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North East

Counting consumption

CO_2 emissions, material flows and Ecological Footprint of the North East

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Biffaward Programme on Sustainable Resource Use

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Contents

Foreword

We all make choices about how we live our lives. Ecological Footprinting shows us the impacts of these choices so that each one of us can take a more responsible approach to our activities and plans in the future.

I am delighted to introduce this first Ecological Footprint for the North East. This innovative project is taking an important step in helping everyone in the region understand the impact each of us has on both global resources and on the environment around us. The North East is one of two regions being piloted for this work as part of a UK-wide programme to provide accessible, well researched information about the flow of resources through the national economy. This has been led by WWF-UK in conjunction with SEI and regional partners.

The findings of the Ecological Footprint show that we should each need no more than the equivalent of two football pitches to provide the resources we need to live without harming the environment. This is known as our fair Earth share. However, here in the North East, as elsewhere in the UK, people use three times this amount – which means we would need to reduce our Ecological Footprint by 62 per cent in order to live within our fair Earth share.

If everyone in the world lived like this, we would need three planets to support us!

This project has provided an opportunity to examine the Ecological Footprint of different activities in the region, and it enables us to commit to reducing this impact over time. Individuals, communities, regional and local authorities will all need to take action if we are going to reduce our negative impact on the world and live a more sustainable way of life. But it can be done!

We can use what we have more efficiently. The challenge now for all of us in the region is to seize the initiative and take individual responsibility for our collective global impacts and work towards reducing our Ecological Footprint. I hope we can use this document to work together and achieve this goal.

Phil Hughes

Chair of Sustaine, the North East Partnership for Sustainable Development

Executive summary

Ecological Budget North East provides a statistical and scientific basis upon which to develop sustainable consumption and production policies and proposals for the North East.

It shows the global impact of consumption activities in the North East from the food people buy to the energy they use in the home. This includes resource flows and carbon dioxide (CO_2) emissions associated with the use, manufacture and transporting of the goods and services people consume.

The three headline indicators used in this report are CO_2 emissions, material flow and the Ecological Footprint. These can be used together or individually to explore the impact of regional policies and strategies on the environment.

The baseline results

The baseline results show that:

- CO_2 emissions from consumption are 32 per cent lower than emissions from production in the North East (this is the largest difference for any region in the UK);
- the North East's Ecological Footprint is 5.31 gha/cap[1]. This is the third lowest in the UK – but even so, humanity would still need three planets to support itself if every region in the world had the same Footprint as the North East;
- the North East has the highest food Footprint of any region in the UK; and
- the lowest per capita household consumption in the UK.

This report sets out future scenarios for the North East, based on existing and proposed polices. The scenarios pay particular attention to the CO_2 emissions associated with energy, housing and transport policies and have been developed through the Resource and Energy Analysis Program (REAP) software tool.

The scenarios

The scenarios show that:

- a switch to renewable electricity alone will not bring about a reduction in CO_2 emissions from energy. A 1 per cent per annum increase in electricity demand could raise CO_2 emissions by 11 per cent, even if renewable energy targets for the region are met. The North East has a range of policy levers available to reduce CO_2 emissions that it should use together.
- transport policies need to tackle car use. Meeting increased demand by expanding transport infrastructure doesn't solve the problem in the long term. Demand management and better efficiency of current infrastructure is required.

This report demonstrates how policy decisions affect the environment around us. It shows the importance of developing a strong statistical evidence base in the region and provides an overview of how this can be done.

By 2020, the North East could be well on the way to embracing a One Planet Economy – an economic system of production and consumption which respects all environmental limits while being financially and socially sustainable. Alternatively, the region could take a standard development path and accept the environmental impacts that come with this.

With its low population, history of green initiatives and strong levels of social and economic cohesion, the North East can choose a development path that creates a truly competitive, inclusive and sustainable region. Building on the evidence in this report is a good place to start.

1 A gha (global hectare) is an area equivalent to a normal hectare but adjusted for average global productivity. For more information go to: www.wwflearning.org.uk/ecobudget/about/faq/global-hectare,503,AR.html

1 Learning to count:

Ecological Budget in the North East

If everyone on Earth had the same Ecological Footprint as the average person in the North East of England, humanity would need the resources of three planets to support itself. Many policy-makers, businesses and citizens are aware of this, and share an interest in moving towards a more sustainable use of the planet's resources.

