy – expansion of carbon levies / emissions trading scheme.
- Renewable energy sources – promote via planning, public procurement, utility / developer investment partnerships.
- Micro-generation, co-generation, distributed heat: incentives through planning, procurement, social housing partnerships.

² Centre for Alternative Technology, 2007: *Zero-Carbon Britain*: Machynlleth, CAT

1.2.7 Waste & resources

Current waste management is a classic end-of-pipe approach, when the most sustainable solutions are clearly ‘upstream’. The main incentive is currently the landfill levy ‘escalator’, gradually increasing the viability of recovery: but there are also barriers and lock-in effects from existing infrastructure and supply contracts. This affects Wales in both the more remote rural areas, and the de-industrialized urban areas.

A One Planet ‘resource economy’ would see the most material flows as ‘re-circulation’ – recycled, re-manufactured and re-used materials and products would become the default, and virgin inputs much reduced. The One Planet approach aims at transformation in all resource-intensive sectors: combining product design, material sources, logistics networks, consumer services, and fiscal incentives. The contribution of the Wales public sector should focus on procurement, local incentives, tax and investment programmes at the sub/regional level for ‘market transformation’ in key sectors.

Waste & resources – summary recommendations

- All manufactured products designed for re-use & recycling: via procurement & market transformation in key sectors.
- All packaging designed for re-use & recycling, with full-cost deposit-return levies
- Industrial ecology clusters & networks – promote via planning & economic development
- Product re-use and recycling – promote via secondary markets, low impact logistics.

1.3 POLICY AND GOVERNANCE

Wales highlights the need for more sustainable development, planning and infrastructure, consumption and production in its economic strategy, spatial strategy, coalition programme and many other documents. With such good intentions, what could possibly be missing? For this we have to look closely at the difference between ‘surface greening’ – a few trees or recycling bins – and a more structural transformation. For each of the key sectors above we need to ask -

- What are the powers and resources of *Wales*, as distinct from the region, the UK or EU? i.e. what is its *competence* and *mandate*.
- What is the scope for local fiscal (taxation) powers, or real spending and investment, which can be decided locally, and not simply delegated from above?
- How can elected local government work effectively with the many agencies, partnerships, and social enterprises?

1.3.1 What can Wales do?

The One Planet agenda involves a wide-ranging and innovative set of policies and investments, at every level – local, regional, national and global. It places local authorities and the public sector in the pole position in various ways:

- As leaders of the agenda
- As stewards of environmental assets and values
- As managers of markets in environmental assets
- As direct purchasers and clients
- As operators of direct public services and (some) infrastructure
- As enablers & sponsors of ‘market transformation’

There is certainly a need for coordination with the regional bodies, UK government, the EU and international bodies. But Wales with its many initiatives and partnerships, also needs to take the lead – to promote, facilitate, innovate, and generally *make things happen* at the national and sub-national level.

Some of these ways forward are very exciting – focusing on new forms of ‘distributed intelligence’, as enabled by ICT. We see huge potential for ‘next generation’ web services on the model of eBay, MySpace and so on, as enabling a step change towards a One Planet Economy:

- trading for re-use and recycling:
- digital democracy and participative planning:
- responsive urban planning & management:
- consumer needs profiling for public service delivery:
- social spaces for community networks, and so on.
- Generally, linking the supply side with the demand side, to avoid waste and increase efficiency.

1.3.2 Fiscal & Investment Issues

Whichever the devolution path taken by Wales and the wider public sector, it is clear that we need to bring to the One Planet agenda every kind of financial power available to the public sector. The overall context for this is national macro-economic policy, assumed as the UK Treasury’s ‘golden rule’ and ‘sustainable investment’ rules on the overall limits to public spending. Within this there are many possibilities, to be explored by Wales and the wider public sector:

- Carbon emissions trading and quota schemes: graduated to be tax neutral and progressive.
- Eco-systems ‘lifetime credit’ schemes: e.g. product impact charging.
- Activity / infrastructure levies and re-investment: e.g. congestion charging with re-investment in public transport.
- Each of these is to be combined with regulation and behaviour incentives.
- Each of these should be devolved to the most local level on the principle of subsidiarity.
- The whole package should add up to serious and strategic investment for market transformation in key sectors.

1.3.3 Affluence, lifestyle and poverty

This all seems high-minded – but in practice there are deep rooted issues of affluence and individual liberties. Few governments have survived by asking the electorate to consume less, except in wartime.

One approach to ‘decoupling’ growth from material consumption, focuses on quality of life factors - behaviour change incentives, awareness and education, media and fashion, and personal development. Another approach is through social enterprise. For instance, private sector childcare appears to increase GVA, while public sector childcare appears to be a drain on the public purse: but community sector childcare may be more sustainable, even while no money changes hands. We need to focus on such vital overlaps between private, public and community sectors.

This applies to the regeneration agenda, where levels of deprivation in some parts of Wales are as high as anywhere in the UK. The conventional ‘economic’ response to deprivation is to improve competitiveness, incomes and material consumption. In contrast a ‘sustainable development’ response looks at a wider picture – social cohesion, community enterprise, mental health and aspirations, alternative skills and careers, and community investment. This is more in tune with current understanding of deprivation as a whole-life situation, more than simply low incomes. ‘Empowerment’ of individuals and communities is seen as the pre-condition to a more sustainable pattern of economic development.³

1.4 RECOMMENDATIONS & NEXT STEPS

This report shows an outline of the ‘transformation’ of the economic and physical development of Wales, towards a ‘One Planet’ nation.

We take the measures of this transformation as the ecological footprint (consumption based): and climate change emissions (production based), as defined in Section 2. We take the target generally as the 4-fold increase in resource efficiency, needed to live on a fair share of the resources of One Planet by 2050. This translates to an annual change target of around 3.5% absolute improvement, or around 6% ‘decoupling’ relative to economic growth.

This challenge raises huge questions on *who* is responsible, *how* it can be achieved, *what* are the actions required, and *how much* are the costs and benefits.

This first phase report can only provide a sketch of such challenges and responses. It can point to the process of strategic ‘business planning’, in the short, medium and longer term: on the ‘demand side’ and ‘supply side’: and for both ‘physical’ and ‘human’ actions.

We put the case that Wales and the wider public sector should take forward this process, with a multi-level participation programme of evidence gathering, policy development, vision building and capacity building.

³ Friedman, 1992

1.4.1 One Planet Economy recommendations

The One Planet Economy is a huge theme, and not simple to boil down to a simple set of instructions. The main report discusses a set of '10 principles' for the One Planet Economy, which are based on a combination of mainstream and new economic thinking. The recommendations to WAG, in partnership with the wider public sector, are drawn from this.

Main recommendations to the Wales Assembly Government and the Welsh public sector.

- Set targets for 'One Planet' levels of resource use, with transformation strategies in key sectors such as housing, transport, manufacturing etc.
- Use public procurement to foster business innovation.
- Use public investment partnerships for low-impact infrastructure.
- Promote integrated supply chain management and consumer partnerships in key sectors.
- Develop incentives for improving the indirect effects of financial & business services
- Promote social and community enterprise as a way towards sustainable consumption.

Each of these can be used as the basis for strategic planning and 'route mapping'. Such strategic planning will generally contain actions on the supply side and demand side, for both physical, economic and social issues:

- Short term – enabling and capacity building, pilots and demonstration, rapid mobilization.
- Medium term – new infrastructure, supply chains, policy frameworks,
- Longer term – full market transformation strategies in each key sector.

1.4.2 Next steps – short term actions

The next steps are to set out a short term strategy for the next period of government to 2011, in each key sector, aiming to produce quick and positive results with maximum leverage. This would include priority actions in each sector, focusing on public procurement and the 'public estate', as often the easiest place to start. This short term programme would need to be developed through intensive consultation, but for now we can show some likely examples:

Recommendations: examples of short term actions

- Food: local & organic catering in all public institutions.
- Built environment: pilot programme for the full scale upgrading of existing housing.
- Transport: green travel management for all public organizations.
- Products: promote ‘free-cycle’ hubs and networks.
- Services: eco-tourism scheme & ethical finance programme.
- Public services: green procurement & internal carbon trading scheme in large organizations.
- Energy: promote ‘transition towns’ efficiency campaign in urban neighbourhoods.
- Waste: set up ‘bag free’ towns & retail parks.

1.4.3 Next steps – Action Foresight programme

Each of the above is a practical agenda – the question is how to mobilize it, given the wide range of stakeholders, and the many incentives and barriers? One approach is the Foresight process, much used in regional development and technology innovation, in the UK and EU.⁴ The Foresight principle is to explore future trends and opportunities, build the capacity of stakeholders and networks, and develop practical strategies and programmes.

We recommend a One Planet Wales ‘*Action Foresight*’ programme (provisional title) which is adapted to focus not only on futures thinking but also on urgent practical actions. This aims to accelerate positive thinking and ‘joined up’ policy through catalyst actions. This could work in 4 parallel strands, focusing on key sectors in a rolling programme, building on current innovation programmes such as the ‘Technium’ and similar initiatives:⁵

- Short term action prioritization and mobilization, with stakeholder partnerships and actor-networks:
- Longer term trends and opportunities: horizon scanning and trend monitoring on annual basis: policy options analysis and modelling: futures workshops for SWOT analysis:
- Networking & capacity building: stakeholder forums on a quarterly basis for key sectors: online library of opportunities & contacts.
- Strategic planning: rolling programme of One Planet transformation strategies in key sectors, which then link into the mainstream economic & spatial planning process:

The outcomes of such a 2-3 year programme would aim to mobilize some of the more innovative and topical actions which are as yet in the talking stage:

- Potential for local carbon trading & incentives schemes, (as proposed by the Energy White Paper).

⁴ PREST for DG RTD K (2002)

⁵ Technium is a network of business and high technology clusters around Wales:
<http://new.wales.gov.uk/topics/businessandconomy/help/innovation/technium>

- Partnerships with utility companies for ‘nega-watt’ investment in raising energy efficiency.
- Accelerate the use of IT as a catalyst for social trading and participative decision making.

1.4.4 Summary of the summary

Main objective of the One Planet Wales:

- To demonstrate pathways for ‘transformation’ of the Wales economy towards a ‘One Planet’ level of resource efficiency.

The main challenges are based on the ‘key sectors’ of consumption, here defined as:

- Food & agriculture
- Housing & built environment
- Transport & communications
- Products and manufacturing
- Commercial & public services
- Energy & waste management

Key targets and indicators:

- 3.5% annual reduction in climate emissions and ecological footprint: equivalent to a 75% cut by 2050.

Overall strategic policies for WAG to take forward:

- In the medium-longer term: investment for strategic ‘transformation’ in supply chains and markets.
- In the short term, a One Planet Wales ‘Action Foresight’ programme, to facilitate and mobilize the above.

Implications for UK government and EU policy: to support and enable Wales and other Devolved Administrations, to take initiatives and contribute to the overall One Planet Economy strategy for the UK.

2 Introduction

2.1 CONTEXT

Never before has the world been faced with such a far-reaching agenda. In the words of the UK Treasury's Stern Review (2006):

The scientific evidence is now overwhelming: climate change is a serious global threat, and it demands an urgent global response. This Review has assessed a wide range of evidence on the impacts of climate change and on the economic costs, and has used a number of different techniques to assess costs and risks. From all of these perspectives, the evidence... leads to a simple conclusion: the benefits of strong and early action far outweigh the economic costs of not acting.

However even with this, plus other evidence such as the IPCC reports, the UNEP Millenium Eco-Systems Assessment, and the WWF Living Planet report, it is far from clear whether real progress is being made.

To tackle this involves a multi-dimensional approach – involving technology, markets, policy and regulation, infrastructure and spatial planning, lifestyles and attitudes, and so on. One vital area is at the territorial level of the UK, both in regions and devolved administrations such as Wales.

At present the regional / devolved policy agenda is driven mainly by social and economic pressures – environmental improvements are often an add-on mainly for image and amenity. However environmental issues have now shifted from a local and regional agenda, to the overriding imperative of the global climate and resource agenda. This raises fundamental questions about how an economy such as Wales should respond:

- Look for conventional economic development solutions, based around energy dependent and transport intensive branch-plant types of employment.
- Look for new and more sustainable forms of growth and employment, based around the opportunities for competitiveness from a low carbon, high efficiency, high value added pattern of development.

The latter is likely to work within the context of 'multi-level governance' – from households, neighbourhoods and districts, to city-regions and regions. It will also work within 'multi-lateral governance' – only when policy, business, finance, communities and consumers are coordinated and working together at all levels, can we expect to see real results.

It is the goal of this project to show how this can be done – that there are practical ways towards the development and transformation of an entire economy such as Wales, which bring competitiveness and added value, and also respect the One Planet principle.

2.2 THE PROJECT

2.2.1 Objectives

The One Planet Wales project is a small scale pilot and demonstration of a very large and challenging agenda. Within limited resources it aimed to outline the scope of what would be a much larger research programme. Its general aim was to:

- Identify the medium-longer term agenda for One Planet Economy in Wales, in terms of strategic policies and programmes.

To do this it set the specific objectives:

- Identify the scope of the One Planet Economy for Wales, with metrics, trends & targets for each key sector.
- Apply current tools and methods to modelling and policy analysis, such as the REAP tool and the One Planet Economy Regional Analysis.
- Focus on the specific situation and opportunities for Wales in each key sector.
- Identify the most significant actions and a route map for the Welsh Assembly Government, together with other public sector partners.

2.2.2 Methods

The method was mainly a desk study, but also included a small set of semi-structured interviews with key experts and stakeholders. The study generally followed the OPERA method which was piloted in 2007 for the South East England Regional Assembly (details in the Annex). However, much of the discussion material of the One Planet Wales was drawn from the UK-level One Planet Economy Network materials, due to the very modest resources available at this stage.

In the OPERA the main steps for each key sector include, 4 main stages, each with a ‘baseline’ (present) and a ‘prospective’ (futures) component.

- **Agenda setting:** this is about defining the problem and setting clear boundaries for the present and the future.
- **Technical issues:** this includes the technology, infrastructure, with environmental and spatial impacts, and the opportunities for change.
- **Economic issues:** focus on the ‘wider economy’ system - flows of capital and human value, on the production and consumption sides, in public and private sectors.
- **Policy issues:** this focuses on the organizations in public, private and civic sectors, and the opportunities for new kinds of policy.

There is a baseline component for each of these, followed by a ‘prospective’ (future opportunities) component. This should then be taken to an ‘extended analysis’, in order to look more closely at cross linkages. It should then be taken to an ‘evaluation’ stage which digests the results and provides feedback to users.

In addition, to inform the policy relevance for Wales, a consultation programme was carried out. This involved semi-structured interviews with a range of experts and stakeholders across Wales and the WAG. Details of the structure and the respondents are shown in the Annex. In both the interviews and the analytic research there were key reference points (details in the Appendix):

- WAG, 2007: One Wales: a progressive agenda
- WAG, 2004: Sustainable Development Action Plan 2004-2007
- WAG, 2005: Wales: a Vibrant Economy
- WAG, 2005: Environment Strategy for Wales
- Sustainable Development Commission / Cardiff University, 2006: *Pioneer to Delivery: and Aiming Higher*
- Expert panel on resource management for Wales, 2006: *'Low Carbon Wales'*
- Stockholm Environment Institute, 2005: *'Ecological Budget of Wales'*: WWF-Cymru
- CURE, 2006: One Planet Economy Network – a Prospectus: available on www.oneplaneteconomynetwork.org
- Barrett J, Ravetz J & Bond S, 2006, *Counting Consumption*: Surrey, WWF-UK
- Ravetz J, (2000): *'City-Region 2020: Integrated Planning for a Sustainable Environment'*: London, Earthscan

2.2.3 Policy analysis and modelling

In each of the key sectors, the cumulative effect of the policy recommendations is shown in a series of 'wedges' charts, which puts the 'Business As Usual' (BAU) trend against the One Planet targets. Such charts are highly indicative at this stage: to provide a more accurate picture, the policies would take much further definition, the modelling would be greatly improved, and the scenarios would need much more detail, and even this would depend on many assumptions.

The most topical curve on each of the charts is the BAU trend line, and the 'stabilization' actions which would achieve a zero-growth in impact. The trend lines are based on a rough outline calculation, pending further analysis commissioned by DEFRA. The calculation assumes the policies and policy modelling in the UK Energy White Paper 2007: and then adds in the effects of aviation and international shipping, embedded emissions in the net trade balance (imports minus exports): and the growth rate of ecological impact of land use change at the global level.

2.2.4 Resource analysis framework (RAF)

The general background to the OPERA method is based on the idea of the 'inter-dependency' of environmental, social and economic factors. To explore this, we find most useful the combination of 'causal path analysis' charts: together with a series of analytic matrices. These matrices are based on the 'resource analysis framework' (RAF). This was developed through the OPEN programme, with three main categories based on economic modelling:

- Supply side: primary, manufacturing, infrastructure, service sectors
- Demand side: utilization, mode, product operation
- External impacts: environmental, social, economic

Each of these categories can then be analysed in terms of resource flows, economic issues and policy issues. In each key sector this RAF is expanded to a more detailed chart, showing a

summary of the whole of supply chain in that sector, with environmental, economic and policy issues set out: this is then the key to more detailed investigation of the linkages between and across the framework.

RESOURCE FLOW FRAMEWORK - OUTLINE			
	supply side	demand side	external impacts
agenda setting			
technical issues & opportunities			
economic issues & opportunities			
policy issues & opportunities			

It should be stressed that this RAF structure is only a guide. Many of the boxes will be hard to fill with actual data, and being clear about the many layers of uncertainty will be more useful than pointless precision in numbers. Each component in this method is a process of investigation, rather than a fixed ‘answer’, particularly when looking into future projections and scenarios. The aim is not so much a final ‘answer’ as a useful guide for research and debate.

2.3 ONE PLANET ECONOMY CONCEPT

In this project, the stabilization and reduction of the ecological footprint and carbon footprint (EF and CF) is placed in the context of the ‘One Planet Economy’ agenda. This comes from the view that a reduction in footprint needs more than a ‘technical fix’, rather it involves step-changes and transformations - in markets, technologies, policies, infrastructure and lifestyles.

The UK Government in its Sustainable Development Strategy has highlighted the concept and goal of a One Planet Economy, and the evidence base needed to support it.⁶ However as yet, the UK government has not clearly defined a One Planet Economy, or provided evidence or policies to help achieve it.

The One Planet Economy Network (OPEN) is set up to investigate and promote the One Planet Economy agenda. It starts with the national resource flow data produced by the Ecological Budget UK, and provides a set of ‘consolidated accounts’, on an annual basis, just as with any major company. Then the OPEN looks at applications of such evidence to the One Planet Economy goals, in each of the key sectors such as transport, housing or energy. For each of these there are new methods of benchmarking, policy appraisal, economy-environment analysis, and so on.

Following this it outlines a forward strategy for the UK economy as a whole – aiming at a step-change in resource efficiency, and transforming our current patterns of consumption and production. This starts with the pro-active use of public finances, focusing on eco-investment as well as eco-taxation. This enlarged policy agenda has to work with science and technology, corporate management, spatial planning, international trade and many other issues.

⁶ Her Majesty’s Government (2005): Securing the Future

All OPEN papers are available at the moment on www.ecologicalbudget.org.uk, and the main sponsor is WWF-UK.

2.3.1 Context – climate policy vs One Planet policy

At the moment there is a massive attention on climate change and carbon emissions policy. However it is clear that much if not most climate / carbon policy tends to be an end-of-pipe, *problem-focused* agenda:

- The problem definition is based on accounting for carbon at the point of emissions;
- The policy agenda tends to focus on climate impacts;
- The business agenda tends to focus on energy and emissions technology.

In contrast it can be argued that the One Planet Economy theme aims towards a *solutions- focused* agenda:

- it uses several types of ‘footprint’ measures to identify total impacts, both direct and indirect, all the way to final consumption.
- It focuses on imported goods and their embedded impacts: this gets past the ‘green illusion’, in which the UK appears to be more sustainable simply by exporting its impacts to overseas.
- It takes on the whole economy, with supply chains from origin to ‘end-fate’, and with all its social, cultural and political dimensions.

Overall, the One Planet Economy theme looks for pro-active ways to turn the perceived ‘costs’ of an emissions reduction policy, into the economic and social ‘opportunities’ of a transformation strategy.

2.3.2 One Planet Economy goals

The over-arching idea behind the One Planet Economy is very simple – sound management for the longer term. Whether we are dealing with a corner shop, a multi-national corporation, or the devolved nation of Wales – we need to manage our assets and liabilities, and be aware of future risks and opportunities. We need to think both short and long term, be responsible to suppliers and customers, and look after both employees and stakeholders. This is the way to organize an economy which lives well on the resource of One Planet, rather than squandering the resources of three or four. To summarize:

- The *footprint* measure shows that consumption by Wales’ residents (about 5.25 gha/cap) is using up the earth’s resources at over 3 times their per capita share of about 1.8 gha/cap.
- As a service-led economy Wales is now *exporting its environmental impacts*, by importing more goods from overseas, even while local environmental conditions improve.
- To reduce the *current* Wales footprint of 5.25 gha/cap to the 2050 fair share of bio-productive land area would need a *Factor Four* reduction.
- This also translates into a long term goal of *Factor Four* increase in resource efficiency.
- Such resource efficiency improvement can be both cause and effect of economic *growth and competitiveness*.

- This can be achieved through the principle of *‘industrial evolution’*. We interpret this as environmental sustainability, achieved by a combination of technological, economic, organisational and social change.

As and when the Wales economy is clearly moving on this strategic path towards a Factor Four, then it will take up the Prime Minister’s challenge in the UK Sustainable Development Strategy of 2005, and move towards a true **ONE PLANET ECONOMY**:

“an economic system of production and consumption which respects environmental limits, local and global, while being financially and socially sustainable.”⁷

The concept of the One Planet Economy was referred to in the UK Sustainable Development Strategy of 2005, but not defined, measured or otherwise followed up at that point. This is the aim of the One Planet Economy Network (OPEN).

2.3.3 One Planet Economy themes

The over-arching theme of the One Planet Economy is that of *transformation*. We need a transformation strategy which increases resource efficiency and reduces environmental pressure. This strategy needs to be gradual, long term, reliable and equitable. This strategy needs to be based on sound business thinking, viable investment, with the right incentives for each of the stakeholders.

All of this adds up to a full *‘industrial evolution’* or sector by sector transformation program, in its wider sense – including low impact technologies, integrated logistics, equitable distribution and sustainable consumption patterns.

- Such a strategy should be *financially viable*, aiming at net gains in both national and individual costs and benefits.
- Such a strategy should also be *socially responsible*, aiming towards equalising the differences between social groups, between regions, and between the UK and the developing world.
- Such a strategy requires a practical *‘business case’* and *‘investment case’* for each sector: each policy level: each product type, and so on. Economic, social and environmental costs / benefits (as far as can be defined) should all ‘stack up’.

By its nature, industrial evolution is not likely to be simple and predictable – so the One Planet strategy is as much about responding to uncertainty as it is to fostering mutual learning between different sectors and social groups.