Ecological Budget North East shows in positive and measurable terms how this is possible. It provides an overview of existing resource use in the North East and predicts the impacts of regional activity in the future.

Sustainable development and quality of life

Sustainable development in the North East has to be achieved in the context of its unique social and economic challenges: industrial transition, high levels of socio-economic deprivation, urban-rural migration, and house market restructuring.

The North East is not characterised by rapid economic growth, so measures to reduce its Ecological Footprint have to be developed with this in mind. Some low-Footprint patterns – such as those brought about by extreme poverty – are as unsustainable socially and economically as unfettered economic growth is unsustainable environmentally.

Sustainable policy-making requires a delicate balance between reducing the region's impact on the global environment, providing a high quality of life, ensuring vital infrastructure is maintained, and creating a dynamic economy that attracts people to the North East and encourages them to stay. These priorities are reflected in the vision for a better North East shared by the Regional Spatial Strategy (RSS)[1], Regional Economic Strategy (RES) and Integrated Regional Framework (IRF):

"*The North East will be a region where present and future generations have a high quality of life. It will be a vibrant, self-reliant, ambitious and outward looking region featuring a dynamic economy, a healthy environment and a distinctive culture. Everyone will have the opportunity to realise their full potential.*"

Quality of life is prominent in the vision and covers a range of important sustainable development issues including social, economic and environmental well-being. The Audit Commission has recognised that individual indicators do not always reflect these cross-cutting issues adequately, or indeed provide the "big picture"[2]. The Ecological Footprint, an aggregate indicator of environmental impact, can help provide this bigger perspective. Combined with measures of CO_2 and material flow, it is used here to present a picture of the North East's resource efficiency, global impact and overall environmental performance.

Accounting for resource use

The region's strategies set out complementary policies, proposals and initiatives to achieve the vision outlined above. The challenge is to ensure that sustainability principles and actions to reduce the region's Footprint run through each of them.

While systems are in place to measure success from a social and economic perspective, monitoring the region's development from an environmental perspective has been less consistently applied. The IRF provides a sustainability framework but has few measurable indicators for its key environmental objectives. This affects the way the RES, RSS and other initiatives accommodate environmental objectives in their plans. In order to choose a sustainable development path, accurate, standardised measures of the region's impact on nature need to be regularly used and related to policy.

The Ecological Budget UK project: A Route Map

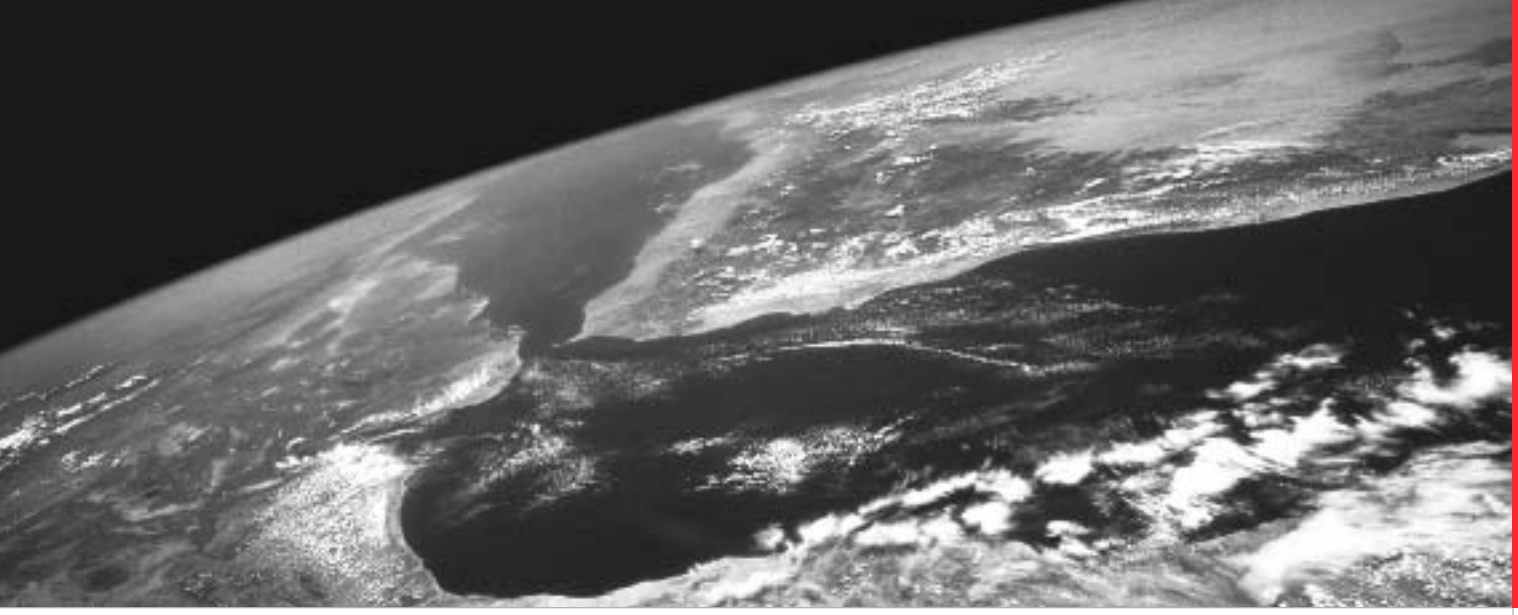
The Ecological Budget UK series of reports provides a statistical and scientific understanding of the environmental impact of different policies and strategies.

This report focuses on the North East and provides detailed comparisons with other regions and local authorities. It also shows how different social groups, industrial sectors and consumer groups use resources at regional and local levels. Alongside the UK report *Counting Consumption*[3], it provides the most comprehensive understanding yet of the UK's physical production and consumption, region by region, local authority by local authority, and of the resource flows within and between regions, devolved administrations and the rest of the world.

Ecological Budget has four main outputs:

- *Counting Consumption* is the baseline report that summarises national and regional results. It was published in March 2006 and can be accessed at www.ecologicalbudget.org.uk.
- Resource and Energy Analysis Program (REAP) is the project's software application. It enables interactive access to Ecological Budget's resource accounting data and can assess future scenarios and policy options in terms of sustainability. More about REAP can be found at www.sei.se/reap
- *Regional reports*. The North East report is accompanied by regional reports for the West Midlands.
- *One Planet Economy* is a prospectus for continuing research on how to steer the UK towards a One Planet Economy. It will be published later in 2006.

The Ecological Budget UK project was funded by Biffaward and regional partners and jointly fulfilled by WWF-UK, the Stockholm Environment Institute and the Centre of Urban and Regional Ecology at Manchester University.



GETTY IMAGES

"Counting consumption" – a baseline report
UK and regional carbon, material flow & Ecological Footprint in consumpion and production

"Stategy for a One Planet Economy" – a prospectus
Building the evidence base for moving towards a One Planet Economy in consumption & production

REAP toolkit (Resource and Energy Analysis Program)
Software for modelling & assessment of consumption & production

Regional report: North East

Local area Footprint database

Regional report: West Midlands

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Technical reports
1 Outline & methods
2 Data structure
3 Input-output method
4 UK/regional results
5 Scenario model
6 REAP user manual
7 REAP applications
8 Strategy for One Planet Economy

"Sustainable communities in the West Midlands"

Resource and Energy Analysis Program (REAP)

The results in the report have been produced through the Stockholm Environment Institute's Resource and Energy Analysis Program (REAP), a software tool that calculates the global impact of an area's consumption activities. It creates three headline indicators – CO_2 emissions, the Ecological Footprint and material flow analysis. These indicators are region-specific, comparable, standardised, and measure the core environmental elements of sustainability. They provide the core indicators of human demand for natural resources in the North East.

All three indicators show the indirect effects of consumption along with the direct effects, both upstream and downstream, of any industrial sector or consumer product. This enables comparisons between the production side of the economy (including exports) and the consumption side (including imports). Since sustainability involves consumption as well as production, a full environmental trade balance such as this is essential.

REAP can be used to model the future impacts of policy measures and interventions and create scenarios for the future (a scenario is a plausible account of future paths and conditions). When based on existing or hypothetical targets, it can suggest what policy-makers might expect from a given policy.

Scenarios are inherently uncertain, given the high number of variables possible and the interaction of different dynamics – population, economics and sub-regional trends. Even so, they can have real predictive value, and well-informed scenarios offer much more certainty than the alternative, which is to have no idea about the possible outcomes of policy. REAP has a role to play in policy development and can be used in Sustainability Appraisals and Strategic Environmental Assessments (SEAs).

In this report, REAP has calculated scenarios covering the next 20 years. The resulting projections have been designed to align with targets in the RSS and other strategies. Projections are possible up to 2050, enabling policy-makers to plan for the long-term consequences of their work.