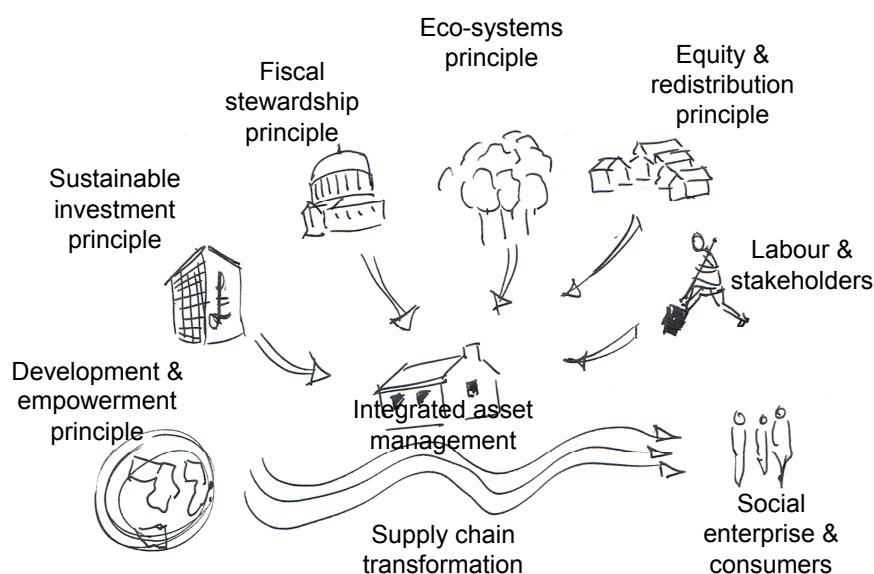
2.3.4 One Planet Economy principles

A ‘One Planet Economy’ is measured ultimately by the resource flows and global impacts of its supply chains, from production to consumption. However there is much more to an economy than material movements. There are flows of finance and credit: inputs of labour and skills: international trade and development issues, and so on.

⁷ This is the working definition used in the One Planet Economy Network documents: www.oneplaneteconomynetwork.org.

There is no single or complete way to represent such a wide range of issues, or to define a strategy which is guaranteed to achieve the One Planet target in resource flows and global impacts. But we can identify from experience, analysis and road-testing, the most significant principles. The 10 principles summarized below (details in the Appendix) represent the most significant avenues to pursue, in the wider concept of a One Planet Economy. These are not fixed in stone, rather they are fuzzy and up for debate. So this aims to be a practical, flexible menu of broad themes, to be adapted to circumstances and opportunities.

One Planet Economy – principles



The pyramid diagram below (and the cartoon above) show how the principles overlay on the supply chain and resource flow concept.

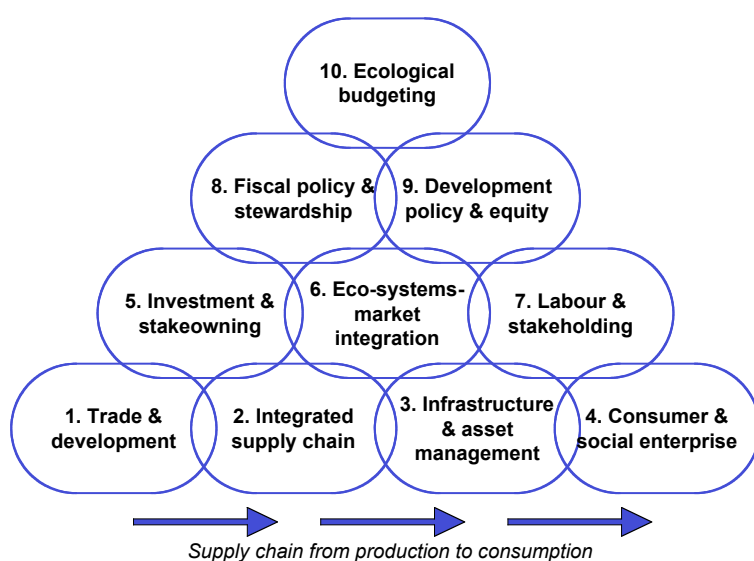
- The base of the pyramid is defined in terms of the resource flow supply chain, from source to destination.
- The next layer concerns the ‘factors’ which input to the economy, as in mainstream textbooks: including capital, labour, and land (ecological assets).
- The third layer concerns the two main policy strands which respond to this: basically, fiscal policy for ecological transformation, and development policy for socio-economic transformation (corresponding to the principles of ‘inter-generational’ and ‘intra-generational’ equity).
- At the top of the pyramid is the ‘ecological budgeting’ principle, as the over-arching goal of the One Planet Economy.

There are many other possible goals for sustainable development, but we take this global ecological limit as the focus for the One Planet concept. This global limit then has to translate to the local, regional or national level – either directly, or adapted for particular situations such as growth or decline, local thresholds etc.

Each of the principles is defined with a series of benchmarks for measuring, comparison and assessment. These benchmarks are basically tools to analyse the components of the supply chain concept, applied to environmental, economic and human factors, and played out in various levels of time and space. Such benchmarks are not always simple to define or calculate, and their value can be as much in the process of investigation, as in the actual results. Businesses reporting in this way will need to be open and transparent about the options for investigation, and the experience of doing this. Further details of the principles and benchmarks, are in the Technical Annex.⁸

10 principles for a One Planet Economy

System-level principles to enable definition & benchmarking of a One Planet Economy



2.3.5 Footprint and other concepts

The ‘footprint’ concept now appears everywhere – but what is a footprint? The underlying concept is that of displacement, of leaving behind a mark on the landscape, for others to suffer or to deal with. So, the footprint is suited to being assessed at the point of consumption, i.e. accounting for all the impacts through each point of each supply chain which is involved in producing something for the final consumer. For example, the footprint of a loaf of bread includes the land used to grow the wheat, the energy in production and distribution, the materials used in packaging, and even the office blocks used by that loaf’s share of the advertising and insurance sectors. We can look more closely at different types of footprint -

- **Ecological footprint** – the total bio-productive land area required to supply resources or absorb pollution, to meet consumption needs, and to absorb pollution, particularly climate

⁸ All current working papers are on the site www.oneplaneteconomynetwork.org and also www.ecologicalbudget.org.uk

emissions from fossil fuel energy. This is now covered by an international standard from the Global Footprint Network, but the methods and the data sources are still under development.⁹ There is scientific debate on the ecological footprint measure, its accuracy and its relevance to policy, (particularly as 'land' is not always a fixed commodity in single functional use categories). However it is clear that as a broad measure of the scale of human impact and balance with their environmental support systems, and as a communications and awareness raiser, the ecological footprint is very effective.

- **(Resource footprint)** – this is loosely applied to mean the materials taken from nature into the economic system, with impacts on stocks or other types of environmental impact. The best way to measure this in principle is in the Environmental Space resource depletion scheme developed by Friends of the Earth.¹⁰)
- **Carbon footprint** – this is also used loosely. In principle this should be defined as the carbon emissions of the supply chain, as allocated to final consumption categories. A more useful scientific definition would also include the other climate emissions 'greenhouse gases' as expressed in CO2 equivalents.
- **Carbon emissions:** as specified by the UN Framework Convention on Climate Change reporting mechanisms, this covers direct climate change emissions as allocated to production or direct processes within the territory: again, more usefully expressed as greenhouse gas emissions in CO2 equivalents.
- **Climate change anthropogenic causes:** these include direct emissions together with deforestation, landuse change and other causes.

Other kinds of footprint – social, economic or cultural – can be developed to deal with other effects and impacts. The diagram here is an outline of the links between carbon, resource and ecological footprint measures:

- One key to accounting for this inter-relationship is the energy system of primary, conversion and demand, as shown on conventional energy balances.
- The other key to accounting is a clear definition of boundaries and responsibility paths, particularly in relation to the energy system, which may cross the boundaries at several stages of the primary – conversion – demand chain.

⁹ www.gfn.org

¹⁰ McLaren et al 1996, Tomorrow's World:

A): resource flow 3) - footprints

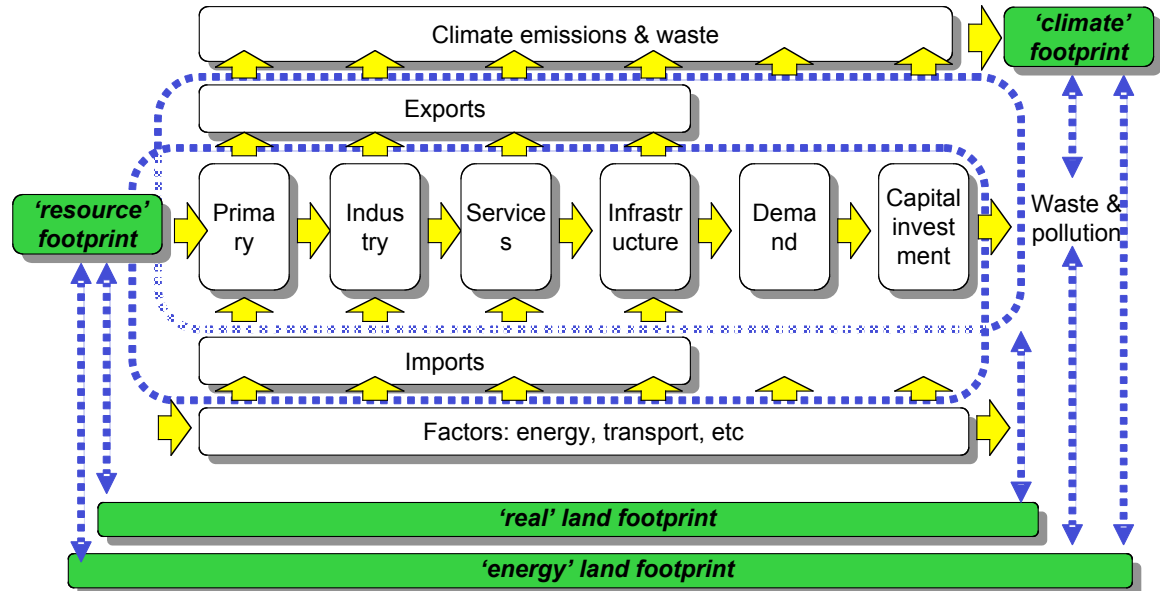


Fig 2.3 ecological & climate footprint

2.3.6 Trends and targets

The key result of the Ecological Budget UK shows that the UK is exploiting the Earth’s available resources, as measured in bio-productive land area or ‘bio-capacity’, at more than three times its “fair” share, as measured by the Ecological Footprint in global hectares per capita (gha/cap). This is not a universal catch-all measure, but it does draw attention to the totality of global impacts and limits. These of course are changing over time, so that the sustainability target is a moving target:

- By 2050 there is likely to be a 50% increase in world population, up to 9 billion people.
- There may be some additions to bio-capacity through land reclamation and reforestation, but there may be other damage to eco-systems, particularly from climate change.
- Therefore a mid-range estimate of change in bio-capacity would be from 1.8 to 1.3 gha/cap in 2050.
- To reduce the *current* Wales footprint of 5.25 gha/cap to the 2050 fair share bio-capacity of 1.3 gha/cap would need approximately 75% reduction – a ‘**Factor Four**’ reduction.
- To reduce the *future* Wales footprint (assuming current growth trends of 0.8% per year) of 7.7 gha/cap in 2050, to the 2050 fair share bio-capacity, would need a Factor Six reduction.

For climate emissions the figures are a little different but the principle is similar:

- The UK government has set out a long-term target, in line with international scientific advice, for 60% reduction in climate emissions by the year 2050.
- There is more recent evidence, as quoted in the Stern Review, to say that a more stringent target of 80% is in fact a less risky course.
- Also, as the UK as a wealthy high-impact nation causes about 2.5 times more emissions per head than the global average, there is a strong case for increasing global equity through the “contraction and convergence” principle. In that case the 60% target would be increased to 75-80% cut in emissions by 2050, exceeding the Factor Four target.

This provides the overall horizon for the sustainability of the UK economy i.e. the path towards a **‘Factor Four’** goal, (named after the book of the same name).¹¹ At that point it will take up the challenge of the UK Sustainable Development Strategy, and move towards a real One Planet Economy – “an economic system of production and consumption which respects environmental limits, local and global, while being financially and socially sustainable”.

2.3.7 Trends, targets and decoupling

Clearly, the transformation of the Wales or the UK into a One Planet Economy will not happen overnight. But we can define the target rate of change by setting the Factor Four goal at a strategic point such as 2050 (the current horizon for UK climate policy).

- This equates to a year on year reduction in total resource use of about 3.5% per year (if starting from 2007), as measured by the Ecological Footprint.
- By 2020, at this rate of change, the reduction in total Footprint would be about 35% and by 2050 about 75%.¹²
- If we factor in economic growth at an average of 2.5%, then the required rate of “decoupling” or improvement in the resource efficiency (Footprint/£GDP) would be a reduction of around 6%, year on year for the next 40 years. This is about twice the rate of decoupling in the recent past, which held resource use more or less level while the economy grew.
- For comparison, if we take the UK’s current policy target of a 60% cut in climate emissions by 2050, this is equivalent to a year on year reduction of about 2% (starting from 2007).¹³

The Factor Four target rate of around -3.5% in absolute resource use, and around -6% in relative decoupling – is the ultimate benchmark for a pathway to environmental sustainability. It is also a guide to the long-term policy framework for public policy and business performance which enables organisations to plan ahead. It can then translate into schemes such as the ‘cap and trade’ principle of the European Emissions Trading system (assuming this could be made to work): using the ‘cap’ as a ceiling on emissions, this would be targeted to reduce by 3.2% per year.

¹¹ Von Weizsacker et al 1997

¹² The calculation depends on which year is set as the baseline year, and whether figures are rounded.

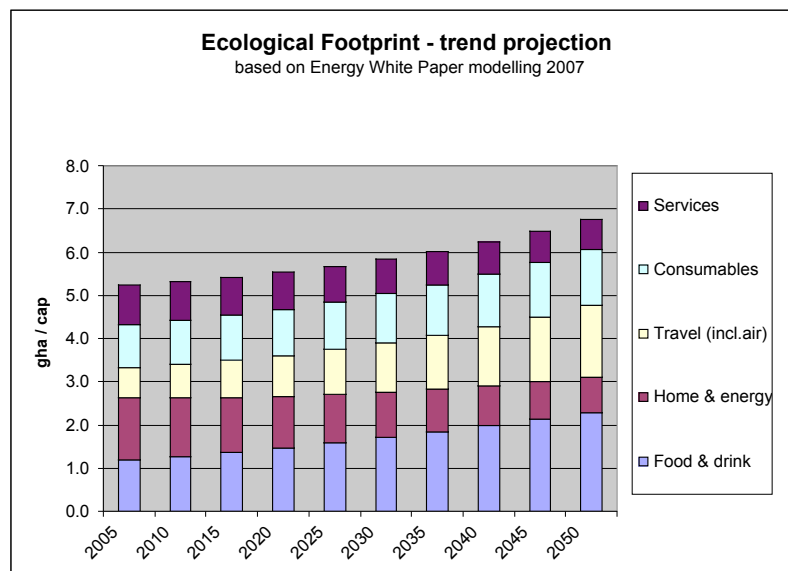
¹³ The Energy White Paper 2007 proposes a set of policies, which assuming central estimates of growth, would result in an annual reduction of direct CO2 emissions of -1.2%.

2.3.8 Trend projection by sector and source

A breakdown of the BAU trend projection was calculated on a rough illustrative basis (this is an interim result, pending more detailed studies from SEI commissioned by DEFRA in 2007). This took the Energy White Paper 2007 modelling studies, using the ‘central estimate’ of growth and policy impact, as the baseline for direct CO₂ emissions projections, at the UK level. This was then enlarged with calculations for aviation and international shipping: embedded emissions in the net trade balance: proportion of international trade growth: and an estimated land use impacts growth from the Millennium Eco-systems assessment. The results were then allocated back to high-level consumption categories.

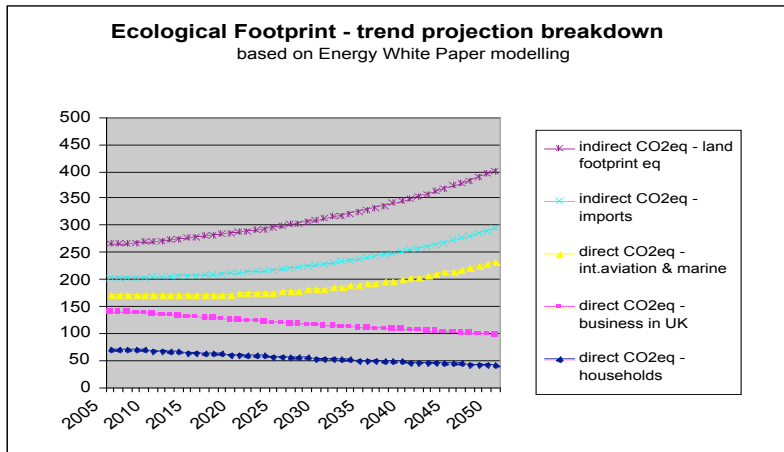
The allocation of detailed 123-sector and COICOP items to high-level (summary) categories is an issue: the method has been improved since the original version of the REAP system. Details of the new classification are in the Technical Annex.

The total trend projection for ecological footprint is shown in the chart, as an annual growth rate of 0.6-0.7%, or an increase by 2050 of around 30%.



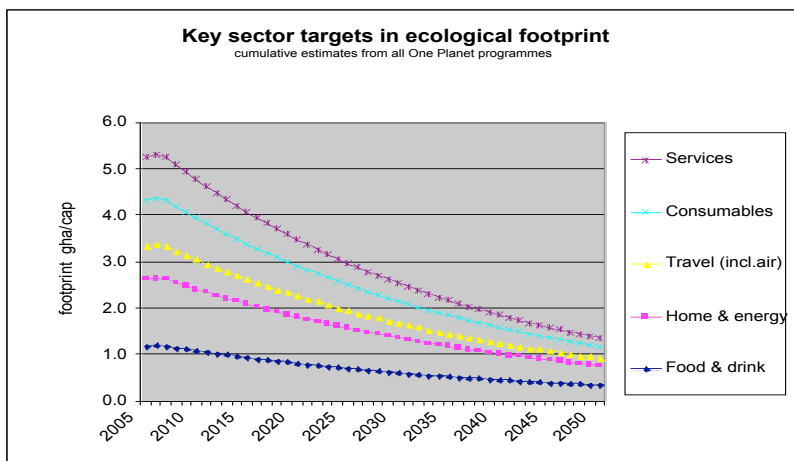
An alternative breakdown of this is shown in the second chart, in which all impacts are shown in terms of CO₂ equivalents, including that of ‘real’ land footprint:

- Household-related footprints, which are dominated by the direct CO₂ emissions of surface transport and household energy: a projected reduction rate of -1.2%
- Business-related footprints in commerce, industry and the public sector in the UK: a projected reduction rate of -0.4%;
- Aviation and international shipping, which does not appear on the national climate emissions accounts: a much higher long term growth projection in the region of 3.5%.
- Embedded CO₂ in imports minus exports: a projection of 1.5%
- Other land and ecological impacts (the ‘real land’ component of the ecological footprint, which is dominated by agriculture and forestry); estimated growth projection of 1.2%.



2.3.9 Targets by sector

The overall target of 75% reduction by 2050, or -3.5% per year, is a top-down calculation which leaves little room for manoeuvre in specific sectors. For example, there are important differences between food, transport and construction, but they all need to converge to a fairly narrow range of around 65-80% reductions. Within that range, top-down estimates were made of the likely potential (technological / economic / behavioural), which led to minor variations, as in the next chapters. The chart shows the net effect of these reduction curves, which were then taken as the basis for the policy modelling.



The table below shows these as % reductions at 2020 and 2050:

Sector	Current Ecological Footprint	Target Ecological Footprint 2050	% reduction by 2020	% reduction by 2050
Food and drink	1.29	0.41	30%	70%
Home and energy	1.09	0.35	30%	70%
Travel and tourism	0.88	0.24	35%	75%
Consumables	0.64	0.17	35%	75%
Services and public	0.65	0.14	39%	80%
Capital and other	0.70	0.19	35%	75%
TOTAL	5.25	1.39	35%	75%

Table 1 : Summary of potential impacts of sectoral policies

3 The state of the nation

3.1 ECONOMIC AGENDA

3.1.1 Economic strategy

Wales is clearly a unique case – a beautiful but fragmented country, with many remote and deprived areas, and a continuing gap between rich and poor. Many areas were previously suppliers of minerals, coal and steel, and are now striving to move into a knowledge-based economy. Wales retains its vibrant culture and language, but otherwise it is integrating into the UK economy, as much through industrial supply chains, as through tourism and higher education.

The Welsh economy has moved forward since its ‘partial devolution’ – 100,000 more people are in employment now than in 1999, and unemployment is now below the UK average. Average earnings have risen by 10 per cent in real terms, and growth is stronger than many countries – however Wales is still failing to narrow the gap with the UK. Particularly in West Wales and the Valleys, there is a perceived dependency on grants and public sector employment, well above the UK average, and there are problems with skills, economic activity rates, and business entrepreneurship. The vision for the most recent national strategy, *W:AVE (Wales – a Vibrant Economy)*, is summarized:

“a vibrant Welsh economy delivering strong and sustainable economic growth by providing opportunities for all. This strategic framework for economic development examines how we can achieve this vision. The approach it sets out focuses on encouraging sustainable growth through helping more people into work and helping to raise earnings for those in work by maximising the value created in the Welsh economy.”

There is a strong environmental theme in all this. The rehabilitation of the South Wales coalfields was a major task, and there are now clusters of environmental technologies around the country. Much of the Wales terrain favours small scale farming, eco-tourism and other diversification; however this also makes transport and conventional economic development more difficult, and even to link the south and north of the country is a challenge.

3.1.2 Strategic responses

However, environmental issues and policy have now moved on from what was a local and regional agenda, to the overriding imperative of the global climate and resource agenda. This raises fundamental questions about how an economy such as Wales could or should respond:

- Look for conventional economic development solutions, based around energy dependent and transport intensive branch-plant types of employment:

- Or, look for new and more sustainable forms of growth and employment, based around the opportunities for competitiveness from a low carbon, high efficiency, high added value pattern of development.

Assuming that the second option is pursued, then it has to link into the main agendas of the W:AVE approach:

- (i) agenda to *increase labour productivity*: the issue is the ways in which the One Planet Economy agenda can enhance added value, productivity and competitiveness;
- (ii) agenda to *decrease economic inactivity*: the issue is the ways in which the wider One Planet agenda can enable social enterprise, community investment and alternative forms of employment, all of which can encourage participation.

These issues are not simple – certainly they do not fit easily into conventional economic modelling or other analysis. We discuss some of the main questions at the end of this section.

3.1.3 Economic profile

Generally the Welsh economy is relatively dependent and seen as lacking entrepreneurial capacity: 55% of all employment is public sector or public grant-aided, compared to 37% for the UK as a whole.

This is backed up with some Regional Trends data (ONS, 2006)

- The proportion of people of working age qualified to GCE A level/equivalent or higher in Wales was around 46 per cent in spring 2005, compared to a UK average of 50 per cent. In 2004 the proportion of full-time first degree graduates studying in Wales who subsequently gained employment in the UK was below the UK national average.
- In spring 2005, the employment rate in Wales was 71 per cent for people of working age, which was below the UK overall rate of 74 per cent. In April 2005, gross weekly earnings for full-time employees on adult rates in Wales were £433 for males and £337 for females, 8 and 9 per cent below the UK levels respectively.
- Dwelling prices in Wales increased by 22.4 per cent between 2003 and 2004; this was the largest percentage change of any region.
- In Wales, manufacturing accounted for 19 per cent of gross value added (GVA) in 2003, compared with 15 per cent for the UK as a whole. Agriculture, hunting, forestry and fishing accounted for 1.6 per cent of GVA compared with just over 1 per cent in the UK overall.
- For the service sectors, 29 per cent of businesses in Wales were in the areas of distribution, hotels and catering or repairs; this was slightly higher than the UK average of 28 per cent.
- In 2004, Wales maintained the same number of business deregistrations as in 2003, of 28 per 10,000 adult population. But also significantly, Wales had the highest net capital expenditure per employee in 2003 of £5,023, compared with the overall UK figure of £3,755 per employee.
- To summarize the economic profile, GVA per head in Wales in 2004 was £13,300 compared with £17,300 for the UK as a whole.

3.1.4 Economic policy issues

The pattern of deprivation and dependency covers both rural and urban areas, and is concentrated in West Wales and the Valleys. This covers most of Wales - an area of 1.24 million hectares (around 12,400 km²) with approximately 1,150 km of coastline. Approximately 80% of the total area of West Wales and the Valleys is designated as Less Favourable Areas, which parallels closely the mountainous and upland areas. West Wales and the Valleys is a diverse area of Wales comprising a population of some 1.86 million (64% of the total population of Wales).

West Wales and the Valleys, and Wales as a whole, actually perform quite well on the leading labour market indicators compared to the average for the EU25 and have shown significant improvement since 2001. Improvements in the labour market have been more marked than in Wales or the UK more generally, with these improvements coinciding with the period of the Objective 1 programme. The lower unemployment rate across West Wales and the Valleys compared to the average for the EU25 is not matched by an equivalent difference in the employment rates. The explanation behind this lies in the relatively lower economic activity (or higher economic inactivity) across West Wales and the Valleys compared with the average for the EU25 is a key weakness of the economy, and one of the key drivers behind the programmes.

3.1.5 EU development programmes

The West Wales and the Valleys region has been awarded the highest level of support (£1.4 billion), known as Convergence, from the European Union for the new European Structural Funds programming round 2007–2013. Convergence is the successor to the Objective 1 programme 2000–2006, and geographically will cover 15 local authority areas in the West Wales and the Valleys region.

The Convergence programmes for West Wales and the Valleys comprise funding from two separate European Structural Funds: the European Regional Development Fund (ERDF) and the European Social Fund (ESF). Around £856 million of ERDF funds will be channelled through the Welsh Assembly Government to help progress the region's transformation into a sustainable and competitive economy by investing in the knowledge economy and helping new and existing businesses to grow. It will also focus on regenerating Wales' most deprived communities, tackling climate change and improving transport. Some £570 million from the ESF will be used to tackle economic inactivity, increase skills and employment. Together, the funds will total more than £1.4 billion of Convergence spending, which combined with match funding, will drive a total investment of £3.2 billion in the West Wales and the Valleys region.

This is the largest single programme for economic development and infrastructure, and it is vital that decisions are made with longer term objectives in mind. However at present it is arguable that the programme so far is being developed along conventional lines, as above.

3.1.6 Other relevant policy areas

Beyond the boundaries of mainstream economic development programmes, almost every area of public policy and public services is involved. The policy analysis tables in the Annex looks at the

organizational structures, and the 10 ‘key sectors’ in the next section cover this agenda in more detail. Here we can summarize the main policy themes and agendas in each key sector.

- Food and agriculture: rural development & national park policy: CAP and stewardship: retail planning: public health & education.
- Built environment: planning & building regulations: sustainable construction policy: minerals and forestry: energy markets & climate policy:
- Transport and communications: highways and infrastructure planning & investment: public transport finance & subsidy: spatial planning for accessibility.
- Products and manufacturing: business development, enterprise and innovation support: clusters and networks: business infrastructure:
- Commercial services: corporate responsibility: ethical trading and investment: accessibility planning: sustainable construction:
- Public services: public procurement: corporate responsibility: ethical trading and investment: accessibility planning:
- Energy and climate: carbon markets & quotas: demand side management: climate adaptation:
- Waste and resources: waste disposal and recycling: natural resource policy: product regulation: public procurement:

Each of these is combined in cross-cutting policy areas. For instance tourism and leisure sees each of the above sectors combined in various forms of ‘sustainable tourism’ programmes. Likewise the rural and urban regeneration agenda contains each of the above, combined in various forms of ‘sustainable regeneration’ programmes.

The challenge is that in many or most of these areas, current policy structures and processes are not adequate to deal with the scale of change needed for the One Planet Economy agenda. Although there is much high-level aspiration from the EU and UK, and ground level aspiration from local authorities and communities, the way forward is very far from clear.

So, it is not necessarily simple or straightforward to define the actions from WAG or other public bodies, for the One Planet Economy. There is no ‘magic bullet’ shopping list to cure all problems. It is more a case of building capacity, seeking opportunities, developing networks, exploring strategic thinking and so on, in various stages from shorter to longer term horizons.

3.2 ONE PLANET ECONOMY POLICY DIRECTIONS

3.2.1 Role of multi-level governance

The One Planet Economy agenda for the UK involves a wide-ranging and innovative set of policies and investments. It places government and the public sector in the pole position in various ways:

- As stewards of environmental assets and values
- As managers of markets in environmental assets
- As direct procurers and contractors
- As direct operators of direct public services

- As enablers & sponsors of market transformation

For Wales, the question is how these can be implemented by and with the public sector, at the level of WAG, local authorities, and the many agencies and providers in health, education etc. Rather than Wales ‘going it alone’, more constructive results are more likely where Wales develops its capacity to deliver its part of a One Planet Economy at the UK and EU level.

The general policy context in each key sector concerns the governance, powers, resources and mandate of many organizations. In other words, if we are serious about achieving a One Planet Economy in Wales, who should or could do what, with who and how much?

- What are the general scope of powers, duties, fiscal powers and other resources of *Wales*, as distinct from (a) UK, or (b) English regions.
- How does the principle of subsidiarity and multi-level governance apply to EU / UK / GB: WAG / Welsh Assembly : local authorities: local service boards, and so on.
- How far does government interact with various kinds of agencies, quangos, arms-length organizations, partnerships, non-profit and other organizations?.
- Are there examples of organization / legislative maps for each sector? (these were almost impossible to find: the partial tables shown in the Technical Annex are only a start on this task).

In each of the above there are several levels of government which each interact, in a system of ‘multi-level governance’.

- EU and other international agreements
- UK / Great Britain
- Welsh Assembly Government (see annex)
- 22 Unitary Local Authorities
- Other levels

3.2.2 Role of governance in the One Planet Economy

The One Planet Economy is measured ultimately by the resource flows and global impacts of its supply chains, from production to consumption.

However there is much more to an economy than material movements. There are flows of finance and credit: inputs of labour and skills: international trade and development issues, and so on. There is no single or complete way to represent such a wide range of issues, or to define a strategy which is guaranteed to achieve the One Planet target in resource flows and global impacts. But we can identify from experience, analysis and road-testing, the most significant principles.

The question for policy-makers is then how to respond to this: what are the benefits and costs: what are the opportunities and barriers. The following table provides an overview of such challenges, as related to each of the ‘10 principles’ in the previous section.

General principles of the One Planet Economy	Role of W.A.G., local authorities & other public bodies in Wales
Ecological budgeting , - the over-arching goal of the One Planet Economy, targeted at 3% increase in resource efficiency (ecological footprint: climate footprint: climate emissions): year on year	Each authority should set key factor targets and operational budgets for each aspect of its operations.
Fiscal policy - this assumes a pro-active role of stewardship for common resources by the public sector. To achieve this we need a wide range of taxation, market signals and re-investment.	Each authority should set up a pro-active fiscal development programme in order to use all available powers and resources.
Investment and partnership – on the basis that market transformation involves public-private-third sector partnerships, and that investment needs to combine entrepreneurial risk-taking with a long term view.	Each authority should set up a partnership or consortium for responsible investment and public procurement.
Trade and development – this looks at the other end of the supply chain, and the imperative for development and empowerment of developing nations.	Each authority should adopt a ‘public social responsibility’ principle and management programme for all its supplies, procurement, and subsidy regimes.
Integrated supply chain – addresses the core business activity, and particularly the challenge of allocating responsibility and incentive along complex supply chains and product lives.	Each authority should consider its influence on industrial supply chains, through procurement and contracting, regulation, fiscal policy and infrastructure.
Infrastructure and asset management: identifies the business case for strategic management and investment in assets such as national stocks of buildings, vehicles and so on.	Each authority should examine its fixed assets (the ‘public estate’), and its role as enabler or regulator of other fixed assets (e.g. the existing housing stock).
Consumer and social enterprise: on the demand side there is great potential in more sustainable consumption, enabled by community actions, networks, non-profit and other types of social market.	Each authority should explore ways to engage community and voluntary bodies, and encourage citizens in sustainable consumption.
Stakeholding and labour: surrounding every supply chain is a wider community of stakeholders who need to be engaged and mobilized. The most important of these are employees, with their stake in the enterprise and in their own skills.	Each authority should consider its own and its partner’s employees and stakeholders as instrumental in the move towards a One Planet Economy.
Stabilization and equity: local and regional economies should be resilient to the impacts of economic change and polarization, and empowered to realize their own potential in moving towards a sustainable economy.	Each authority should consider its policies in the light of local empowerment, (particularly where ‘branch-plant’ type development is likely to increase dependency and vulnerability),
Eco-systems integration: finally, the links between economic, social and environmental assets and flows need to be strong and responsive. These may be through enhanced eco-systems markets, other trading and investment systems, responsive planning, multi-level stewardship, and new technology to facilitate.	Each authority should build its evidence on its eco-systems assets and impacts: and develop ways in which these can be integrated to the economy and economic development.

Table 2: application of the One Planet Economy to WAG

3.2.3 Linking the One Planet Economy to the WAG agenda

The above table shows a general kind of route-map for WAG and other public bodies in facilitating the One Planet Economy agenda. As a counterpart, we can look at the issues raised by the current development agenda of WAG, both in general terms, and in how these might be adapted to meet the One Planet Economy agenda. The issues below are drawn from the summary section of the W:AVE report.

Firstly there are the ‘main priorities in pursuit of the vision’:

- increase employment still further, so that over time the Welsh employment rate matches the UK average, even as the UK employment rate itself rises;

- The general effect of the One Planet Economy approach is likely to increase employment, both directly via infrastructure improvements, and indirectly through enhanced added value.
- There is also likely to be employment increases for lower skills levels in activities such as recycling.

- raise the quality of jobs, so that average earnings increase and close the gap with the UK average.

- The quality and skills levels of jobs is likely to increase as the One Planet Economy agenda mobilizes and spreads through the economy.
- Achieving step-changes in resource efficiency is generally through activity which is higher skill and higher added value.

Our key actions for achieving these priorities will be: supporting job creation and helping individuals to tackle barriers to participation in the world of work;

- The One Planet Economy takes a holistic approach to the deprivation agenda, with social enterprise and environmental quality as means to individual empowerment.

Helping businesses to grow and to increase value-added per job and earnings by:

- investing in our transport networks and other economic infrastructure;

- This is one of the crucial points – i.e. how far to invest in a material growth based transport infrastructure, as the fastest growing source of ecological impact. The alternative approach, as in the Transport section, would look at a whole supply chain approach to low impact connectivity.

*- attracting more high value-added functions to Wales and supporting businesses and sectors with strong growth potential, notably through the new **Knowledge Bank for Business**;*

- The sustainability sector is seen as one of the highest growth potentials, and wider transformations of the One Planet Economy are also sources of growth in each sector. The Knowledge Bank should prioritize this agenda and the necessary tools for business.

- Ensuring that all economic programmes and policies support sustainable development, in particular by encouraging clean energy generation and resource efficiency.

- This is at the core of the One Planet Economy agenda. What needs to happen now is the ‘mobilization’ of this, in terms of targets and monitoring, investment partnerships, and deliverable steps in a strategic programme.

3.3 KEY SECTOR PROFILES

The following 6 Chapters comprise outline reviews for each of the ‘key sectors’. These are defined as broad functional groupings of production, infrastructure and consumption categories.

Each sector could (and should) be a major research project in itself. So again, this current report has drawn a practical line around the scope of investigation. (Further detail is in the Appendix). Generally the approach is to review the profile of the sector in terms of the One Planet agenda: to look at issues specific to Wales: and to raise particularly questions on future uncertainties and the role of governance and the public sector.

3.3.1 Resource analysis framework

In each key sector the Resource Analysis Framework (RAF) provides the basic structure for the integrated supply chain approach:

- Supply side: primary, manufacturing, infrastructure, service sectors
- Demand side: utilization, mode, product operation
- External impacts: environmental, social, economic

Each of these categories can then be analysed in terms of resource flows, economic issues and policy issues. At the end of each chapter, the RAF is set out in a more detailed chart, showing a summary of the whole of supply chain in that sector, with environmental, economic and policy issues: this is then the key to more detailed investigation of the linkages between and across the framework.

- **Material sources:** primary agriculture, minerals and fuels: both domestic and imported
- **Manufacturing:** includes all branches of industry, processing and manufacture
- **Services:** includes tertiary sectors and public services
- **Logistics:** includes ‘factors’ such as transport and buildings, and distribution of goods.
- **Demand side 1:** overall rates of consumption and purchase by ‘final consumers’
- **Demand side 2:** related factors such as product utilization, product operation etc
- **Products in use:** the lifetime of the product or service, with energy performance, maintenance, replacement etc.
- **Externalities:** includes all external impacts such as pollution, waste, landuse change etc.

The summary tables also distinguish ‘physical’ from ‘economic’ and ‘institutional’ agendas. Many if not most of the policy leads are in reality likely to be partnerships and networks, rather than single bodies. On the principle of multi-level and multi-lateral governance, the lead public sector

organization is often a matter for debate and negotiation. On that basis, many of the ‘lead organization’ boxes are left blank intentionally, in order to stimulate discussion and debate on the One Planet Wales agenda.

3.3.2 Policy modelling

The scope of quantitative policy modelling is often quite limited in this wider frame, but it can provide some useful insights and comparisons. More detailed studies would combine resource models and economic models, but again there are no models which can represent effectively the whole of the One Planet transformation agenda. We can aim to use a coordinated range of models for each of the issues on the supply side, technology, infrastructure, demand side, fiscal policy, institutional issues, spatial effects and so on. The Technical Annex gives more details of the modelling method used, and of its current limitations.

In each sector, there are parallel tracks for shorter and longer time horizons. We focus first on the medium-longer term strategic programmes, stretching from now until the year 2050. Then we review the short term actions within the next 4 years of this government, aiming more at quick wins and popular results.

The charts for each sector show the ‘business as usual’ projection of unrestricted impacts, together with ‘wedges’ for each strategic policy. The cumulative effect of the wedges is to first stabilize and then reduce the impacts of each sector. Different sectors have different targets, reflecting the anticipated rates of technology change, economic effects, behaviour change and policy commitment. However they are all in the 65-80% range, which is more or less mandatory in terms of the One Planet agenda.

There is not necessarily a direct correspondence between the policy programmes, and the stages of the supply chain which can be measured. However as far possible the wedges are estimated in the following ‘rough policy modelling’ process:

- Assess the contribution to ‘carbon footprint’ and ‘real land’ footprint from each stage in the supply chain for that sector.
- Estimate the policy scope for import volume reduction;
- Estimate the policy scope for import production energy and/or ‘real land’ impact reduction;
- Estimate the policy scope for secondary / tertiary sector energy efficiency, and/or decarbonisation of energy supply;
- Estimate the policy scope for infrastructure improvements (i.e. buildings, transport etc) for secondary and tertiary sectors, through policy;
- Estimate the policy scope for demand side choice / utilization / product life policies or trends, to influence further changes to energy, carbon or ‘real land’ impacts upstream.
- Estimate the policy scope for externality changes in regulation of emissions, waste etc, to influence further changes to energy, carbon or ‘real land’ impacts upstream.

4 Food & agriculture

4.1 The One Planet agenda

At present, 75% of all food eaten in Wales comes through the supermarkets, where consumers are faced with 20,000 products, each with sophisticated packaging and advertising.

The 'One Planet Food' agenda sees a transformation of the food system at each stage of the supply chain. This includes an agri-environment agenda on the producer side, and a healthy diet agenda on the consumer side.

Nationally, production could shift towards more IT-enabled 'precision farming', regional niche products, and more intelligent logistics for distribution. Consumption is likely to follow the trend of growth in healthy low-additive fresh foods, and this could also go in the direction of low impact supply chains, given a package of fiscal incentives and industrial transformation measures. This could result in much import replacement with local glass-house cultivation, using renewable energy sources, with advanced control and logistics systems. In parallel there is an agenda for local community cultivation, where this enhances landscapes, provides fresh foods, promotes education and social capacity.

4.1.1 Profile of the sector

In the food sector there is generally a direct path from production to consumption to waste, i.e. there are small levels of consumer stocks, or ongoing effects from products in use. The UK is generally more self sufficient than would appear, i.e. 60% overall by raw food weight. However the imports are generally of much higher impact, particularly with the growth of air freight for fresh produce.

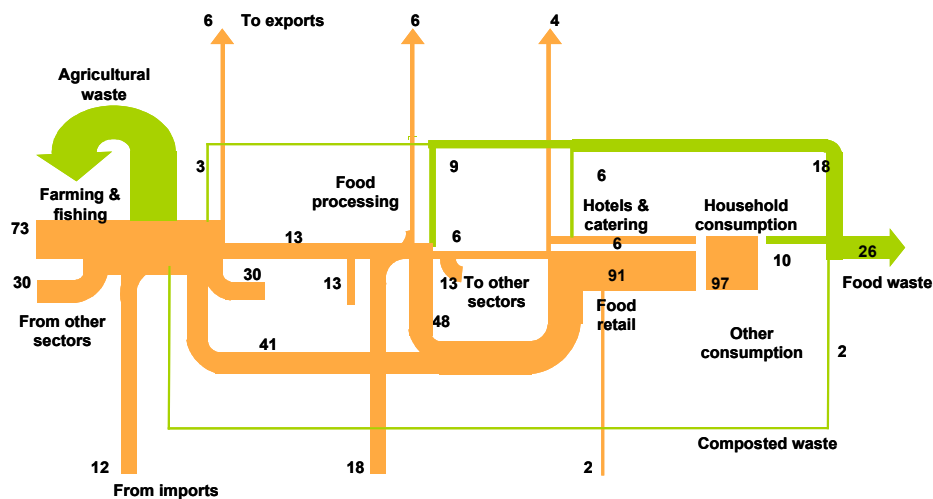
The results from the REAP system Material Flow Analysis shows that most economic value-added and energy inputs are concentrated in the manufacturing & distribution sectors. The bulk of material flow in farming is returned to the land: most imports are entering at the food processing stage. The impacts of agriculture also include many non-CO₂ climate effects (CH₄, N₂O, etc: and also the non-climate impacts include land-use, biodiversity and many others. In particular there are questions on the international trade and development agenda.

There is also competition / substitution between agriculture and other sectors for scarce resources such as land / water etc. In particular the energy transformation puts pressure on land for bio-fuels, with clearance of rainforest etc, and industrialized farming of bio-fuels can be as damaging as any other. Generally, the food chain with its globalized logistics is based on unrestricted use of cheap fossil fuels, and this will be under pressure in the event of rising energy prices and/or taxes.

The total Ecological Footprint of food consumption in Wales is 1.29 gha/cap: this comprises imports, farming, processing, distribution, packaging, catering and retail, with a further allocation for the waste fraction at each of these stages. The target outcome from the strategies below is a 70% reduction by 2050 on the current footprint of the sector.

Food chain resource flows

Summary of 2002 MFA data generated from REAP system:
all figures shown to nearest million tonnes, approximate for illustration



4.1.2 Summary & questions

The main resource effects in the One Planet Food scenarios include:

- overall reduction in resource use and impacts of -3.5% per year (climate emissions and ecological footprint).
- Rapid reduction in climate emissions and chemical inputs to agriculture and food processing.
- Shift away from chemical and land-intensive meat, towards more vegetarian and organic foods, in both production and consumption.
- Return of local / regional food production for local / regional markets.
- Link international food trade policy to overseas development partnerships.

Within this, there are key economic issues:

- Phase out regressive farm subsidies & export subsidies.
- Phase in healthy food / stewardship subsidies
- Premium on compostable recycleate material
- Fuel levies on transport, both UK & international
- Increase in farm employment & rural diversification.

For the future there are highly topical alternative scenarios. In different conditions each could lead to the One Planet goals for resource use, however each scenario involves a host of social and economic questions:

- ‘Technology / top-down’ scenario: intensive cultivation, using renewable energy: GMO crops and precision farming could reduce inputs of fertilizers, pesticides and packaging.
- ‘Lifestyle / community’ scenario: increase in local cultivation to near self-sufficiency in rural Wales; social enterprise uses urban permaculture for organic cultivation.

4.2 FOOD & AGRICULTURE IN WALES

4.2.1 General context and policy issues

Generally, agriculture is a larger part of the Welsh economy than in the UK: 1.6% of the total, compared with 1.1% in the UK: although it has declined steadily from around 10% in the 1950s. There are many topical issues for Wales:

- Mountainous terrain with a long coastline – relatively few areas suitable for large scale intensive production.
- Poverty & deprivation in urban areas, and generally across West Wales and the Valleys
- Large tourist and transient population in many coastal areas.
- Manufacturing industry is concentrated in the south and north east.
- A strong existing culture of local farming, and many initiatives in diversification.

There are big food policy issues in Wales – in farm incomes, CAP reform, marginal land use, low impact rural dwellings, the tourism sector, and in public health. The recent report of the *Sustainable farming and environment: action towards 2020* group, although more centred on the production side of this, and sums up the vision for 2020:¹⁴

To achieve a profitable, competitive and sustainable agricultural industry that is responsive to consumer demand, helps to sustain the environment of Wales and supports the maintenance of healthy, well balanced rural communities.

There are a range of topical issues which form the background to the study:

- The immediate problems facing many Welsh farmers, with incomes and return on capital falling towards zero.
- Global economy: market shifts and production shifts, for instance the impact of American conversion to bio-fuels.
- Climate change, and the impacts both on local landscape and world food markets:
- Market effects and the current system of Single Farm Payments, which may enable greater diversification and non-food crops.
- CAP reform and the future of subsidies after 2013, which may see further shift towards the Rural Development Plan approach, with more closely targeted modulation.
- Farming community: collaboration, generational effects, and skills development in the industry are all vital issues.

¹⁴ WAG, 2007: *Sustainable farming and environment: Action towards 2020*

- Production technology and research, much of which is at present run by DEFRA rather than Welsh bodies
- Environmental and biodiversity issues at the farm and landscape levels.
- Rural communities, local economic development, and policy integration in general.

This is far reaching set of studies and recommendations, but it can be seen as focused on the Welsh producer side. It does not cover the issues in world food supplies and food chain impacts, which are central to the One Planet Economy agenda. On the positive side, there are a range of current schemes:

- The Wales Rural Development Plan: although this may be stalled at the present time:
- Tir Cynnal Scheme provides farmers with small grants for Nutrient Management Plans, Bio-Diversity Plans, Wildlife Protection etc.
- Tir Gofal goes further than the England ‘Higher Level Stewardship’ scheme, aiming at conservation and management on a whole farm basis, through the provision of incentive payments. It combines elements from a variety of predecessor schemes previously operating in Wales, and brings farming and conservation into a different level of partnership.

However there are deep rooted problems in farming diversification, and no sign yet of a comprehensive, Wales-wide, coordinated supply chain partnership scheme. This may be a pre-requisite to going further in the direction of a One Planet Food sector.

4.2.2 Main policy issues

Here we set out the main themes, in terms of general policy, and in terms of policy directions and opportunities for Wales.

GENERAL POLICY THEME	WELSH POLICY AGENDA
shift from chemical / land-intensive meat production, towards more organic vegetarian and dairy produce	organic strategy needs research & demonstration: market support: distribution support:
Intensive production using hi-tech farming, where suitable	areas are restricted, should be targeted
Niche production for local varieties, coupled with farm diversification etc.	incentives through procurement: planning regulations for low impact dwellings etc
Local community food cultivation on allotments etc.	may require land reforms or new scheme for public land
‘Extensive’ cultivation on bio-productive landscape – woodlands, uplands etc	need to include in management plans, national park plan etc: integrated with farm diversification / tourism / rural enterprise
Climate change adaptation may support these.	opportunities to be included in climate adaptation plans.
Food processing sector -	accelerate environmental management in food sector.
GENERAL POLICY THEME	WELSH POLICY AGENDA
Shift to local, seasonal, fresh foods	Promote through ‘Eat Wales’ campaign: planning for local food infrastructure.
Shift towards organic / vegetarian diets	Promote through education, health, etc
Public catering – opportunity of procurement policy	Define sustainable supply chain terms for all procurement
Commercial & tourist catering - responsible low impact	accelerate & incentivise environmental management in

	food sector. Subsidies, marketing opportunities
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4.2.3 Main economic issues

The economic effects and shifts, and the economic policy issues are flagged up in this table, as a pointer for further investigation.

GENERAL POLICY THEME	WELSH POLICY AGENDA
Phase out regressive farm subsidies	<i>(Mainly CAP & UK level:)</i> Wales can reinforce the incentives for producers, possibly by supply chain partnerships with processors and distributors.
Phase in healthy food / organic / low impact production	<i>(Mainly ELS at national level):</i> Possible supply chain initiatives for organic dairy, poultry etc.
Levies on fertilizer, pesticide etc	Support for recycleate markets & distribution
Premium on compostable recycleate material	Support for recycleate markets & distribution
Fuel levies on transport, both UK & international	<i>(Mainly UK / EU level:)</i>
Increase in farm employment & rural diversification.	Sector transformation strategy includes diversification, training, market support, procurement, research and development, marketing, and integrated supply chain partnerships.
Increase in food processing employment and added value	Sector transformation strategy includes: integrated environmental management: higher value added products through quality control and supply chain coordination: integrated supply chain partnerships.

4.2.4 Strategic recommendionss

Overall, the contribution of public policy in Wales to ‘One Planet Food’ is likely to develop through a programme of fiscal subsidy, investment and other incentives, building on current and forthcoming schemes under the Rural Development Plan and related schemes. These measures would focus on public procurement, sectoral innovation, rural diversification, and incentives for low impact food production. They would build on current schemes, with the added value of the integrated supply chain approach, with its global outlook and One Planet targets:

- **Food imports:** applying the principles of Fair Trade, sustainable sourcing and corporate responsibility to all food imports could help to save up to 10% of the ecological footprint of the food sector.
- **Farming in Wales:** organic conversion is well suited to smaller scale cultivation for local markets: it needs an active procurement strategy through WAG and the public sector, combined with EU and local incentives for land stewardship and farm diversification. With a full conversion over 25 years this could save up to 15% of the ecological footprint.
- **Food and drink processing sector:** the principle of integrated supply chain management applies to food imports, processing, packaging, distribution, retail and waste management. This focuses on industries owned and run in Wales, and aim to increase competitiveness through higher value added products and processes. On current industry estimates this could save up to 20% of the ecological footprint.

- **Distribution, retail and catering:** environmental management, intelligent logistics, low-impact packaging and waste minimization across the sector. Target reduction of 10% of the ecological footprint.
- **Demand side management** centres on the healthy diet and consumer side: WAG and the public sector should promote, demonstrate, educate, and facilitate across all public services, to encourage sustainable food purchasing: this could save up to 15% in addition to the above.

The cumulative effect of these policies is shown in the chart (produced as per the methodology in the Technical Annex). Note that such charts are extremely rough and purely for illustration at this stage: to provide a more accurate picture, the policies would take much further definition, the modelling would be greatly improved, and the scenarios would need much more detail, and even this would depend on many assumptions.

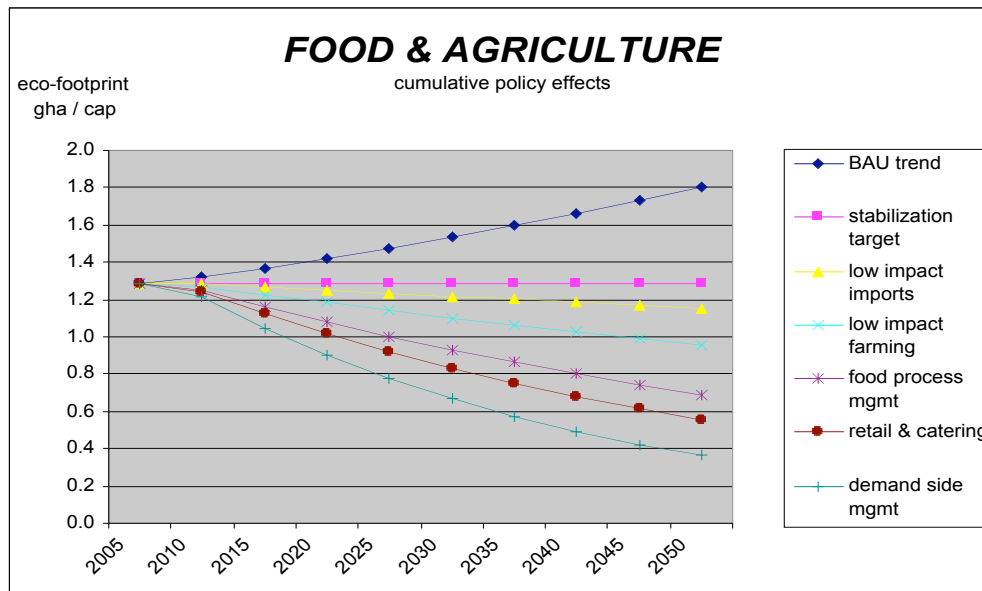


Fig 4.1: One Planet food policies.

The most topical issue on the chart is the difference between the BAU trend line, the ‘stabilization’ for a zero-growth, and the target actions showing a rapid reduction in ecological footprint. The trend lines are based on a rough outline calculation, pending further analysis commissioned by DEFRA. This assumes the policies and policy modelling in the UK Energy White Paper 2007: and then adds in the effects of aviation and international shipping, embedded emissions in the net trade balance (imports minus exports): and the ecological impact of land use change at the global level.

In terms of the food sector, imports and international aviation and shipping are highly topical. Imports cover about 40% of UK production, and land use change impacts are related to the

industrialization of agriculture worldwide. Such trends are inbuilt to the dynamics of the UK food processing and distribution sectors (i.e. increasing imports in processed and packaged food, with growing amounts of air-freighted fresh produce). Such trends can be ameliorated and stabilized by lifestyle changes in consumption, or management changes in production, and the larger supermarket retailers have perhaps the leading role in linking one side to the other.

4.2.5 Shorter term recommendations

In parallel with the formation of longer term strategies, there are some short term actions. These should aim to be relatively quick and simple to mobilize, mainly from within the public and NGO sectors:

- Food import programme targeted at retailers, accelerating the shift towards 100% ethical and fair trade:
- Organic farming conversion strategy for all viable areas, with accelerated ‘stewardship’ schemes:
- Integrated environmental management in food processing and distribution:
- Packaging for all food products to be designed for 100% re-use and recycling:
- Public procurement for sustainable and low-impact food for all catering-related activity.

4.2.6 Summary table: One Planet Food

	Material sources	Manufacturing	Logistics	Services	Demand side 1	Demand side 2	Products in use	Externalities
PHYSICAL AGENDA	Import %, source, extraction mode	Energy in production	Transport distance & mode	Tertiary activity & value added	Intensity & utilization factors	Consumption / mode choice	Product life: energy efficiency	Waste, emissions
Policy themes	Sustainable farming / forestry	Cleaner production	Integrated supply chain mgmt	Incentives for low impact catering	Local food policy	Social marketing		Integrated agri-environment policy
Lead	DEFRA, DFID			WAG tourist bodies	DEFRA, open space policy	retailers, health, education		DEFRA, waste regulators
ECONOMIC AGENDA	Commodity prices: market effects	Fuel costs: factor & finance cost	Int. transport fuel / transaction cost	labour costs: investment costs	Consumer exp / saving: social discount rate	Market behaviour: stock turnover	Product life: energy prices in operation	External costs / impact charges
Policy themes	Commodity levies / tariffs	Carbon tax: public procurement for clean tech	Comm / indust energy tax: Multi-lateral aviation tax	Incentives for CSR	Public procurement for sustainable food	Incentives for low impact diets		eco-services trading: food waste recovery
Lead	EU		EU, network rail, haulage		LA, health / education	LA, health / education		Waste authority, EA
INSTITUTIONAL AGENDA				Service / social economy	Utilization choices	Behavioural choices	Operational choices	Waste practices
Policy themes	International development: ethical trading	Producer responsibility: env management	CSR	CSR	healthy diet partnerships	healthy diet partnerships		Education on waste recovery
Lead	procurement / pension funds				regeneration, social services, NRF etc	health & education		Waste authority, EA

5 Housing, construction & built environment

A Factor 4 efficiency transformation in the built environment is a huge challenge – at present, much ‘sustainable construction’ activity is tinkering at the margins. But there is potential at each stage of the chain: low impact materials and components, strategic management of the building stock, energy upgrading, and demand side management in households and organizations. There are examples of near zero-carbon and zero-waste buildings, and strong incentives from government, and the industry and property market could rapidly follow these.

The built environment agenda is basically a fixed asset, with turnover of 1-2% per year, and its overall energy performance and footprint is dependent on that. While new housing is now headed for the WAG ‘carbon neutral’ targets in the very near future, a much larger issue is the residual building stock, and the many barriers to its improvement.

Overall, this could be achieved through public procurement, progressive incentives, and tariffs on energy demand and supply, and localized innovation programmes in the construction and materials industries. There are already creative local / regional initiatives, in the emerging markets for carbon trading, offsets or other incentives. There are many open questions as yet – who controls local business rates, or has the power to set local carbon levies?

5.1.1 Profile of the sector

The built environment sector includes minerals and forestry: building material and engineering components: and the construction industry itself, together with related service sectors such as property and insurance. In material flow terms, the largest bulk flows are in aggregates from the quarry into the construction sector: the sector also has to deal with about 100 million tonnes of construction and demolition waste, together with industrial waste from materials production. The most significant direct impact is from the energy used in buildings, and there are many other indirect impacts generated through the effect on transport, water use, land use etc.

The total Ecological Footprint of domestic buildings is 1.09 gha: approximately four fifths from energy in use, the remainder from construction and maintenance. Commercial and public building construction, shown as ‘capital’ items, account for another 0.38 gha/cap). We anticipate a reduction of up to 70% on the current Ecological Footprint of this sector.

The built environment can be divided into three main strands:

- Housing – generally more data and defined standards (floorspace, efficiency etc)
- Other commercial, industrial and public buildings, of all shapes and sizes
- Other infrastructure and engineering, with overlap to transport and utilities sectors.

In each of these there are distinct stock-flow effects: i.e. the average turnover in the building stock is 1-2% per year. The whole sector is very dependent on energy supply, but this is a long term stock issue, as much as the day to day usage. For demonstration buildings it appears possible to

achieve ultra low energy usage, with increasing capital costs towards zero energy: however for the mainstream industry it appears to be very difficult to improve efficiency, as there are many institutional barriers. The much larger issue is the residual building stock and the actions which may improve it. There appear to be many barriers and disincentives to rational behaviour, such as the split of responsibility between landlords and tenants: and much centres on the ‘apparent’ social cost of carbon / fossil fuel energy.

A Factor 4 efficiency transformation in the built environment is a very challenging goal – at present, most ‘sustainable construction’ activity is marginal to this bigger picture. We can at least point to potential transformations at each stage of the chain:

- Building materials and sources: more renewable materials, less high-energy materials such as cement or aluminium.
- Building design and specification: more low-impact design on eco-building sustainable communities lines:
- Building stock and life cycle: new-build design for long-life and loose fit: coordinated upgrading of existing buildings for energy & services efficiency.
- Planned replacement of the least efficient portion of the UK building stock, as proposed in the ‘40% house’ research programme.¹⁵
- Building performance: beyond the Eco-Homes ‘excellent’ standard, to the Code for Sustainable Homes Level 5-6 with its goals of zero-carbon and zero-waste.¹⁶

5.1.2 Building stock strategic management

Clearly to meet the above targets will need economic, social and environmental costs and benefits (as far as can be defined) to be balanced on the principle of *integrated asset management*. One example is the energy demand of the housing stock, notorious for inefficiency and resistance of the property industry to change. There are current studies such as the ‘40% House’ above, showing that the national climate change targets will be impossible without a strategic overhaul of the existing housing stock: but so far the business case has not been clearly set out.

On outline estimates, an investment programme costing about 10% of the domestic energy bill in Wales, or about £90 million per year, could over 25 years reduce household running costs by over a third, and the external environmental costs by two thirds, however these are defined; it might also generate in the region of 2000 jobs, largely in areas of high unemployment. Where would such investment come from? As far as possible by market measures which adjust the huge financial flows around the property, construction and utility industries. National level revenues could be raised by direct taxation, trading of carbon permits, levies on producers, or tax breaks for energy investment. At the local level there is scope for differential rating by efficiency, planning obligations linked to energy footprint; or direct infrastructure charges. Such revenues could be recycled into direct investment in CHP networks and energy upgrading; into tax breaks for efficiency investment; underwriting of energy services companies; technology and R&D support; or financial guarantees for energy infrastructure. Otherwise the revenues could simply offset employment costs and stimulate intermediate labour markets.

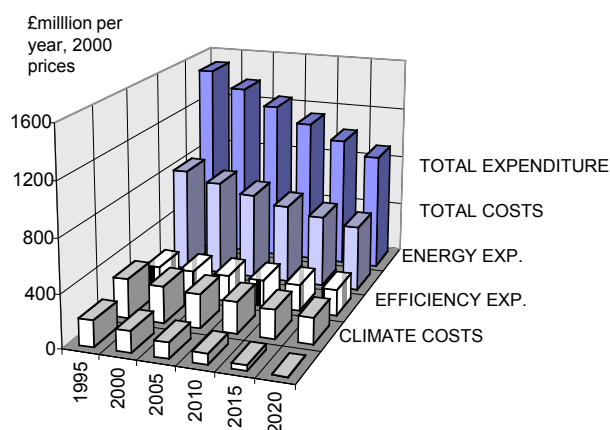
¹⁵ Boardman et al 2005

¹⁶ DCLG, 2006: Code for Sustainable Homes, Consultation Paper

The easiest place to start would be with major measures with short paybacks. For instance cavity wall insulation, if fitted in a coordinated programme of upgrading, can generate a payback of 1-2 years, saving 1-2 tonnes CO2 per household per year.

INTEGRATED ASSET MANAGEMENT

Example of energy efficiency in the UK housing stock



Expenditure & social / environmental costs of 25 year programme for energy efficiency for UK housing stock. Source: based on RCEP 1994, Pearce et al 2001, Boardman et al 2005.

Such an investment case for energy efficiency, would need all market gaps to be closed, all stakeholders and competitors to work closely together, and all market signals and incentives to work in synchrony – adding up to a whole ‘market transformation’ in the built environment.

5.1.3 Main resource flow goals & targets

A Factor 4 efficiency transformation in the built environment is a very challenging goal – at present, most ‘sustainable construction’ activity is marginal to this bigger picture. We can at least point to the potential at each stage of the chain:

- 3.5% per annum reduction in energy and material inputs to construction, materials for production of the built environment.
- 3.5% per annum target for energy efficiency of the existing building stock
- ‘sustainable’ urban form, community infrastructure, and patterns of poly-centric urban development
- Phased upgrading / demolition / rebuilding of existing stock
- Shift towards on site renewable sources.
- Shift towards renewable / low energy materials.

5.2 ISSUES FOR WALES

5.2.1 Current policies

As summarized by the NAW in 2006,¹⁷ Under the *Sustainable Energy Act 2003*, the Welsh Assembly Government was required to set targets for energy efficiency savings, and these were published in the energy efficiency action plan *Energy Saving Wales*, in October 2004. This plan aims to support the promotion of energy efficient practices by:

- Highlighting the help available and improving access to practical guidance
- Helping business become more competitive through increased energy efficiency
- Reducing fuel poverty through simple, cost effective energy efficiency measures
- Encouraging adoption of energy efficiency best practice by public bodies
- Promoting and developing the environmental goods and services sector in Wales

5.2.2 General policy issues

Here we set out the main themes, in terms of general policy, and in terms of policy directions and opportunities for Wales.

SUPPLY SIDE POLICY THEMES	WELSH POLICY AGENDA
<ul style="list-style-type: none"> • Construction industry – role in economy: labour & skills issues: 	<ul style="list-style-type: none"> • sustainable construction demonstrations & examples.
<ul style="list-style-type: none"> • Construction materials – local minerals in great abundance, but economics may be against. 	<ul style="list-style-type: none"> • Local material incentives through planning & building regs systems
<ul style="list-style-type: none"> • Renewable materials 	<ul style="list-style-type: none"> • potential for local mixed forestry – much hilly terrain, in areas of landscape value, coniferous not always not suitable. Public support for mixed forestry & timber supply

DEMAND SIDE POLICY THEMES	WELSH POLICY AGENDA
<ul style="list-style-type: none"> • Housebuilding – general pattern of new building, trends & projections: areas of high / low demand: energy efficiency standards & schemes 	<ul style="list-style-type: none"> • New carbon neutral requirement – needs incentives, promotions & transformation strategy. Also should extend scheme to material embodied energy.
<ul style="list-style-type: none"> • Existing housing – some part of stock in poor conditions: low energy efficiency standards; 	<ul style="list-style-type: none"> • Strategic regeneration of all existing residential areas. Using local carbon investment markets as below. Council tax rebates, parking charges etc.
<ul style="list-style-type: none"> • Social housing - general conditions: energy efficiency standards & schemes: funding & subsidy issues. 	<ul style="list-style-type: none"> • Strategic regeneration of public estates, using local carbon investment markets as below.
<ul style="list-style-type: none"> • Rural housing – general pattern of demand and supply: funding sources: 	<ul style="list-style-type: none"> • Link with rural housing to rural economic activity & diversification: low impact rural housing options: incentives for onsite renewables options.
<ul style="list-style-type: none"> • Existing Commercial & industrial property – poor conditions & under-investment outside of prime areas: 	<ul style="list-style-type: none"> •
<ul style="list-style-type: none"> • New Commercial & industrial property – 	<ul style="list-style-type: none"> • Procurement & other incentives for sustainable

¹⁷ NAW 2006: Climate mitigation: a comparison of policiess

	construction
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5.2.3 Economic Issues and questions

Generally there is scope for creative local / regional initiatives, in the emerging market for carbon, offsets, other eco-system services. There are big questions on local control of business rates, or powers to intervene with other levies & subsidies.

GENERAL POLICY THEME	WELSH POLICY AGENDA
<ul style="list-style-type: none"> Domestic carbon levy recycled into efficiency programme 	<ul style="list-style-type: none"> Local / voluntary carbon market: linked to planning & building regs incentives.
<ul style="list-style-type: none"> Quota protection for lower income & energy poor 	<ul style="list-style-type: none"> Local / regional partnership scheme with utilities suppliers to use tariff system to favour domestic quotas.
<ul style="list-style-type: none"> Full life costing for all public building & procurement 	<ul style="list-style-type: none"> Building procurement on whole life triple bottom line basis, with carbon credits / bonds advance paid

Key questions to be addressed:

- What would be the acceptability of rebuilding large parts of the housing stock?
- How far can natural resistance be shifted in the construction & property industry: from the financiers to the employees and professionals ?
- What is the trend projection for new high energy intensive consumer items, e.g. patio heaters, air conditioning?

Key questions for public policy:

- How far to intervene in private owned housing or property?
- How much forward investment can the public sector raise?
- How much difference can the options make, within the spatial strategy at national or local level?

5.2.4 Strategic recommendations

The main recommended policy programmes for 2020 – 2050 are set out here for further debate and research:

- ***Sustainable construction***: this focuses on the production and distribution of building materials off-site. Architects, engineers, developers, suppliers and local authorities need to coordinate in supply chain partnerships, to ensure that all materials and components are low-impact and cost-effective over their life cycle. Local materials are in abundance in Wales, and should be the first choice for ecological design: these could save up to 5% on the current ecological footprint: sustainable construction materials and components across the board could save a further 10% by 2050.
- ***Housing energy efficiency***: now that the UK is committed to ‘zero carbon’ new housing by 2011 and 2016, the focus is back on the existing building stock. The technology now

exists, but, to make it cost-effective, needs ‘market transformation’ partnerships to bring the entire housing stock up to best practice standards. These would bring together residents, lenders, landlords, utilities, developers, designers and builders who would bring the entire housing stock up to best practice standards. Overall this could reduce by up to 30% the current Ecological Footprint of buildings by 2050.

- **Property energy efficiency:** for larger buildings there is the prospect of carbon trading as a means of raising investment finance, and providing incentives for improvements. This should be rolled out in the public sector as a priority, and then to all other properties. This would save up to 25% of the current Ecological Footprint of buildings by 2050.

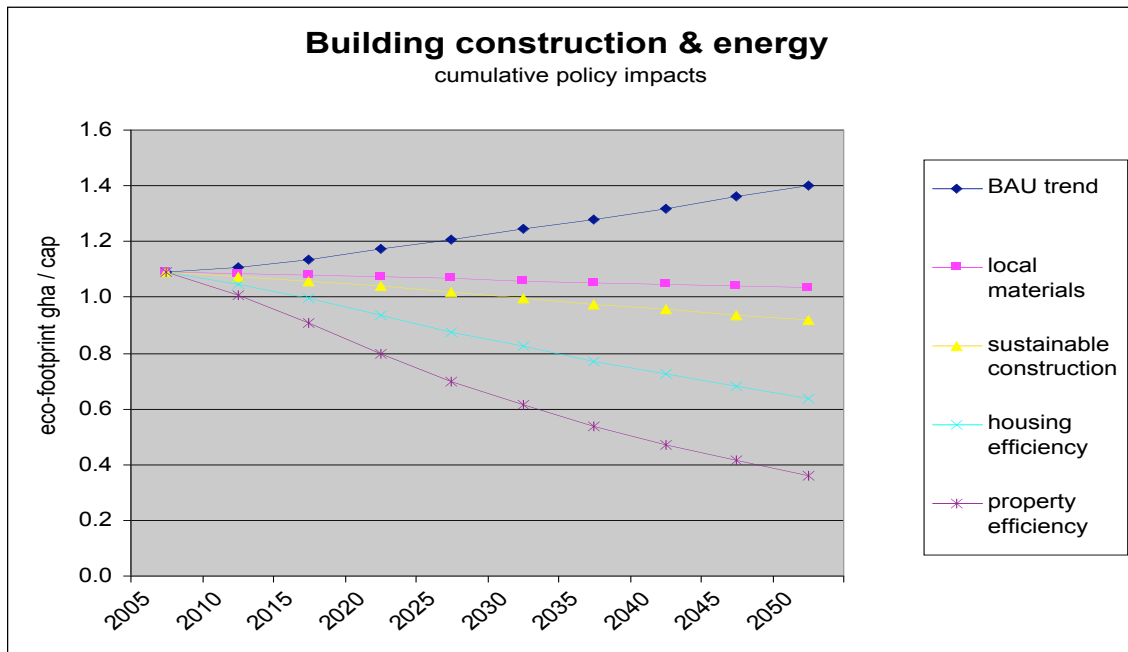


Figure 5.1: policies for building and construction.

5.2.5 Short term recommendations

The effect of immediate actions in the next 4 years should be to kick-start a rapid reduction of about 8-10% in the ecological footprint of this sector:

- Construction industry supply chain forum, and re-used materials exchange scheme:
- Ensure rapid implementation of zero carbon new homes, making the Code for Sustainable Homes mandatory ahead of schedule – (2011 in Wales and 2016 in the UK).
- Low-carbon house building demonstration programme by the public sector.
- Existing housing rehabilitation demonstration, showing the partnership approach.
- Public buildings best practice programme, with a prototype public sector internal carbon market.

- Longer term campaign strategy, together with a monitoring / evidence base.

5.2.6 Built environment policy summary

	Material sources	Logistics	Manufacturing	Services	Demand side 1	Demand side 2	Products in use	Externalities
PHYSICAL AGENDA	Import %, source, extraction mode	Transport distance & mode	Energy in production	Tertiary activity & value added	Intensity & utilization factors	Consumption / mode choice	Product life: energy efficiency	Waste, recycling %: waste mgmt:
Policy themes	Resource protection	Integrated supply chain mgmt	New processes: new products	ICT based materials markets	Utilization incentives	Integrated spatial planning	Regulation / accreditation	recycling & re-use
Lead	DFID / DTI	WAG procuremt / industry forum	WAG procuremt / industry forum	WAG procuremt / industry forum	WAG procuremt / industry forum	planning / building regs	planning / building	DEFRA / UKT
ECONOMIC AGENDA	Commodity prices: market effects	Int. transport fuel / transaction cost	Fuel costs: factor & finance cost	labour costs: investment costs	Consumer exp / saving: social discount	Market behaviour: stock turnover	Product life: energy prices in operation	External costs / impact charges
Policy themes	Commodity levies / tariffs	International fuel levy	public procurement for clean technology	ESCOs & other financial vehicles for env.mgmt	Public procurement for market transform	Eco-labels & other incentives for ZED	Incentives for demand side management	Domestic tradable quotas???
Lead	international carbon mkt	DEFRA / UKT	WAG procuremt / industry forum	WAG energy partnership	WAG procuremt / industry forum	planning / building regs		DEFRA
INSTITUTIONAL AGENDA				Service economy / social economy	Utilization choices	Behavioural choices	Operational choices	Waste practices
Policy themes	Sustainable mining & forestry		Producer responsibility: env management	CSR	Sustainable urban development	Social economy & community initiatives	Education for low impact living	
Lead	WAG procuremt / industry forum		WAG procuremt / industry forum	WAG procuremt / industry forum	WAG Spatial strategy	WAG Spatial strategy	WAG energy partnership	

6 Transport & communications

Transport is a key to economic growth and social welfare – but also the fastest growing source of climate and resource impacts. It is fair to say that there is underlying conflict between conventional ‘sustainable transport’ and conventional economic development, based on expanding labour markets, specialization of businesses, lengthening of supply chains, and widening of consumer choice. So we have to look at transport in the wider picture of social and economic development. For both urban and rural Wales it is clear that such development patterns need rethinking, in terms of how activities are spread out in space and time, and the challenges of sustainable transport.

6.1.1 Profile of the sector

Transport is seen as the maker and breaker of modern economies and globalizing lifestyles, and is also the most directly damaging of all sectors. The issues can be divided as:

- Demand factors, which involve behaviour, regulation, micro-finance, spatial planning, business practices, etc.
- Supply of transport services, which focuses on fuel supply chain in public and private modes. There is an EU led agenda for vehicle efficiency, and the possibility of hydrogen or renewable bio-fuels. On the demand side there are many local possibilities – increasing occupancy, reducing unnecessary trips, shifting to low-impact modes, encouraging walking and cycling through urban planning etc.
- Infrastructure & vehicle production / maintenance. For this the stock question is crucial, ie generally the renewal of the stock of vehicles will increase efficiency but at the cost of extra production and increases in size or power. Stock turnover in UK for most vehicles is approaching saturation at about 7-10% per year. There is scope to improve the life cycle of vehicle manufacture – again a national / EU level agenda, where the role of Wales is mainly to promote and facilitate.

The environmental impact of transport includes; fossil fuels and climate emissions: other air emissions, noise, dust etc: the fuel production and disposal life-cycle: and the vehicle manufacture & usage life cycle. There are outstanding questions on the potential for alternative vehicle fuel technologies:

- Liquid gas is only marginally more clean than oil:
- Bio-fuels may be very environmentally damaging on a global scale.
- Hydrogen fuel systems are attractive but untested on a larger scale.

The Ecological Footprint of our use of transport is 0.88 gha/cap: this comprises the vehicle, infrastructure and fuel supply chains, and direct fuel consumption by car, bus, rail and (leisure) air travel modes (freight, business aviation and marine shipping are counted in the supply chains of other sectors). The reduction in Ecological Footprint from each of these should be up to 75% from the current total for the sector.

The most topical policy question is that of fuel prices vs fuel taxes, as against other incentives or pressures for change. This is deeply political, and likely to become more so on a local and national level. On an international level, there will be increasing competition for land use between bio-fuel and food production. The current consensus is that the government's transport bio-fuels scheme, the Renewable Transport Fuels Obligation, although due for implementation in 2008, is not yet up to the challenge.¹⁸

6.1.2 Towards Factor 4 Transport

On the supply side there is potential for substitution of fossil fuels by renewable energy: the main choice is between bio-fuels or hydrogen, as the common energy currency between electricity and other forms. A wider question is the life cycle of vehicle manufacture and maintenance, road infrastructure, and other environmental effects of transport.

It is clear that there is at least as much potential in demand side management as on the supply side. For passenger travel this is a familiar list – increasing occupancy, reducing unnecessary trips, shifting modes, encouraging walking and cycling through urban planning etc – all combines with a new attitude to urban development and urban form. For freight, ICT may be the catalyst for integrated supply chains and low-impact logistics, coupled with a new generation of infrastructure – low energy vehicles and modes coupled with inter-modal logistics systems.

However there are inbuilt conflicts between demand management, and the general direction of economic development, as promoted by economic strategy. The trends of increased specialization and labour market size, advanced logistics and supply chain management, and increased choice in public or consumer services, all act to generate transport growth, for both producers and consumers. It is fair to say that reducing travel demand needs more than minor adjustments to business activity and public services – it may require more of a paradigm shift, for instance in the way that health, education or leisure are organized and delivered.

For air travel, it is fair to say there are no easy win-win solutions in sight, beyond those of pricing or taxing out growth, which are politically less plausible at present. A Factor 4 approach might aim at a socially progressive system of quotas, to enable basic travel for lower income people, while higher incomes pay increasing surcharges: all this coupled with vastly improved IT infrastructure to enable 'virtual travel'. This suggests that every neighbourhood or workplace should have a high capacity video-conference suite, supported by grid computing and virtual reality simulation.

The proposed North-South shuttle is a topical case: this may be seen by some as an essential part of the economic development of Wales. As such it should be placed against the One Planet Transport target of approx 75% reduction in footprint from the transport sector: there are then a series of leading questions for investigation:

- the direct effects caused in climate and resource impacts
- the scope for offsetting through increased efficiency in other transport modes
- the scope for substitution by other technologies such as ICT.

¹⁸ Sustainable Development Commission 2006

6.1.3 Summary & questions

Main resource flow effects of a One Planet transport strategy:

- Total travel growth stabilized.
- Phase in renewable energy vehicle fleet
- Shift to responsive integrated transport modes
- Air travel growth slowed.

Main economic implications of a One Planet transport strategy:

- Domestic / commercial fuel levy, recycled to investment in integrated transport
- Levy / subsidy incentives for low energy / cleaner vehicles
- Tradable quotas for low income & essential travellers

Topical issues & questions:

- International fuel price or carbon tax? What if most vehicles switch to hydrogen?
- Public & business reaction to fuel levy – will they accept?
- How will the UK live with limits to air travel?
- Will congestion charging become universal across the UK?
- Should local authorities tax out-of-town parking?
- Should urban public transport be re-regulated / nationalized?
- Alternative fuels (e.g. biomethane from city waste) for public transport fleet?
- Role of public sector IT facilities in reducing need for travel via teleworking / conferencing etc?

6.2 ONE PLANET TRANSPORT – THE WALES AGENDA

Wales is a challenging case – much of the conventional thinking on sustainable transport from England is more difficult to apply:

- Large latent demand for car ownership in deprived areas, both urban and rural.
- Remote rural population – more difficult to service with conventional public transport.
- Much urban population is also relatively inaccessible, e.g. the Heads of Valleys
- Terrain makes N-S-E-W communications within Wales difficult by modern standards
- Large visitor tourism peaks & flows, with highly decentralized patterns.
- Coastline is scenic but lacks many deep water ports.
- Rail routes are mountainous and difficult to increase speeds.

6.2.1 Current policies

In 2004 WAG announced an £8 billion, 15-year programme to deliver an integrated transport system in Wales. The Programme aims to reduce congestion, increase consumer choice, and

improve both national and international transport links, and includes improvement schemes for road, rail, bus, and air transport. Additional powers to help implement this programme were gained under the *Railways Act 2005* and the *Transport Wales Act 2006*, which gives NAW more powers to plan and improve transport. The *Transport Wales Act* places a duty on the Assembly to promote safe, integrated, sustainable, efficient and economic transport and also requires WAG to produce a transport strategy. WAG published a draft Wales Transport Strategy, *Connecting Wales*, in July 2006 which has a horizon of 30 years. The strategy has three key objectives:

- to achieve a more effective and efficient transport system
- to achieve greater use of the more sustainable and healthy forms of travel
- to minimise the need for travel.

WAG also produced a *Walking and Cycling Strategy for Wales* in 2003, which emphasises the health and environmental benefits of cycling and walking for short journeys, and encourages reduced car use.

6.2.2 General policy issues

Here we set out the main themes, in terms of general policy, and in terms of policy directions and opportunities for Wales.

SUPPLY SIDE POLICY ISSUES	WELSH POLICY AGENDA
Cycling & walking	Priority for cycle & walking space on and off highways, with provisions & services.
Private car travel	Incentives for low impact cars through parking, council tax, business fleets, public procurement etc.
Public transport – buses / taxis	Low impact buses & taxis. Responsive public transport using ICT – post buses etc. Ticketing etc integrated to train & taxi services.
Public transport – rail	Coordination of events, services, local distribution etc with train services.
Local air services	N-S air shuttle to operate with full carbon budgeting / local offsetting markets.

DEMAND SIDE POLICY ISSUES	WELSH POLICY AGENDA
Demand management for car traffic.	Employers / services green travel plans: car sharing clubs: semi private minibuses etc.
Demand management for public transport	Employers / services green travel plans
Demand management for tourist	Tourist events & attractions green travel plans – incentives through planning, council tax
Freight demand management	Employers / services green travel plans

6.2.3 Main economic issues

Generally there is scope for creative local / regional initiatives, in the emerging market for carbon, offsets and other eco-system services. There are topical questions on local control of business rates, or powers to intervene with other levies & subsidies.

MAIN ECONOMIC ISSUES	WELSH POLICY AGENDA
Domestic / commercial fuel levy, recycled to investment in integrated transport	Does WAG have any kind of leverage on fuel levies?
Levy / subsidy incentives for low energy / cleaner vehicles	How much influence does WAG or local authorities have on parking / public service incentives as above.
Social equity & small business agenda, particularly in rural areas.	Tradable quotas for low income & essential travellers
Local congestion & pollution, particularly in urban areas.	Local incentives – parking charges, differential access zones
Increasing public funding for green tourism transport	Local tourist bed tax, zone charges etc
General revenue for public transport	Local incentives – parking charges, differential access zones

6.2.4 One Planet Transport in Wales

In many ways the Wales terrain shapes its transport agenda: rural rail and bus are often marginal: and in urban areas, development is not easy to fit with existing public transport networks. In this context we need to work on both ends of the supply chain, from demand side to supply side. We also need to combine the global with the local approach, as in the contrasting scenarios:

- ‘Technology / top-down’ scenario: supply-side focus on new technology and infrastructure.
- ‘Lifestyle / community’ scenario: demand-side focus on accessibility, decentralization and alternative modes.

The One Planet Wales transport agenda combines these with a radical approach. It promotes major vehicle efficiency changes, with a next-generation IT-enabled responsive public transport, with a range of ‘soft’ incentives for lifestyle and community. The key priorities for WAG and the public sector are for procurement for innovation: extended business rates and infrastructure charging for re-investment: carbon markets coupled with local incentives.

6.2.5 Strategic recommendations

The main recommended policy programmes for 2020 – 2050 are set out here for further debate and research:

- **Vehicle, infrastructure and fuel supply chain:** environmental management in automotive industries, life-cycle design, and use of alternative fuels: all these can be encouraged and enabled by the city and regional public sector. This could reduce by up to 20% the sector's total ecological footprint by 2050.
- **Public transport:** new technology opportunities can raise the quality, efficiency and utilization i.e. demand-response scheduling, real-time tracking and signalling, integrated ticketing and support facilities. We anticipate a targeted increase in public transport usage at about the same rate as its efficiency improvements, so that its footprint share shows little change.
- **Cars and highways:** intelligent local traffic management is one end of an agenda which may then bring in park and ride schemes, congestion charging, low-impact vehicle incentives, car clubs and occupancy schemes, and fleet / logistics management. Coupled with a reduction in total car mileage, this would reduce the ecological footprint by up to 30%.
- **Demand side management and green travel plans:** a continuous partnership approach between public sector, businesses, and the community. Developments and organizations will need to plan for accessibility and low impact mobility, fitted to the opportunities of public transport and travel substitution. By simple travel reduction, this could reduce the footprint by a further 25%.
- **Aviation:** in the fastest growing sector of all, there is an urgent problem in just stabilizing the growth trend. In the near future there are possible improvements in utilization, fuel efficiency and so on, and the possibility of some travel substitution to high speed rail. The Emissions Trading Scheme may extend to aviation, in which case there will be modest economic incentives for improvement. In the medium longer term there are possibilities in advanced ICT. For a One Planet Transport strategy, aviation and its impacts should be included alongside other modes, so that the total costs and benefits of each can be taken as a package. The net effect of this is estimated at stabilization only, i.e. that the growth trend in transport is reduced to zero growth in aviation, leaving other transport modes to take up a greater share of the reduction targets.

Fig 6.1 Summary of transport policy options

The chart shows broad estimates of the effect of the policy programmes from 2010-2050. These are shown in cumulative form, i.e. so that improvements are made step by step from the BAU (Business as Usual) baseline growth trend.

The 'stabilization' line here is mainly due to the reduction in the rate of air travel growth to equal the rate of efficiency improvement, i.e. about 1-2% per year.

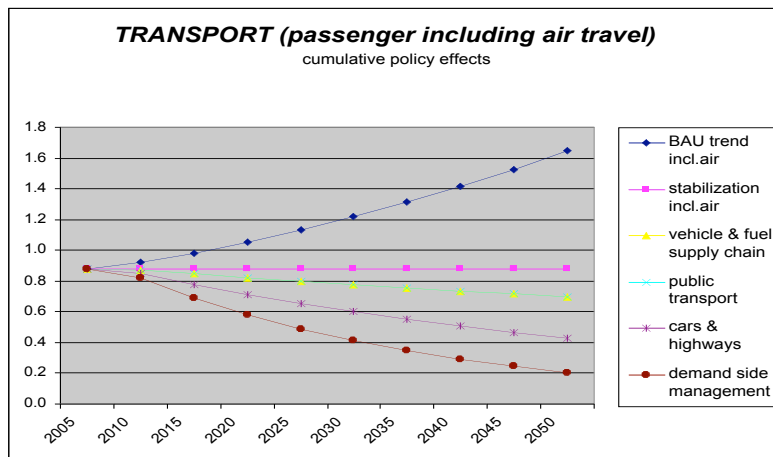


Fig 6.1 One Planet Transport policy impact

6.2.6 Short term recommendations

The effect of immediate action in the next 4 years should be to kick-start a reduction of up to 10% in the ecological footprint of the transport sector:

- Low impact vehicle incentive pilots programme
- Green travel planning for all public sector organizations
- Green tourism programme with integrated travel based on rail & responsive bus.
- Longer term campaign strategy, with a monitoring / evidence base.

6.2.7 Summary of One Planet transport strategy

SECTORS: surface / freight / air	Material sources	Manufact uring	Logistics	Services	Demand side 1	Demand side 2	Products in use	Externalitie s
PHYSICAL	Import %, source, extraction mode	Energy in production	Transport distance & mode	Tertiary activity & value added	Intensity & utilization factors	Consumption / mode choice	Product life: energy efficiency	Waste, emissions
Policy themes		Integrated supply chain & life cycle management		ICT based markets / exchanges	Utilization incentives: demand side management	Integrated transport planning	Regulation / labelling /	Regulation / market transformation
Lead								
ECONOMIC	Commodity prices: market effects	Fuel costs: factor & finance cost	Int. transport fuel / transaction cost	labour costs: investment costs	Consumer exp / saving: social discount rate	Market behaviour: stock turnover	Product life: energy prices in operation	External costs / impact charges
Policy themes		public procurement for clean vehicles	Multi-lateral aviation emissions cap & trade	Tax incentives for green travel schemes	Public procurement for market transform	Road pricing: differential license fees: vehicle carbon tax	Fuel tax: mileage charge:	Tradeable quotas:
Lead								
INSTITUTIONAL				Service economy / social economy	Utilization choices	Behavioural choices	Operational choices	Waste practices
Policy themes				Integrated transport services company	Social economy for car & lift sharing	New travel networks for eco-leisure & tourism		
Lead								

7 Manufacturing & consumer products

Technological innovation tends to drive obsolescence and hence turnover, i.e. products are increasingly outmoded before they are physically worn out. Such innovation involves a combination of performance, processes, logistics, cost advantage, brand name and market creation. For most manufactured product types, a globalized market and logistics system now applies, where the manufacturing process is in reality more like assembly of components from around the world: and for many such products the material content is reducing in relation to economic added value. In other words, manufacturing is in many ways approaching the pattern of the service sectors.

On the demand side there are equally challenging issues. Demand by consumers is highly dependent on culture, psychology, fashion, advertising, consumer affluence etc. It is also technologically driven in terms of functions and symbols, e.g. so that demand increases for clothes which are 'streetwise' or cars with 'attitude'. Products also operate their own infrastructure systems with packaging, peripherals, spares etc, all of which add to the mix.

7.1.1 Profile of the sector

'Products, consumables and durables' covers a huge variety of material goods and products to meet 'final demand' by households and government: i.e. any material items not included in food, shelter or transport. For this variety there is a wide range of disparate information, and in practice the majority of material flows comprise intermediate products used in other industries. We can divide the sector by life cycle profiles and material intensities:

- **Consumables:** generally items with a short life, of between zero and 1 year.
- **Peripherals:** generally, items which are part of a larger system, e.g. ink for printers
- **Durables:** generally items with more than 1 year lifetime: this latter includes appliances and media items which are significant energy users. There are saturation effects for some of these.
- For each of these there are different balances of material intensity, economic added value, life cycle impact and so on.

For all these there are supply side issues, in technology, logistics, business practice etc. Technological innovation tends to drive obsolescence and hence turnover, i.e. products are increasingly outmoded before they are physically worn out. Such innovation involves a combination of performance, processes, logistics, cost advantage, brand name and market creation. For most manufactured product types a globalized market and logistics system now applies, where the manufacturing process is in reality more like assembly of components from around the world: and for many such products the material content is reducing in relation to economic added value. In other words, manufacturing is in many ways approaching the pattern of the service sectors.

The ecological footprint of our 'consumables and capital investment' is 1.4 gha/cap, of which 0.64gha/cap is direct supply chains including raw materials, industrial processes, plant and machinery, distribution and retail impacts. The other half is in plant, machinery, infrastructure etc. The combined measures below should deliver savings of up to 75% from the total ecological footprint of the sector.

7.1.2 Towards One Planet products

Despite the complexity, there are some clear directions towards a Factor 4 approach to goods and products, and these are shown up in the general templates in the previous sections. The average product would be longer life, shared and adaptable: designed for re-use, reconditioning and recycling: composed of non-toxic and lower-impact materials, more energy efficient in use. Wherever possible it would be locally sourced or distributed on low-impact logistics. Consumer demand would favour ecological and social responsibility through ethical trading, and financial investment would encourage sustainable enterprises and trading markets.

All this represents a paradigm shift in consumption – what we consume, how it gets to us, who we share it with, and how much of the costs are transferred to others. This takes coordination from the supply side to demand side. It also brings together the global economy with local and community initiatives, as in the two contrasting scenarios:

- 'Technology / top-down' scenario: supply-side focus on new technology, integrated supply chains, and environmental management.
- 'Lifestyle / community' scenario: demand-side focus on value added of consumption, and contribution to local economy and community.

7.1.3 Summary & questions

Main resource effects:

- Reduced energy & resource demands in manufacturing
- All manufactured products designed for re-use & recycling
- Longer product life & higher energy efficiency
- All packaging designed for re-use and recycling
- Increased secondary owners' markets, with real-time distribution logistics

Main economic effects:

- Fuel levies on manufacturing & distribution: re-invested in innovation strategy.
- Public procurement incentives for industrial evolution
- Subsidy / levy incentives for energy efficient goods.
- Taxes and charges on products with toxic content e.g. batteries
- Economic structural shift from resource added to value added activity.
- Likely fiscal effect on the average household: saving on household expenditure on longer life & more efficient goods: balanced by higher unit prices.

Key issues & questions to be addressed:

- Public acceptability of lifestyle constraints:
- Willingness to buy lower impact
- Willingness to share, re-use and recycle

7.2 ONE PLANET PRODUCTS – THE WALES AGENDA

The reality for manufacturing and retail in Wales is as an integral part of the UK and EU economies. In this it is struggling to keep up with growth and restructuring at the UK level, and levels of skills and enterprise are also below average.

Against this challenging background, the future of economic development in many sectors and clusters is increasingly seen in low-carbon / high value added products and supply chains. Likewise there is an agenda for social enterprise, as an alternative to private consumption which both reduces impact and enhances quality of life. Wales needs to look at the potential for investment for market transformation in key product supply chains, and link this to future eco-systems markets and other kinds of incentive.

Economic development is often uncertain and controversial. So here are some leading questions on the manufacturing & products agenda:

- How far is manufacturing production in Wales following an environmental management path towards step changes in resource efficiency?
- Is there evidence that households and public attitudes in Wales take any account of ‘sustainable consumption’?
- What role could distributors and retailers in Wales play, on both supply and demand sides?
- What role could investors and intermediaries in Wales play, on both supply and demand sides?

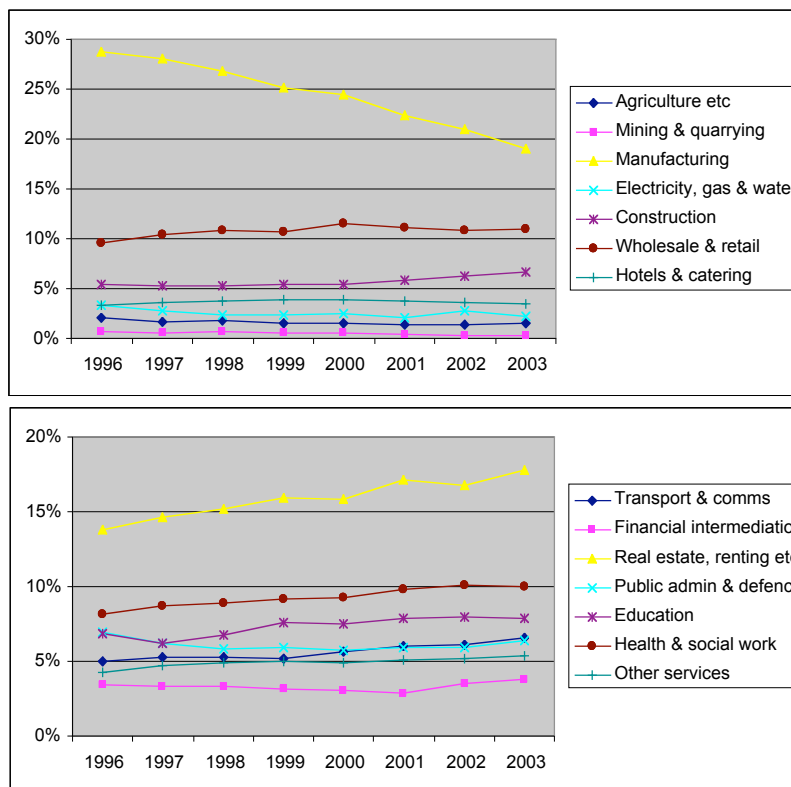
Generally, national or local government has not engaged with the issues of household consumption and its supply chain impacts, apart from the general goal of increasing affluence. There is a general assumption by economic development strategies that more production and more consumption is desirable in itself. This may possibly begin to change with the UK Sustainable Consumption & Production strategy, or with local carbon footprinting, or simply from the realization that the concept of a One Planet nation needs to include consumption-based accounting for household products.

However in many aspects of production / supply side, Wales has been an exemplar. The concept of promoting environmental management to clusters of local industries, for greater competitiveness and added value, is now widespread. One recent initiative is the Expert Group on Resource Management, whose report outlines a policy process rather than fixed targets.¹⁹ However there is some evidence that the easier wins have been achieved, that the firms most in need of management do not participate, and that the more damaging parts of product supply chains are displaced to overseas. This may change with the spread of carbon trading throughout large sections of industry.

¹⁹ Expert Group on Resource Management, 2006

Trends in the Wales economy

shown as % of total activity 1996 – 2003: Source: Regional Trends 2006



The general trend and pathway for the Welsh economy is the backdrop to this. The first chart shows the relative rapid decline of manufacturing, the recent dip in agriculture, and the slow rise of retail sectors. The second chart shows the steady rise of the commercial and public services which now underpin the economy - real estate, education and health. These are indications as to the focus for the One Planet agenda in both manufacturing and services.

7.2.1 Business-Environment initiatives

The Wales Business-Environment Action Plan has set the direction with a 3 year programme, of which the following is a sample of recent activity:²⁰

- Continued efforts by Carbon Trust Wales to improve the energy efficiency of businesses and the public sector in Wales.
- Significant strides have been made under the Materials Action Programme (MAP) in raising the profile of improving resource efficiency and supporting Welsh organizations in taking action through the Envirowise programme. Envirowise Wales will continue to deliver tailored support to Welsh businesses to help reduce waste to landfill, focusing on priority sectors for 2006/07 of chemicals, food and drink, construction, public sector and electronics.

²⁰ WAG 2006: Business-Environment Action Plan 3rd report

- The appointment of a construction co-ordinator to deliver practical information, guidance and support to the sector to minimise and recycle construction waste.
- Completion of the Eco-design pilot project the results of which will be tested in Wales with approximately 5 companies. The findings from the pilot to be used to refine an all Wales model of support for SMEs in Wales.
- Continued close co-operation between WAG, DTI and DEFRA has ensured that Welsh business interests have been fully taken into account in UK policy decisions and EU negotiating positions on the End-of-Life Vehicles (ELV), Waste Electrical and Electronic Equipment (WEEE) and Batteries Directives.

In April 2006, WAG announced a £6.8 million 'Materials Action Programme' (MAP) which aims to improve resource efficiency for key sector businesses in Wales (the food and drink, pharmaceutical, chemical, and electronics industries). Businesses will be encouraged to divert waste from landfill and increase the recycled content of their products and packaging. One important component of the MAP will be an Industrial Symbiosis initiative (MAP-IS) which facilitates links between organisations from different sectors to create commercial opportunities whereby previously unwanted or low value output resources from one business become useful, competitively-priced inputs for another business.

Alongside is the ARENA network and Green Dragon, a five-stage environmental management system relevant to the specific needs of any business. Participating organisations gain recognition for effective environmental management without necessarily adopting a formal management system. (<http://www.greendragonems.com/>)

BEST PRACTICE: SOLAR POWER IN CARDIFF

Source: Guardian 09-08-07

If you were hunting for the future of solar power, Wales might not seem the most obvious place to look. Yet in a factory in Cardiff, technology that could finally harness the energy of the sun in an affordable way is quietly rolling off the production line. Such claims may sound familiar. Advocates have talked of the potential of solar power to offer clean and green energy for years, yet the technology has remained stubbornly on the fringes. One reason is the cost. Photovoltaic (PV) solar panels to provide an average home with electricity will set you back about £10,000 to £18,000. Now those behind the Welsh operation think they may have made a crucial breakthrough. Their solar cell works in a different way from most, and is not based on silicon - the expensive raw material for conventional solar cells. G24 Innovations (G24i), the company making the new cells, says it can produce and sell them for about a fifth of the price of silicon-based versions. At present, it makes only small-scale chargers for equipment such as mobile phones and MP3 players. But it says larger panels could follow - large enough to replace polluting fossil fuels by generating electricity for large buildings.

7.2.2 Summary of Wales agenda

Here we set out the main themes, in terms of general policy, and in terms of policy directions and opportunities for Wales. The specifics of the Welsh policy agenda need to be assessed and inserted in the follow up discussion with stakeholders.

GENERAL ISSUES	WELSH POLICY AGENDA
Reduced energy & resource demands in manufacturing	
All manufactured products designed for re-use & recycling	
Longer product life & higher energy efficiency	
All packaging designed for re-use and recycling	
Increased secondary owners' markets, with real-time distribution logistics	

GENERAL ISSUES	WELSH POLICY AGENDA
Public procurement incentives for industrial evolution	
Subsidy / levy incentives for energy efficient goods.	
Taxes and charges on products with toxic content e.g. batteries	
Economic structural shift from resource added to value added activity.	

7.2.3 Strategic recommendations

The main recommended policy programmes for 2020 – 2050 are set out here for further debate and research:

- **Materials and imports sourcing:** this should aim at 100% sustainable sourcing and ethical trading, with incentives from public procurement, market accreditation and eco-labelling. This could save up to 15% of the total ecological footprint of the sector by 2050.
- **Integrated supply chain management:** greater coordination in sectors and clusters on the industrial ecology principle, with groups of suppliers, processors, distributors, utilities etc. This can achieve full-scale energy/water/waste minimisation coupled with major cost savings, and could save up to 30% on the sector's total footprint.
- **Product life design:** the life cycle of products includes energy, maintenance, waste, and the consequent demand for new products: by total quality management and design, this can save up to 15% of the total footprint.
- **Demand side management:** likewise there is an agenda for social enterprise, as an alternative to private material consumption. This can include leasing / sharing of products, re-use and recycling exchanges, and awareness campaigns. By simply re-directing demand and the components of demand side growth, this could save a further 15% of the footprint.

The anticipated projections / targets for the longer term strategies are shown in the chart below:

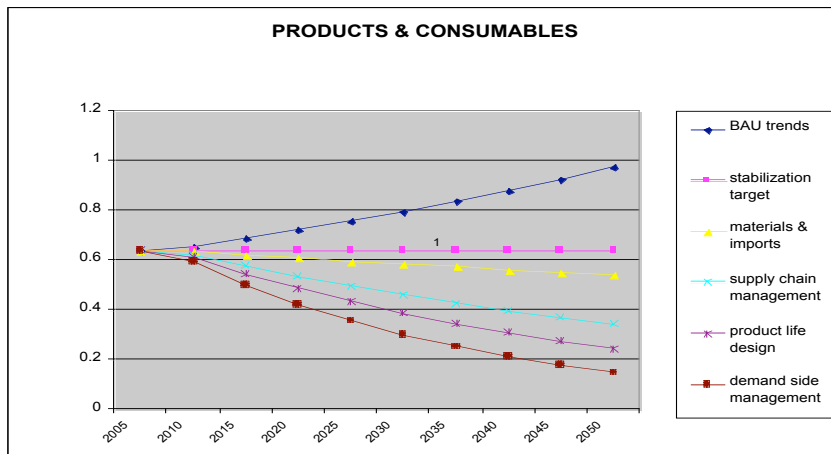


Figure 7.1: policies on products and manufacturing.

7.2.4 Short term recommendations

The effect of immediate action in the next 4 years should be a reduction of about 10% in the ecological footprint of this sector: this uses public procurement and the public estate as the main lever, combining the spending power of all public bodies:

- Sustainable sourcing pilot schemes for materials and imports.
- Supply chain management pilot schemes in selected industrial clusters.
- Sustainable consumption feedback campaign, targeted on schools and colleges
- Groundwork for the longer term One Planet Products strategy, with a monitoring / evidence base.

7.2.5 Summary table for One Planet products

	Material sources	Manufacturing	Logistics	Services	Demand side 1	Demand side 2	Products in use	Externalities
PHYSICAL	Import %, source, extraction mode	Energy in production	Transport distance & mode	Tertiary activity & value added	Intensity & utilization factors	Consumption / mode choice	Product life: energy efficiency	Waste & emissions
Policy themes	Resource protection	Low impact technology innovation	Integrated supply chain mgmt	ICT based markets / exchanges	Utilization incentives	Integrated planning & resource mgmt	Regulation / quotas / labelling	Regulation / legal liability
Lead								
ECONOMIC	Commodity prices: market effects	Fuel costs: factor & finance cost	Int. Transport fuel / transaction cost	labour costs: investment costs	Consumer exp / saving: social discount rate	Market behaviour: stock turnover	Product life: energy prices in operation	External costs / impact charges
Policy themes	Commodity levies / tariffs	Carbon tax: public procurement for clean technology	Multi-lateral aviation tax / emissions trading	Incentives for CSR & environ.mgmt	Public procurement for market transform	Incentives for demand side management	Eco-labels & incentives for product life & efficiency	Emission & eco-services trading schemes
Lead								
INSTITUTIONAL				Service / social economy	Utilization choices	Behavioural choices	Operational choices	Waste practices
Policy themes	International development: ethical trading	Producer responsibility: env management	CSR	CSR	Social economy for product life & sharing	Social economy for product life & sharing		
Lead								

8 Commercial & public services

The resource flow profile and ‘metabolism’ of consumer services is different from the previous sectors above. It is apparently more indirect and further down the supply chain: however the total indirect effects are as great as upstream secondary sectors. There is lower direct material intensity, with greater added value from labour & information, at the downstream stages of many supply chains. So we need to be clear about the various roles of services in relation to resource flows and the One Planet agenda:

- Direct effects - property, transport, specialized products, etc.
- Downstream effects – indirect effects along the supply chain on logistics, consumer choices etc.
- Infrastructure effects – transport, construction, energy supply, waste management etc, are also classed as ‘services’, where their role is providing physical infrastructure for other activities.
- Induced effects – financial services, professional services etc have major influence on other more material activities, both upstream and downstream.

Public services are in a special category. Although the range of public services is similar to that of commercial, the political economy is quite distinct, and one of the first opportunities for transformation is (in principle) through public procurement.

Generally the agenda for services will focus on the downstream and indirect resource flows, with measures such as CSR, environmental trading, ethical finance and consumer protection. In different sectors there are emerging agendas for green tourism, low impact logistics, socially responsible retail, fair trade and so on. In this way the transformation of the service sectors can provide incentives and pathways as the driving force in the One Planet programme for other more material-intensive sectors.

8.1.1 Commercial services profile

In policy terms, commercial services are more embedded in a free market approach to individual choice: In some areas there is direct overlap or competition with the public services economy; e.g. in health, care, education etc. There is an interesting area of overlap with the social / household economy, for instance in the balance of catering vs home cooking, where a similar mix of food could be either in ‘economic production’ or in ‘private consumption’. Arguably, the first priority looks towards financial services, for their instrumental role in providing incentives for other sectors.

Given the mainly indirect resource flows in the service sectors, there is naturally more focus on Corporate Social Responsibility (CSR), environmental management systems, ethical trading, ethical finance and consumer protection. In various sectors there would be versions of green tourism, low impact logistics, responsible retailing and so on. In this way the greening of the service sectors can provide incentives and structures, as an instrumental force in the Factor 4 programme for other more material-intensive sectors.

8.1.2 Public services profile

The policy context or political economy for public services is quite different to that of commercial services. Health, education, defence and so on are generally structured in large organizations/consortiums, so that forward planning, integrated asset management and green chain management are more feasible. Some public services – health, defence and so on – are also major material and capital consumers, and also major occupiers of land and buildings. Therefore public services are the first priority for advancing the programme of public procurement for industrial evolution.

However public services are subject to financial efficiency criteria, which does not necessarily coincide with environmental policy. There are major questions on the privatization, franchising, devolving and otherwise marketizing of health, education and many other services: this brings up the role of public / private partnerships (PPP, PFI, DBFO etc) in adding value on both sides. Apart from the many social and economic issues, there are very large environmental issues involved.

The total ecological footprint of all the 'services' we use is 0.65 gha / cap, roughly half each for commercial and public services.

The definition includes holidays abroad by Welsh residents, but excludes the local impacts of visitors to Wales (to avoid double counting). In each of the areas below there is a general target for 75% reduction in ecological footprint: however in many office-based service sectors, up to 95% of the footprint is indirect, either upstream or downstream, and the targets and calculations need to take this into account. Overall the total ecological footprint of the service sectors could be reduced by up to 80% by 2050.

8.1.3 Towards One Planet Services

The Factor 4 programme for public services would include several layers from direct to indirect. Firstly there is scope in environmental policy for direct impacts: transport, buildings, energy, waste. The health and education sectors are becoming aware of the greening agenda, although as yet it is secondary to service and management issues. The Building Schools for the Future investment programme has the potential to produce ultra low impact buildings with enhanced educational value.

There is also an agenda for indirect and induced impacts: i.e. where provision of services may increase or substitute for material consumption. For instance, health professionals have realized that providing some types of patient with a window may have more effect than prescribing drugs. Each of the sustainability agendas then applies, i.e. ethical trade, finance, CSR, environmental management systems etc. The difference is the huge potential of public procurement, which in public services should be coordinated and strategic like nowhere else. This represents the leading edge of the One Planet strategy.

8.1.4 Summary of resource issues

- Stabilize demand for energy & transport through spatial & property development
- Accelerate material recycling & recovery, through supply chain & logistics management
- Shift in local labour markets etc.

8.1.5 Summary of economic issues

- Tradable quotas on commercial energy use
- Accessibility incentives for new commercial development
- Packaging deposit levies for retail & distribution
- Tourism & leisure managed through progressive transport levies
- Shift to recycling & recovery economy with rising waste costs.
- Shift to knowledge-added for resource / energy intensive sectors
- How far can CSR activity be shifted to the service sector?
- What are the macro-economic implications of a shift towards intermediate labour market / social economy?

Overall, the commercial and public services agenda needs to deal with multiple scenario possibilities: i.e. so that both the top-down and the bottom up trends are working in parallel:

- ‘Technology / top-down’ scenario: supply-side focus on corporate responsibility, technology, customer profiling, supply chain management etc.
- ‘Lifestyle / community’ scenario: demand-side focus on ethical trading and investment, and overlap between private, public and community economies.

8.2 ONE PLANET SERVICES – THE WALES AGENDA

There is potential for the entire public sector of Wales to lead the One Planet strategy, through pro-active procurement and contracting for public services. This in turn will stimulate change in commercial services through corporate social responsibility, environmental management, ethical trading and finance, carbon trading etc.

As yet there is little apparent coordination between the many different sectors and activities involved, as diverse as finance, health and tourism. However there is much effort within many organizations and sectors. One public example is the health service, and the recent ‘Healthy Sustainable Wales Toolkit’.²¹ This was designed to support NHS organisations in their development of sustainable policies and practices, working to improve the wellbeing of staff, patients and the local community, and developed by the Sustainable Development Commission and WAG. A private sector example is in the tourism sector, and the efforts to promote ‘green tourism’ through farm diversification.

²¹ Sustainable Development Commission & NHS Wales (2007)
<http://www.sd-commission.org.uk/publications.php?id=531>

At the cross-over of public and private services is great potential for steering large scale investment and equity holdings towards the One Planet strategy. As in the final section there are various routes for this:

- Public sector pension funds; possibly the largest single source of direct investment for sustainability enterprises;
- Leasing and outsourcing of capital goods and infrastructure – further potential through the PFI and PPP schemes;
- Public sector equity shares, in private or third sector enterprises, e.g. airports, higher education;
- Direct servicing of the public estate, i.e. energy, transport, financial services etc.
- Direct procurement or contracting for goods and services:
- Indirect influence through regulation, subsidy / levy schemes or other incentives.

8.2.1 Questions for commercial services

- How far are commercial services in Wales following environmental management for a resource efficiency agenda?
- Is there evidence that commercial services in Wales takes any account of ‘sustainable consumption’?
- What role could distributors and retailers in Wales play, on both supply and demand sides?
- What role could investors and intermediaries in Wales play, on both supply and demand sides?

8.2.2 Questions for public services

- How far are health and education services in Wales following environmental management for a resource efficiency agenda?
- How far does the public sector set strategies and targets for its direct demand for buildings, transport, energy and so on?
- What role could social enterprise play in making the public services more sustainable (e.g. reducing trips to out of town hospital sites?)
- What role could private sector partnerships, PPP, PFI, DBFO etc play, in steering public services towards a One Planet Economy agenda?

8.2.3 Strategic recommendations

The main recommended policy programmes for 2020 – 2050 are set out here for further debate and research:

- **Public services:** health and education are the first priority for a One Planet procurement strategy. This should use its £6 billion public expenditure in Wales, to promote supply chain partnerships and innovation strategies for suppliers and contractors. This could save 35% of the current ecological footprint by 2050.
- **Financial services** and other business services have a crucial role in setting the incentives for all other sectors. There is a transformation agenda which includes carbon / eco-system

trading, community credits, triple bottom line accounting, and mutual / cooperative equity structures. The direct/upstream impacts could be reduced by 5% of the total Ecological Footprint of the sector.

- **Retail and distribution:** these have large on-site impacts through buildings, logistics and waste / packaging, as well as wider impacts on local economies and communities. There is a ‘sustainable retail’ agenda, for logistics, premises, sourcing, product life, equity structure and local markets. Direct and upstream impacts could be reduced by up to 15% of the total footprint.
- **Tourism:** this is the largest single employment sector in Wales. There is a wide-ranging agenda for sustainable transport, catering, accommodation, diversification and landscape management. This could save 15% of the Ecological Footprint.
- **Demand side management:** social enterprise, intermediate labour markets and community self-help are sustainable alternatives in many areas such as social care, landscape protection and urban regeneration. Substitution of low- for high-impact activity could save 10% of the sector’s current ecological footprint.

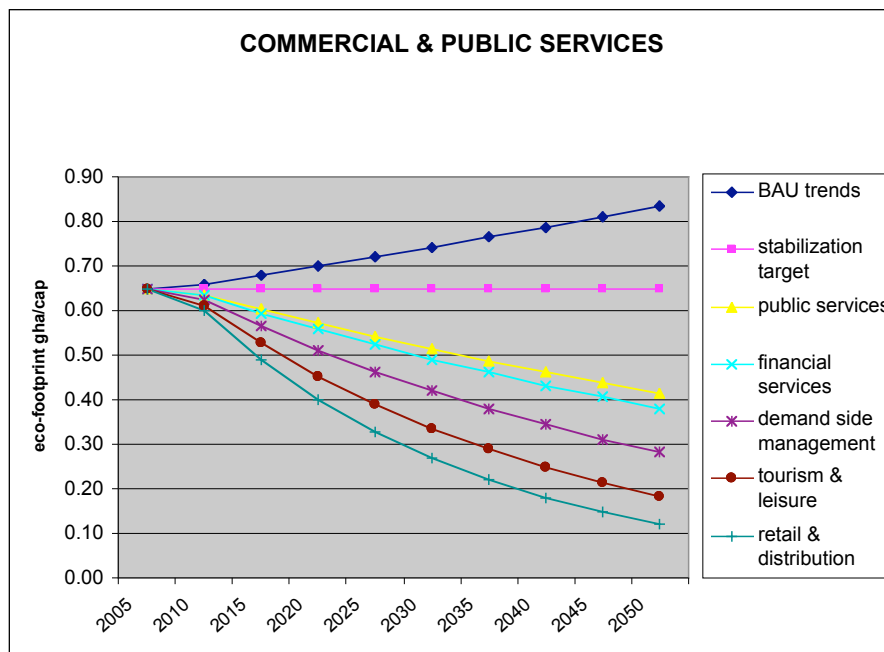


Figure 8.1: One Planet Services policy impacts

8.2.4 Short term recommendations

The effect of immediate actions in the next 4 years should be to kick-start a reduction of about 8-10% in the ecological footprint of this sector:

- Retail: large / small business partnership with pilot carbon trading and fair trade programme.
- Financial services: ethical investment pilot programme, with internal pilot carbon trading scheme.
- Tourism: green visitor scheme for travel, catering, accommodation etc.
- Public services: first phase greening of health and education buildings, catering, transport and other suppliers.

- Demand side: develop ‘social enterprise pilots’ which generate local employment and training, high quality services, and community stakeowning.

8.2.5 Summary of services policy options

	Material sources	Logistics	Manufacturing	Services	Demand side 1	Demand side 2	Products in use	Externalities
PHYSICAL	Import %, source, extraction mode	Transport distance & mode	Energy in production	Tertiary activity & value added	Intensity & utilization factors	Consumption / mode choice	Product life: energy efficiency	Waste, recycling %: waste mgmt: emissions
Policy themes	Resource protection	Integrated supply chain mgmt	New processes: new products	ICT based markets / exchanges	Utilization incentives	Integrated planning & resource mgmt	Regulation / quotas / labelling	Regulation / legal liability
Lead								
ECONOMIC	Commodity prices: market effects	Int. transport fuel / transaction cost	Fuel costs: factor & finance cost	labour costs: investment costs	Consumer exp / saving: social discount	Market behaviour: stock turnover	Product life: energy prices in operation	External costs / impact charges
Policy themes	Commodity levies / tariffs	Multi-lateral aviation tax	Carbon tax: public procurement for clean technology	Incentives for CSR & environ.mgmt	Public procurement for market transform	Incentives for demand side management	Eco-labels & incentives for product life & efficiency	Emission & eco-services trading schemes
Lead								
INSTITUTIONAL				Service economy / social economy	Utilization choices	Behavioural choices	Operational choices	Waste practices
Policy themes	International development: ethical trading	CSR	Producer responsibility: env management	CSR	Social economy & civic society	Social economy & civic society		
Lead								

9 Energy & climate

Energy is very topical at the time of writing – since 2006 we have seen the DTI Energy White Paper, the Treasury ‘Stern Review’ on the economics of climate change, and the DEFRA Climate Change Action Programme – even while more urgent estimates arrive daily, of more extreme events and risks from climate change.

There is also a national / regional policy and economic agenda, with added social dimensions. Energy is increasingly a globalized industry, with larger UK / EU inter-connectors planned for gas and electric. The majority of UK distribution is now foreign-owned, and UK fuel self sufficiency is declining. However there are new opportunities for renewable and embedded generation at the local / regional level. Energy security is a key concern, in the light of international tension.

9.1.1 Sector profile

This sector focuses on the *supply side* to meet the demand for energy or energy services coming from each of the other key sectors, i.e. food, shelter, transport, products and services. In many ways the energy question is at the heart of the One Planet Wales agenda. If current energy supply systems and technologies can be *de-carbonized*, and then *de-materialized*: and if other land-use and environmental impacts can be greatly reduced, then in most practical terms the level of energy demand is not an issue – the One Planet goals could be achieved even with rising energy demand. However it is more plausible that changes will be spread across each stage in the chain from supply to demand.

Following the logic of the RAF supply chain framework, there are several agendas to consider:

- Fuel sources, resource depletion, and the impacts of each fuel option;
- Energy conversion and distribution technology, i.e. for electricity or other medium;
- Direct emissions and waste, and energy system life cycle impacts.

There is also a national / regional policy and economic agenda, with added social dimensions. Energy is increasingly a globalized industry, with larger UK / EU inter-connectors planned for gas and electric. The majority of UK distribution is now foreign-owned, and UK fuel self sufficiency is declining. However there are new opportunities for renewable and embedded generation at the local / regional level.

The ecological footprint of the energy we use is accounted for in other sectors above: both the 20%, which is directly consumed in housing, or the remainder in commerce and industry. The strategies and actions shown here are needed in order to enable the achievement of the targets in the other sectors.

9.1.2 Towards One Planet energy

The over-riding question can be framed as – peak oil vs emissions controls – i.e. will the oil (and later on the gas) start to run dry, or whether climate emissions should be contained by policy. If the latter case, then there are further questions at national and international level, i.e. targets vs trading: taxes vs quotas: and offsets vs emissions. Each of these is highly problematic: for instance the European Trading Scheme (ETS) first phase is operating, but with an over-supply of credits, so that a tonne of carbon is trading at €2, a small fraction of its estimated ‘social cost’ of damage. In contrast the DEFRA estimate for the ‘social cost’ of carbon is £25.40 per tonne of CO₂, and rising at 2% per year.

Is there a valid response for the OPEN in the face of such complexity and controversy? The OPEN approach suggests a ‘no-regrets’ approach to UK energy policy – in other words, working with the uncertainties of emissions trading, market prices, technological innovation and so on, to provide the optimum steps forward, which are technologically robust, low risk and low impact. This *‘zen and the art of climate maintenance’* is likely to put the focus back on demand side management in the sectors above: to encourage UK renewable sources with embedded generation: avoid technologies with long term risks and uncertain hazards: encourage sources with spin-off benefits such as rural economies, and so on. The Zero-Carbon Britain report from the Centre for Alternative Technology shows the very positive opportunities for ‘powering down’ of demand, and ‘powering up’ of supply towards a 100% renewables mix within 20 years (although this is framed at the UK level).²²

9.1.3 Summary issues and questions

Main resource effects on the supply side:

- Shift to renewable sources with low impact storage technology
- Energy diversity and flexibility maintained
- Embedded sources and generation with spin-off benefits.

Main economic effects:

- Expansion of EU emissions trading scheme.
- International levies on carbon in transport fuel.
- Tradeable quotas on commercial and domestic energy use

Again there are alternative scenarios, which can be seen as working in parallel:

- ‘Technology / top-down’ scenario: supply-side focus on new energy technology and new distribution systems: new forms of global finance and supply chain management.
- ‘Lifestyle / community’ scenario: consumer focus on demand-side management, community micro-generation, energy efficiency and local economic benefits.

²² Centre for Alternative Technology 2007

9.2 ONE PLANET ENERGY IN WALES

9.2.1 Current policies

The Energy Route Map 2005 set out key policy directions:²³

- Securing 4 TWhr per annum of renewable electricity production by 2010 and 7TWhr by 2020.
- Much greater energy efficiency in all sectors, as is described in the WAG ‘Energy Savings Wales’ energy efficiency action plan of 2004.
- More electricity generation from cleaner, higher efficiency fossil-fuel plants.
- Significant energy infrastructure improvements,
- On a holistic basis, achieving measurable carbon dioxide emission reduction targets for 2020. This is set in terms of contributing to ‘the sustainable development target of 20% reduction of Wales’ CO2 emissions by 2020’.

The context for this is a wide ranging commitment (as summarized in the NAW research paper on climate mitigation):²⁴

‘The Welsh Assembly Government has expressed its commitment to “contribute fully to meeting UK-wide targets”. It has also set a domestic target to reduce greenhouse gas emissions by 20 per cent between a 2000 baseline and 2020. Other specific Welsh targets are currently under development.²⁵ The Welsh Assembly Government does not have a specific climate change programme but published its first environment strategy and action plan in May 2006. This sets the strategic direction of environmental action in Wales until 2026 and has climate change as a central theme. The accompanying environment action plan details the specific actions, over and above current policies and actions already in place, which are required to deliver the aims of the environmental strategy. A total of 62 actions are outlined, including a commitment to produce an energy route map by the end of 2006, and a climate change ‘adaptation action plan’ by March 2007. Several short term (up to 2008) goals are listed for each action and the progress towards these targets will be measured and reviewed annually, with new goals added over time.’

9.2.2 Renewable energy policy

The WAG approach to renewable energy was outlined in Technical Advice Note (TAN) 8 *Planning for Renewable Energy*, published in July 2005. This promotes onshore wind energy as providing “the greatest potential for an increase in generation of electricity from renewable energy in the short to medium term” and predicts that an additional 800 MW capacity from wind power is required to meet the Welsh target for renewable electricity generation of 4 TWh for 2010. The advice note sets out seven ‘Strategic Search Areas’ (SSAs) in which, for environmental and efficiency reasons, large scale (>25MW) onshore wind developments should be concentrated. These SSAs were chosen to maximise efficiency and to avoid designated conservation areas such as National Parks, and Areas of Outstanding Natural Beauty.

²³ WAG, 2005: Energy Route Map for Wales

²⁴ NAW, 2006: *Climate mitigation: a comparison of approaches*

²⁵ WAG, May 2006, *Environment Strategy for Wales*

The WAG aimed to produce a biomass energy strategy document by mid 2006²⁵. Key tasks identified in the *Energy Wales Route Map* consultation document were to research an appropriate biomass energy strategy for Wales, and to assist in the process of setting achievable targets for biomass-generated electricity and heat. WAG has provided funding, through European structural funds, for the development of a £33 million Wood Energy power plant at Margam. The plant will have a 13.8MW capacity (enough to heat and power 31,000 homes), and will supply electricity to the national grid through the use of surplus product from the timber industry. Construction began in July 2006, and is expected to take two years to complete. £4.95 million of the funding was provided by the DTI through the Bioenergy Capital Grants Scheme.’

In the background is the largest single renewable energy scheme in the UK, the Severn Barrage. This is a hugely complex and controversial project: but the most recent report from the SDC made a qualified positive assessment:²⁶

- “Electricity from a (Severn) barrage would displace output from fossil-fuelled power stations, making a significant contribution to the UK’s renewable energy targets
- The variability in output from a barrage is not a major problem for the electricity grid and can be managed at very low cost
- There would be substantial flood risk benefits from a barrage, but these are only marginal to the economic case for its construction
- The case for new transport links over a barrage is unproven, and needs to be assessed looking at the net costs and benefits.”

9.2.3 One Planet Energy in Wales

The One Planet energy strategy needs to work through the many uncertainties of emissions trading, technology innovation and so on, towards low risk and low impact infrastructure and technologies. On the demand side there is accelerated energy efficiency and affordable warmth. On the supply side there is the current renewable energy scenario, with a four-fold increase from 2000-2010: the majority from on-shore and off-shore wind, with further contributions from biomass and waste recovery.

The contribution of WAG and the public sector needs to keep up with emerging UK and EU policy – there are high expectations in the draft Climate Change Bill 2007, while the actions are as yet unclear. This suggests a rapid rate of policy innovation over the next few years, which should aim to combine emissions trading, micro-generation incentives, and distribution / generation partnerships.

9.2.4 General policy issues

Here we set out the main themes, in terms of general policy, and in terms of policy directions and opportunities for Wales, to be put to consultation. The specifics of the Welsh policy agenda need to be assessed and inserted in the follow up discussion with stakeholders

²⁶ SDC, 2007: Tidal power in the UK

MAIN POLICY ISSUES	ISSUES FOR WAG
Shift to renewable sources with low impact storage technology	
Energy diversity and flexibility maintained	
Embedded sources and generation with spin-off benefits.	

MAIN ECONOMIC ISSUES	ISSUES FOR WAG
Expansion & local application of EU emissions trading scheme.	
International levies on carbon in transport fuel.	
Tradeable quotas on commercial and domestic energy use.	

The contribution of the Wales public sector needs to keep up with emerging UK and EU policy – there are high expectations in the draft Climate Change Bill 2007, while the actions are as yet unclear. This suggests a rapid rate of policy innovation over the next few years, which should aim to combine emissions trading, micro-generation incentives, and distribution / generation partnerships.

9.2.5 Questions on Wales policy:

- How much responsibility should WAG take for the energy demand / energy supply in the nation?
- How much public funding should WAG invest in climate emissions reduction / offset schemes, and can this be counted in ‘social cost-benefits’?
- Should the wider public sector in Wales operate an internal pilot carbon trading scheme?
- How far is planning policy is alive to the need to set aside land and space that would facilitate decentralised energy production in the future.

9.2.6 Strategic recommendations

The main recommended policy programmes for 2020 – 2050 are set out here for further debate and research:

- **Micro-generation:** WAG and the Welsh public sector need to enable and accelerate small scale localized generation, through new forms of utility finance and distribution partnerships.
- **Energy demand management:** this needs a new raft of incentives to take up the efficiency measures, (which would avoid the need for new nuclear generation). This should focus on carbon trading and quota schemes for affordable warmth, and commercial ‘nega-watt’ investment, (i.e. investment in demand side efficiency).
- **Public sector initiatives:** an active role will be needed from Government and the public sector, through procurement, supply partnerships, efficiency investments, alternative fuel infrastructure, and micro-generation innovation.

9.2.7 Short term recommendations

A range of immediate actions are required to enable the targets to be achieved in other sectors:

- Renewables: develop medium-long term programme for wind, solar and biomass at local and regional level.
- Micro-generation: accelerate take-up through pilot technology programme with utility rebates.
- Demand management and the public sector: set up pilot internal carbon trading market and extend to energy partnership investment programme.
- Set up the strategic programme for national energy transformation, with an effective monitoring and evidence base.

9.2.8 Summary of energy & climate policy options

	Material sources	Logistics	Manufacturing	Services	Demand side 1	Demand side 2	Products in use	Externalities
PHYSICAL	Import %, source, extraction mode	Transport distance & mode	Energy in production	Tertiary activity & value added	Intensity & utilization factors	Consumption / mode choice	Product life: energy efficiency	Waste, recycling %: waste mgmt: emissions
Policy themes	Resource protection	Integrated supply chain mgmt	New processes: new products	ESCOs & similar	Diversified energy grid	Infrastructure for heat distribution	Stock replacement programme	
Lead								
ECONOMIC	Commodity prices: market effects	Int. transport fuel / transaction cost	Fuel costs: factor & finance cost	labour costs: investment costs	Consumer exp / saving: social discount	Market behaviour: stock turnover	Product life: energy prices in operation	External costs / impact charges
Policy themes	Renewable development incentives	International fuel tax	Carbon levy: public procurement for clean technology	Tax incentives for partnership investment	Public procurement for energy transform	Cross-subsidy for demand side management	Eco-labels linked to tax incentives	Emission trading scheme enlarged
Lead								
INSTITUTIONAL				Service economy / social economy	Utilization choices	Behavioural choices	Operational choices	Waste practices
Policy themes	International development & ethical trading	CSR	Producer responsibility: env management	CSR	Regional Partnership energy agencies	Social economy & civic society	Education for ZED design & operation	
Lead								

10 Waste & resources

The agenda for ‘sustainable’ waste management also raises more general questions on the flow of resources around the material economy:

- Waste management & recycling is a small sector in economic terms, but clearly very significant in terms of resource flow;
- One key issue in resource flow terms is not only the quantity of re-use / recycling, as the quality of end-uses.
- A Factor 4 economy would see the main flows of materials as secondary – recycled, re-manufactured, re-used materials and products would become the default choice for most forms of production and value added.

In UK policy terms the main current reference point is the landfill levy ‘escalator’: at the point when it reaches £35 per tonne, then other waste recovery technologies become comparable in terms of pure cost.²⁷ However as with other infrastructure issues, there are strong lock-in effects to capital investments and supply contracts. Experience shows that economic incentives need to be combined with institutional & behavioural incentives, which are otherwise hard to shift.

10.1.1 Towards Factor 4 in waste & resource use

An OPEN approach to a Factor 4 resource / waste system would aim towards an integrated industrial evolution approach. Here, product design, material sources, logistics systems, consumer services, and fiscal incentives are all to be integrated with the available resources coming through the waste stream. The example of the Irish tax on plastic bags, shows how a modest economic measure can coordinate with changing awareness, to result in major improvements in the waste stream.

10.2 WASTE & RESOURCES IN WALES

A One Planet ‘resource economy’ would see the most material flows as ‘re-circulation’ – recycled, re-manufactured and re-used materials and products would become the default, and virgin inputs much reduced. The One Planet approach aims at transformation in all resource-intensive sectors: combining product design, material sources, logistics networks, consumer services, and fiscal incentives.

Again there are alternative scenarios, which may diverge or converge together:

- ‘Technology / top-down’ scenario: end-of-pipe focus on waste management technology, material recovery and supply chain management.

²⁷ Mitchell, 2004

- ‘Lifestyle / community’ scenario: upstream focus on small business practices and the local economy, community recycling, product sharing and re-use.

These alternative routes also show different levels of public policy – from the macro and top-down, to the community scale and bottom up. The contribution of WAG and public bodies should focus on procurement, local incentives, tax and investment programmes, which should focus on transformation strategies for key sectors.

10.2.1 Current policies

No municipal waste is exported from Wales, but 25% of Wales’ C&I (commercial and industrial) waste is exported from the region. The handling of special wastes has been restricted to landfilling.

In 2002 WAG published a waste strategy for Wales, *Wise about Waste*, which provides a programme of change over a ten year time horizon. The strategy specifies several waste management targets, including:

- Public bodies and businesses to reduce the amount of waste they produce by at least 10 per cent of the 1998 figure by 2010, building on an anticipated 5 per cent reduction in 2005.
- Each local authority to achieve at least 25 per cent recycling/composting of municipal waste by 2006/07 and at least 40 per cent by 2009/10, building on an anticipated 15 per cent recycling rate in 2003/04 (the actual recycling rate in 2003/04 was 16 per cent).
- The stabilisation and reduction of household waste, such that by 2009/10 the waste produced per household should be no greater than that (for Wales) in 1997/98 and that by 2020 waste produced should be less than 300kg per person per annum.
- To reduce the amount of industrial and commercial waste going to landfill by 20 per cent from 1998 levels by 2010, building on an anticipated 15 per cent reduction in 2005.
- To reduce the amount of biodegradable waste going to landfill by 20 per cent from 1998 levels by 2010, building on an anticipated 15 per cent reduction in 2005.
- To reuse and recycle at least 85 per cent of construction and demolition waste by 2010, building on an anticipated rate of 75 per cent in 2005.

10.2.2 Questions on waste & resources

- How much are the natural resources of Wales prioritized in public policy and planning?
- How far is waste minimization & re-use part of mainstream public policy, in planning, procurement, and other areas?
- Are there long term waste / recycling / resource use projections and scenarios for Wales?
- What are the prospects for new waste technologies – MBT, composting, advanced recycling etc?
- What are the prospects for new forms of waste collection and re-distribution to encourage re-use and recycling?
- What role could retailers, distributors and packagers play, on both supply and demand sides?

- Any examples of best / worst practice of environmental management in waste management?
- Any examples of best / worst practice in waste minimization and re-use?

10.2.3 General policy issues

Here we set out the main themes, in terms of general policy, and in terms of policy directions and opportunities for Wales. The specifics of the Welsh policy agenda need to be assessed and inserted in the follow up discussion with stakeholders

MAIN RESOURCE ISSUES	ISSUES FOR WAG
All manufactured products designed for re-use & recycling	
All packaging designed for re-use & recycling	
Industrial clusters & networks designed around material cascades	
Increased secondary owners' markets for waste minimization	

MAIN ECONOMIC ISSUES	ISSUES FOR WAG
Material / waste levies on international trade to raise prices of raw materials,	
All packaging on deposit-return / trading schemes	
Climate levies on manufacturing & distribution: re-invested to innovation.	
Public procurement incentives for industrial evolution	
Economic structural shift from resource added to value added activity.	

10.2.4 Strategic recommendations

The main recommended policy programmes for 2020 – 2050 are set out here for further debate and research:

- **Re-use and re-manufacturing:** all products would be designed for an extended life cycle - re-use through demand side exchange, and re-manufacturing through supply side industrial ecology clusters. This is then applied to deposit-return, product take-back, eco-labelling, and direct regulation of high-impact products such as batteries or light bulbs.
- **Waste recovery supply side:** this takes a more 'downstream' end-of-pipe focus on waste management logistics, material / energy recovery technology, and supply chain waste minimization / sorting.

- ***Packaging and other temporary material use***: form partnerships with the retail and logistics sector with zero-packaging deposit return systems.
- ***Waste management demand side***: this looks ‘upstream’ on small business practices and community re-use / recycling activities. WAG and the entire public sector should focus on procurement, local incentives, local tax and investment programmes and establish resource transformation strategies for key sectors.

10.2.5 Short term recommendations

These are examples of immediate actions, to enable the short term targets to be achieved in other sectors:

- Re-use and re-manufacturing: industrial ecology clusters / partnerships / material exchanges:
- Waste recovery: best practice programme in waste technology, material recovery and supply chain management.
- Packaging: promote ‘bag free’ retail centres with deposit-return schemes.
- Waste recovery demand side: schools programmes for creative recycling: target feedback on communities with waste disposal issues.
- Set up the strategic programme for a One Planet Resource transformation, with monitoring and evidence base.

11 Making it happen

11.1 WALES – SUSTAINABLE DEVELOPMENT LEADER?

The WAG's duty to promote 'sustainable development' was the first such policy in the UK and EU. As now formed in Section 79 of the Government of Wales Act 2006, this requires the WAG to make a strategy, and to consult, monitor and report on progress. The WAG is also the only national government so far to adopt the ecological footprint as a key indicator of progress. With such good intentions, what could possibly be missing?

For this we should look at the difference between 'surface greening' – a few trees planted or recycling bins filled – and real structural change. We can also look at the powers, resources and mandate of a 'devolved' government, in a complex, affluent, globalized economy. In other words, how far can Wales really move ahead or away from the general trend of economic development in the UK, EU and world markets? If so, then who can drive this, when and where? Who might be the winners or losers from any structural change? The real questions are about real investment, real technology, and the decisions of 300,000 businesses and 2.9 million people.

For each of the key sectors above we need to ask -

- What are the powers and resources of *Wales*, as distinct from the UK or EU?
- What is the scope for fiscal (taxation) powers, or real spending and investment?
- How can elected government link with the many agencies, quangos, partnerships, and social enterprises?

11.1.1 Multi-level & multi-lateral governance

Wales on its own, in the foreseeable future, is unlikely to move any great distance from the UK economy. So the One Planet Wales agenda has a delicate balancing act to follow. It should facilitate and promote the most positive trends and opportunities at the UK / EU policy level, for producers and consumers at the local level. This involves 'multi-level governance' between national and local: 'multi-lateral' coordination between many bodies; and 'multi-sectoral' linking of supply side and demand side (*Fig 11.1*).

The current devolution of Wales may be one step on a long journey. Whichever the outcome, there are open questions for the One Planet Wales agenda, as in the 'scenario' framework in Section 2:

- political integration or decentralization, at the national or local level?
- economic integration or decentralization, at the national or local level?
- Driving forces coming from private enterprise, or from public policy?

Joined up policy for sustainable development

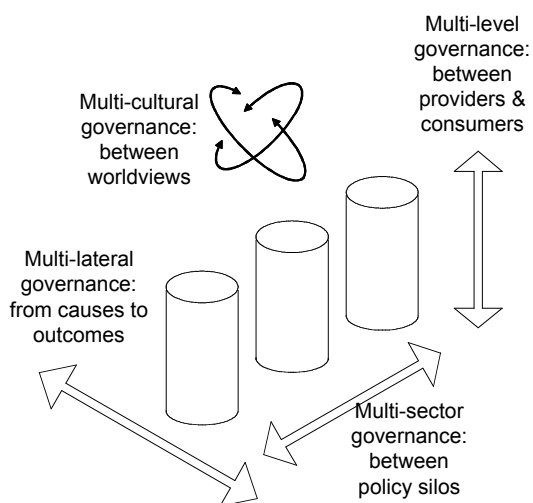


Fig 11.1: joined up policy

We cannot pre-judge these issues, but whichever the outcome, we can advocate practical ways forward.

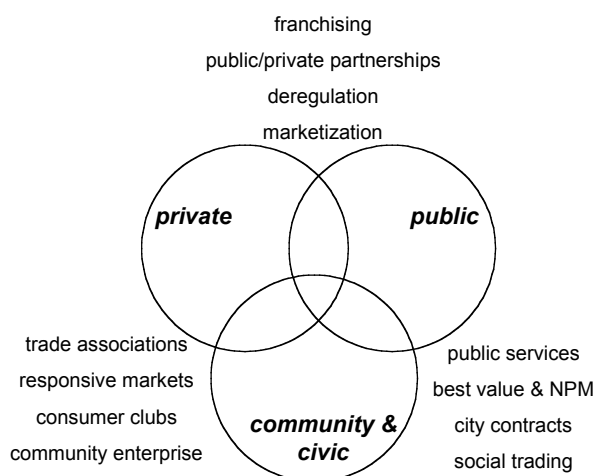
Some of the emerging directions are shown by new forms of ‘distributed intelligence’, as enabled by ICT. We see huge potential for ‘next generation’ web services on the model of eBay, MySpace and so on:

- Business and consumer trading for re-use and recycling:
- digital democracy and participative planning:
- responsive urban planning & management:
- consumer needs profiling for public service delivery:
- social spaces for community networks, and so on.
- Generally, linking the supply side with the demand side, to avoid waste and increase efficiency.

Meanwhile the One Planet Economy approach suggests the need for new kinds of organization which operate in the space between public, private and community sectors. This is nothing new – the reality behind the ‘perfect market’ of economic textbooks has always been a rich mixture of cooperation, exploitation and dependency between interlocking organizations. We can type such alliances and linkages in three basic combinations – public-private, private-community and public-community – where each sector has certain strengths, weaknesses, opportunities and threats.²⁸ The diagram below is but a start in mapping the many possible interactions, but it does give insight on the likely shape of new institutions for the OPEN Strategy (*Fig 11.2*).

²⁸ the ‘community’ or ‘third’ sector includes local informal or social economies, ‘civic’ or non-profit institutions, associations, unions, churches and so on.

New Institutions & Linkages



General linkages and potential alliances between public, private and civic / nonprofit / third / community sectors.

Fig 11.2: new institutions and linkages

11.2 ECONOMIC & SOCIAL AGENDAS

11.2.1 Economic development issues

The first questions on the One Planet Economy programme are what will it cost and what are the benefits? There are many issues in eco-taxation and fiscal policy for environmental objectives. We could start from the text-book analysis of the theoretical ‘optimum tax rate’ for one firm and one pollutant – and then observe the reality:

- Complex supply chains in a globalized economy
- Eco-taxation as one incentive among many other social and institutional factors
- Moving boundaries between taxation, subsidies, trading systems, and investment,
- Even where an eco-taxation measure has a tangible effect, there are many other adjustment, substitution, displacement and institutional effects.
- The overall effect is highly dependent on the policy for re-investment of tax revenues.

On the re-investment issue, the key OPEN principle is that revenues should be re-invested in a strategic programme for ‘industrial evolution’. This is taken to include technological innovation, demand side management, infrastructure development, public procurement and so on. In practice to analyse or model such effects is difficult, as the results are dependent on all the institutional factors above – for instance there is often inadequate evidence on how much waste can be minimized per £GB of re-investment to any one sector. However, we can set the basic options for eco-fiscal policy in three broad categories.

Direct fiscal transfers: Questions are where best to raise taxes in complex supply chains – whether from producers / distributors / consumers / externality victims / other stakeholders?

- Direct taxation: when is a tax not a tax, but a charge or levy on services?
- Indirect taxation: when costs are spread along the supply chain, then many producers, intermediaries and consumers are also *de facto* tax-payers and beneficiaries.

Market initiatives: there are questions on boundaries, regulation, eligibility, ceilings, legacies, and particularly the progressive or regressive effects on lower income or smaller / more vulnerable businesses:

- Trading systems – e.g. carbon trading
- Quota systems. – e.g. packaging recovery notes
- Technology development: specific programmes for innovation

Public sector intervention: There are questions on the macro-economic balance, institutional structure and equity structure:

- Public procurement: can generate critical mass for supply chains to invest in new technologies etc
- Public infrastructure: can enable & facilitate lower impact activities
- Public partnerships – most large infrastructure is partnership investment, such as DBFO – the specific terms & conditions for balancing equity & risk are then crucial.
- Public agencies – may act as vehicles for each of the above, with the general approach of leverage i.e. multiplying the effect of public investment.

The most useful approach is to look at how each of these fiscal measures can work best as combined packages of sticks & carrots – penalties and incentives - spread along the material supply chain, and the economic value chain.

Whichever the devolution path taken by WAG, we need to bring to the One Planet agenda every kind of financial power available to the public sector. The context for this is national macro-economic policy, assumed as the UK Treasury's 'golden rule' and 'sustainable investment' rules on the overall limits to public spending. Within this there are many possibilities, to be explored by WAG and the local authorities:

- Carbon emissions trading and quota schemes: graduated to be tax neutral and progressive.
- Eco-systems 'lifetime credit' schemes: e.g. product impact charging.
- Activity / infrastructure levies: e.g. congestion charging with re-investment in public transport.
- Each of these is to be combined with regulation and behaviour incentives.
- Each of these should be subsidiarized to the most local level.
- The whole package should add up to serious investment in strategic market transformation in key sectors.

11.2.2 Environmental industries in Wales

On the ground, a recent review of the environmental sector in Wales found some very positive results:²⁹

- 1320 EGS firms in Wales, employing 22,000 (1.5% of workplace employment in Wales) and estimated annual sales of £1.2 billion;
- Rapid growth since 2002 survey: up from 725 firms and 12,400 employees (organic growth, new start-ups and new market entrants);
- About two-thirds of the EGS firms are very small (10 employees or less) but there is a significant group of companies (28%) in the 11 to 50 employee size range;
- The largest sub-sectors are Waste Management/Recycling, Landscape Industries and Environmental Consultancy which account for nearly three-quarters of the EGS firms (as measured by main activity). Other significant sub-sectors are Water & Wastewater Treatment and Renewable Energy;
- Over 50% of the EGS firms have been established within the last 10 years (22% within the last 4 years) which illustrates the dynamic nature of the sector. These companies are mainly in the Environmental Consultancy, Landscape, Renewable Energy and Waste Management/Recycling sub-sectors;
- In terms of customer markets, there is a strong emphasis on the public sector and construction industry across all of the main sub-sectors with manufacturing and waste also being important to some of the large sub-sectors.
- The most important future business support needs are associated with financing the business and funding for projects followed by skills & training, networking, developing collaborative partnerships/agreements and market information. These needs vary considerably by company size and sub-sector reflecting the main barriers.
- Using the same sub-sector growth rates for the EGS sector in Wales as forecast for the UK as a whole, it is estimated that sector will grow from the current turnover of £1.22 billion to £1.55 billion by 2010. This would take total employment to around 29,000 or 7000 new jobs over the 2006 to 2010 period.
- Continuation of the growth achieved in Wales over the past four years at an average of 14% per annum, would lead to employment of 37,000 by 2010, an increase of 15,000 jobs compared to current employment.

11.2.3 Affluence & lifestyle issues

This all seems high-minded – but in practice there are deep rooted issues of affluence and individual liberties. One approach to ‘decoupling’ growth from material consumption, looks at behaviour change incentives, awareness and education, media and fashion, and (dare we say it) spiritual development.

Another approach is through social enterprise. For instance, commercial childcare appears to increase GVA, while public sector childcare appears to be a financial drain: but childcare in the community may be the more sustainable, even while no money changes hands. We need to focus on such vital overlaps between private, public and community sectors.

²⁹ Quantum Strategy & Technology 2007

This applies to the deprivation and regeneration agenda, in the Valleys and elsewhere. The conventional solution is to raise competitiveness, incomes, and material consumption: while more sustainable solutions might look at social enterprise, lifestyle aspirations, skills and careers, and community investment.

A practical model of ‘behavioural change for sustainable development’ has been promoted by DEFRA and now provides policy guidance in the shape of a ‘4-E’ model:³⁰

- Enable – making it easier;
- Encourage – give the right signals;
- Engage – get people involved;
- Exemplify – government takes the lead.

11.3 NEXT STEPS

11.3.1 Strategic planning approach

Facing a challenge as large as the restructuring of the entire Wales economy and infrastructure – where does one start?

The best approach is to take practical issues, create opportunities, assess risks and uncertainties, and follow the logic of strategic planning.

For instance, the proposal to upgrade the entire housing stock of Wales depends on active partnership between financiers and developers, landlords and agents, designers and builders, utilities and technology suppliers, and so on. So, the added value of coordination at the settlement or district level has to be negotiated and debated, with the local authority as lead facilitator, enabler and catalyst.

This in reality will be a process rather than a fixed blueprint, where each of the policy options can be researched and negotiated in the short, medium and longer term. A typical strategic programme will contain both ‘demand side’ and ‘supply side’ components: both ‘physical’ actions and ‘human’ actions: and will need both technical and economic resources. The likely shape of a strategic programme can be charted out on the supply chain basis, showing the likely actions at each stage for now, soon and later (*Fig 11.3*).

We put the case that the WAG and all its partners should take forward this process, with a multi-level programme of evidence gathering, policy development, consultation and capacity building.

³⁰ DEFRA, 2007

Strategic business planning

	<i>sources</i>	<i>technology</i>	<i>infrastructure</i>	<i>demand</i>	<i>lifestyle</i>	<i>environment</i>
NOW	Survey & audit	Pollution abatement	management systems	survey & audit	exploration & vision	survey & audit
SOON	Shift to local & low-impact	upgrade technology	coordination	demand management	networks & partnerships	Restoration
LATER	Re-think supply chains	new technology	total integration	total eco-efficiency	new values & lifestyles	integrated management

Fig 11.3: Strategic business planning

The next steps are to set out a short term strategy for the next 4-5 years, aiming to show positive results with maximum leverage. This would include priority actions in each sector, such as detailed in the ‘key sectors’ outlines:

- Food: local & organic catering in all public institutions;
- Built environment: pilot programme for housing energy upgrading; possible funding through S106 agreements (or Planning Gain Supplement, as and when this is implemented).
- Transport: green travel management for all public organizations;
- Products: promote ‘free-cycle’ hubs and networks;
- Services: eco-tourism scheme & ethical finance programme;
- Public services: green procurement, and public sector carbon trading scheme;
- Energy: promote ‘transition towns’ efficiency campaign in urban neighbourhoods;
- Waste: set up ‘bag free’ towns & retail parks;

To achieve such a menu also requires horizontal measures:

- a process of **capacity building** for the public sector, in order to build up financial and human resources to enable and take forward the above;
- A process of **evidence building**, including monitoring and appraisal on the supply side, demand side, infrastructure and spatial development policy options;

- A process of *policy innovation*, including research, development and pilot schemes as above;

Such policy innovation would target a series of policy options for development in the first 3-5 years of the programme. These could include, for example:

- New forms of local investment, e.g. business improvement taxes;
- Potential for local carbon trading & incentives schemes;
- Partnerships with utility companies for ‘nega-watt’ (i.e. measured in demand reduction) efficiency investment;
- Accelerate the use of IT as a catalyst for sustainable trading, supply chain logistics, policy appraisal and public participation.

11.3.2 Summary of economic policy agendas

These recommendations summarize the ‘10 principles’ of a One Planet Economy, as outlined for each of the key sectors.

- *Ecological budgeting*, - ensure at least 3.5% per year reduction in climate emissions, ecological footprint and total resource use, across all policies and programmes.
- *Fiscal policy and stewardship* – new forms of levies, permits, procurement and re-investment, to promote ‘market transformation’ in key sectors.
- *Investment and partnership* – promote longer term private finance and equity partnerships, to promote ‘market transformation’ in key sectors.
- *Trade and development* – ensure through procurement and investment that all goods and products are from sustainable & ethical sources.
- *Integrated supply chain* – promote corporate social responsibility in all business, supply chains and product life cycles.
- *Infrastructure and assets*: - strategic ‘integrated asset management’ for all stocks of buildings, vehicles, plant and other fixed assets.
- *Consumer and social enterprise*: - promote sustainable consumption on the demand side, enabled by communities, networks, non-profit and other social / community markets.
- *Stakeholding and labour*: ensure that the wider community of employees and other stakeholders are engaged and mobilized.
- *Stabilization and equity*: ensure that local and regional economies are resilient and empowered to realize their own potential.
- *Eco-systems integration*: facilitate new forms of market for environmental, social and economic assets.

11.3.3 Next steps – ‘Action Foresight’ programme

Each of the above is a practical action agenda, and together they form part of a bigger picture. The question is how to mobilize and implement this, given the wide range of stakeholders, the many uncertainties, and the many barriers to progress? One approach is the Foresight process, much

used in regional development and technology innovation, in the UK, EU and other OECD countries.³¹

We recommend that a strategic action programme, is mobilized, perhaps on the model of an ‘Action Foresight programme’ (this title is provisional). This should focus not only on futures thinking, but also on urgent practical actions. This aims to accelerate positive thinking and ‘joined up’ policy through catalyst actions. This could work in 4 parallel strands, focusing on key sectors in a rolling programme, building on current innovation programmes such as the ‘Technium’ and similar initiatives:³²

- Short term action prioritization and mobilization, with stakeholder partnerships and actor-networks:
- Longer term trends and opportunities: horizon scanning and trend monitoring on annual basis: policy options analysis and modelling: futures workshops for SWOT analysis:
- Networking & capacity building: stakeholder forums on a quarterly basis for key sectors: online library of opportunities & contacts.
- Strategic planning: rolling programme of One Planet transformation strategies in key sectors, which then link into the mainstream economic & spatial planning process:

The outcomes of such a 3 year programme could include:

- New forms of local investment, e.g. business improvement taxes;
- Potential for local carbon trading & incentives schemes;
- Partnerships with utility companies for ‘nega-watt’ efficiency investment;
- Partnerships with infrastructure providers for demand side management
- Accelerate the use of IT as a catalyst for enterprise and decision making;
- Longer term strategic planning and an evidence base for each of the above.

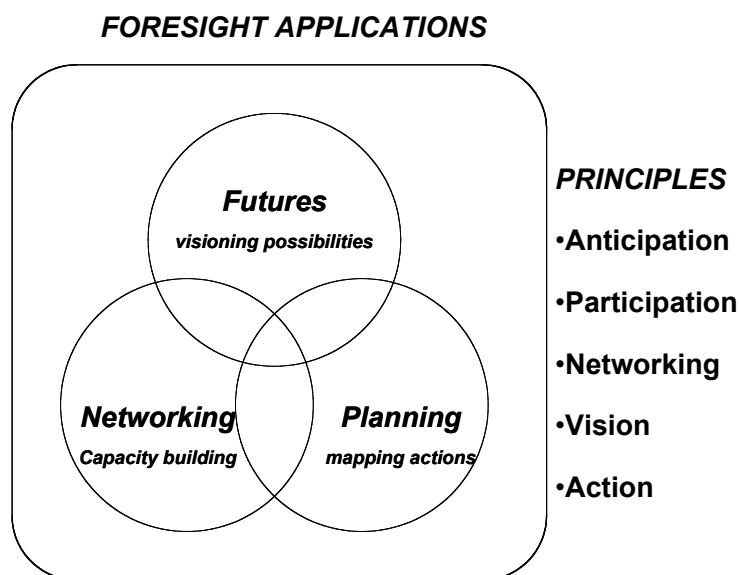


Fig 11.3 Foresight programme, scope and principles

³¹ PREST 2002:

³² Technium is a network of business and high technology clusters around Wales:
<http://new.wales.gov.uk/topics/businessandconomy/help/innovation/technium>

The resource implications of a Foresight programme depend on the number of sectors covered, the depth of stakeholder engagement, the degree of technical resources provided, the in-kind contributions of partners, the length of programme, and other factors, all to be discussed. From previous experience of Regional Foresight, it is possible to run an effective programme which makes significant contributions, with an annual budget range in the region of £500k, which can be spread among a range of partners.

It is also important that such funding requirements are set in the context of a ‘triple bottom line’ cost benefit balance, which includes social, environmental and economic factors.

11.3.4 Scope of an Action Foresight programme

Technology Foresight is a long established technique, which can work at technology, firm level, sector level, or at the national policy level, as in the long running programme of DIUS (the former DTI) <http://www.foresight.gov.uk/>. Regional Foresight is a more recent technique focused on regional economic development, with training and centres of excellence around the EU:³³ see <http://www.innovating-regions.org/mlp/>.

A specific ‘Sustainability Foresight’ programme has been running in collaboration with the German utility sector, which focuses on the transformation agenda. This follows on in many ways from the many ventures in Local Agenda 21 and Environment Forums around the UK and EU, but is more focused on major structural changes in larger organizations and infrastructure systems. For One Planet Wales and similar ventures, the following parallel strands would be recommended, with an initial programme of between 3-5 ‘key sectors’:

a) Short term actions

- immediate horizon scan, risk assessment and opportunity prioritization;
- in selected initiatives, mobilization of key partners and resources;
- short term implementation programme with milestones and deliverables.

b) Future studies

- Visioning, agenda setting and goal setting
- Trend and horizon scanning analysis, economy wide and society-wide
- Key sectors: trend analysis, risks / opportunity assessment
- Key sectors: strategic transformation agendas

c) Networking & capacity building

- User forums and networks, with a coverage across business, policy, civic society, consumers and citizens.
- Capacity building, training, professional development etc, for key sectors and programmes.

³³ PREST et al 2002

- Evidence building, in the form of virtual libraries and databases, monitoring and targeting, benchmarking and evaluation:

d) Strategic planning:

- Economy wide measures – trade, investment, regulation, fiscal policy, infrastructure
- Key sectors: general transformation strategies, actors and factors
- Action planning for key sectors in the shorter term:
- Strategic planning for key sectors in the medium and longer term:
- Monitoring, assessment and evaluation of outcomes, ex-ante and ex-post.

All this is clearly very ambitious. If it was not, it would fall short of the challenge of the One Planet Wales agenda. To set this in motion would require, in the first instance from WAG:

- Political leadership;
- Officer dedication and capacity building;
- Commitment and enthusiasm from key stakeholders;
- Positive thinking from the public and civic society.

11.4 CONCLUSIONS

The overall conclusion of this report is the challenge in moving towards a One Planet Wales.

We take the measures of this as climate emissions and ecological footprint: we take the target as the 4-fold increase in resource efficiency needed, to live on our share of the resources of One Planet by 2050.

This challenge raises huge questions on *who* is responsible, *how* it can be achieved, *what* are the actions required, and *how much* are the costs and benefits.

It is clear that in the face of unprecedented threats to global stability and security, Wales should follow through its aspirations to be a leader in sustainable development.

This involves a far-reaching programme of ‘transformation’ in key sectors, which need the support of all stakeholders in the public, private and community sectors. It particularly involves the Wales Assembly Government in the role of visionary leadership.

The next steps are to mobilize with urgency a rolling programme of capacity building and strategic planning, in parallel with short term priority actions. This is recommended in the form of an Action Foresight programme.

We hope that Wales can live up to this challenge.

12 Appendix

11.5 EXAMPLE CONSULTATION

The questions on the template below cover topical issues for each of the key sectors: i.e. food & farming: built environment: transport: goods & products: commercial services: public services: energy & emissions: resources & waste. They are generally topical to discuss and challenging to answer: so they open the door to the initial stages of a Foresight programme.

Consultation: One Planet Wales		
1) What is your estimate of the most probable trend in resource use in your sector, by 2020 and/or 2050?	<i>(e.g. rapid rise: some increase: no change: reduction: rapid fall)</i>	
2) What is the likelihood of achieving a Factor 4 resource efficiency in your sector, by 2020 or 2050?	<i>(e.g. very strong, probable, possible, unlikely, impossible)</i>	
3) What are the main priorities for action in achieving a Factor 4 efficiency in your sector?	<i>(e.g. new technology: tax & spend policy: infrastructure: behaviour change: regulation & planning, etc).</i>	
4) What are the most significant barriers and challenges to achieving a Factor 4 efficiency in your sector?	<i>(e.g. too expensive, too risky, consumer resistance etc).</i>	
5) If there is a realistic chance of achieving a Factor 4 efficiency, who has the main responsibility for making this happen?	<i>(e.g. government, local authorities, businesses, retailers, consumers, media, new technology).</i>	
6) If government needs to take a lead , what are the most important actions they should take?	<i>(e.g. taxes, subsidies, investment, procurement, regulations, infrastructure: local, regional or national?)</i>	
7) If business needs to take a lead , what are the most important actions they should take?	<i>(e.g. new technology, pollution control, longer product life, higher efficiency, changes to retail etc?)</i>	
8) If consumers and retailers are involved, how can current trends of growing material consumption be altered?	<i>(e.g. ethical trading, health scares, education & marketing, media features, community action, spiritual change?).</i>	
9) If international trade is significant in your sector, what are the most important changes which are needed?	<i>(e.g. trade liberalization, ethical trading, economic partnerships, overseas investment, tariffs & quotas?)</i>	
10) Are there any other issues which are important to the question of achieving / not achieving a Factor 4 efficiency in your sector, by 2020 and/or 2050?		

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11.7 Abbreviations

BATNEEC	‘best available technology not entailing excessive cost’
BAU	‘business as usual’ scenarios
BPEO	‘best practicable environmental option’
CAP	Common Agricultural Policy
CE	Cambridge Econometrics
CCL	Climate Change Levy
CCP	Climate Change Programme
CCW	Countryside Council for Wales
COICOP	national database of household expenditure
CSR	corporate social responsibility
CURE	Centre for Urban & Regional Ecology
DA	devolved administration, i.e. Wales, Scotland, Northern Ireland
DBFO	design, build, finance & operate scheme
DCLG	Department of Communities & Local Government
DEFRA	Department of Environment, Food and Rural Affairs
DFT	Department for Transport

DPSIR	‘driving forces, pressures, state, impact, response’ framework for indicators
DTI	Department of Trade and Industry
EA	Environment Agency
EEA	European Environment Agency
EFTA	European Free Trade Area
EGRM	Expert Group on Resource Management
ESCO	energy services company
ETS	Emissions Trading Scheme
EU	European Union
F-4	factor four reduction scenario
GDP	Gross Domestic Product
IA	integrated assessment
ICT	information & communications technology
IPCC	Inter-Governmental Panel on the Scientific Assessment of Climate Change
IPPC	‘integrated pollution prevention and control’
ISEW	‘Index of Sustainable Economic Welfare’
LCA	life-cycle analysis of environmental impacts
MBI	market-based instrument
NAW	National Assembly of Wales
NE	Natural England
NHS	National Health Service
ODPM	Office of the Deputy Prime Minister
ONS	Office of National Statistics
OPEN	One Planet Economy Network
OST	Office of Science & Technology
PBR	Pre Budget Report
PFI	Private Finance Initiative
RDA	Regional Development Agency
REEIO	Regional Economy-Environment Input-Output (software model)
REAP	Resource & Energy Analysis Programme (software model)
RSS	Regional Spatial Strategy
RSDF	Regional Sustainable Development Framework
SA	sustainability appraisal
SCP	Sustainable Consumption & Production
SCPnet	‘Sustainable Consumption & Production network’
SD	‘sustainable development’ scenario
SEA	strategic environmental assessment
SEI	Stockholm Environment Institute
WAG	Welsh Assembly Government
WFD	EU Water Framework Directive
WTO	World Trade Organization
WDA	Welsh Development Agency