Reducing impacts on global communities

Being able to account for consumption and production side effects has special relevence to the North East, which is historically a production-oriented economy. As it undergoes industrial transition, conventional indicators will show a reduction in the region's environmental impact. This is because the environmental burden of production activities are shifted to other countries or regions even as consumption levels in the region are maintained.

REAP recognises the continued consumption impacts of the North East when production impacts are shifted to other economies. It does this by tracking trade, overall resource consumption and resource flows from other regions and countries.

When the effects of high consumption are exported elsewhere, they can remain invisible to everyday consumers. REAP provides a way of making these impacts visable, and of monitoring the North East's progress on IRF objective 17: to reduce impacts on global communities.

1 At the time of writing, the Regional Spatial Strategy is undergoing an examination in public. All references to the RSS in this report are therefore based on the draft version.
2 See Local quality of life indicators – supporting local communities to become sustainable. Audit Commission, 2005
3 Barrett, J., Ravetz, J., Minx, J. & Wiedmann, T. *Counting Consumption: CO_2 emissions, material flow and Ecological Footprint of the UK by region and devolved county*, WWF/SEI/CURE/Biffaward, 2006

"The North East will be a region where present and future generations have a high quality of life. It will be a vibrant, self-reliant, ambitious and outward looking region featuring a dynamic economy, a healthy environment and a distinctive culture."

Towards a One Planet Economy

A sustainable economy is a One Planet Economy – an economic system of production and consumption which respects all environmental limits while being financially and socially sustainable. For the North East – as indeed for the rest of the UK – to achieve this would require a 75 per cent reduction in resource flows and the Ecological Footprint, commonly known as a "Factor Four" reduction.

This is a hugely challenging target – but it is essential to long-term sustainability even if achieved at the distant horizon of 2050. The UK government has provided an overview of the challenge ahead and includes a chapter on the One Planet Economy in its 2005 UK Sustainable Development Strategy.

One of the objectives of this report is to demonstrate what a One Planet Economy might mean in practice. Inefficient use of resources is a drag on the economy and on business and can hamper competitiveness. But solutions that deliver products and services with lower environmental impacts across their lifecycle can contribute to a productive economy and drive sustainable, inclusive growth.

The creation of a sustainable, world-class economy is one of the core objectives of the North East's RES and is in line with the EU Gothenburg and Lisbon agendas. The RES describes how the region can deliver its aims, but is also strongly aware of the opportunities and risks involved.

One possible risk is economic growth without environmental safeguards. This is highlighted in the regional Sustainability Appraisal for the North East RSS, but the risk is by no means inevitable. With its low population, history of green initiatives and strong levels of social and economic cohesion, the North East can choose a development path that creates a truly competitive and sustainable region.

The UK space

The UK comprises nine English regions including London, and the three devolved administrations of Northern Ireland, Scotland and Wales. Each has a different mix of political and economic power, and each is at the upper level of a local government structure of rural districts, counties, metropolitan boroughs and unitary authorities.

In terms of collecting consistent resource use data for policy-makers, dividing the UK into regions and devolved administrations is a good starting point. In practical and functional terms, however, other classifications may be more useful, and a debate is taking place about how best to organise and plan the "UK space".

This report focuses on the North East region and its component local authorities, but it is equally possible to place a focus on city regions. These comprise conurbations and their hinterlands and can be seen as more natural functional units than those split by regional or local boundaries. In the North East, Tyne and Wear and the Tees Valley are examples.

The Core Cities group has argued the case for the eight largest provincial centres gaining greater recognition as the gateways and generators of activity for most of England[3]. Other spatial definitions include the "travel to work" areas – based on 75 per cent self-containment of labour markets – or "functional urban regions"[4]. The Northern Way provides an example of a framework for multi-regional governance, as does the ODPM's Sustainable Communities plan.

The "bioregion" concept applies clearly to more remote territories, where there is often a direct fit between river catchments, natural resources and landscape types. In the more urbanised parts of England, bioregions are often obscured and may differ from social or economic units. New agendas for rural enterprise and landscape management, such as community forests and local food markets, mean bioregions may emerge once more.

Ecological Budget UK data provides a platform for further research on each of these units, using the detailed breakdowns of local authorities, supply chains and social group consumption choices. For the moment we focus on the regions and devolved administrations as the main units.

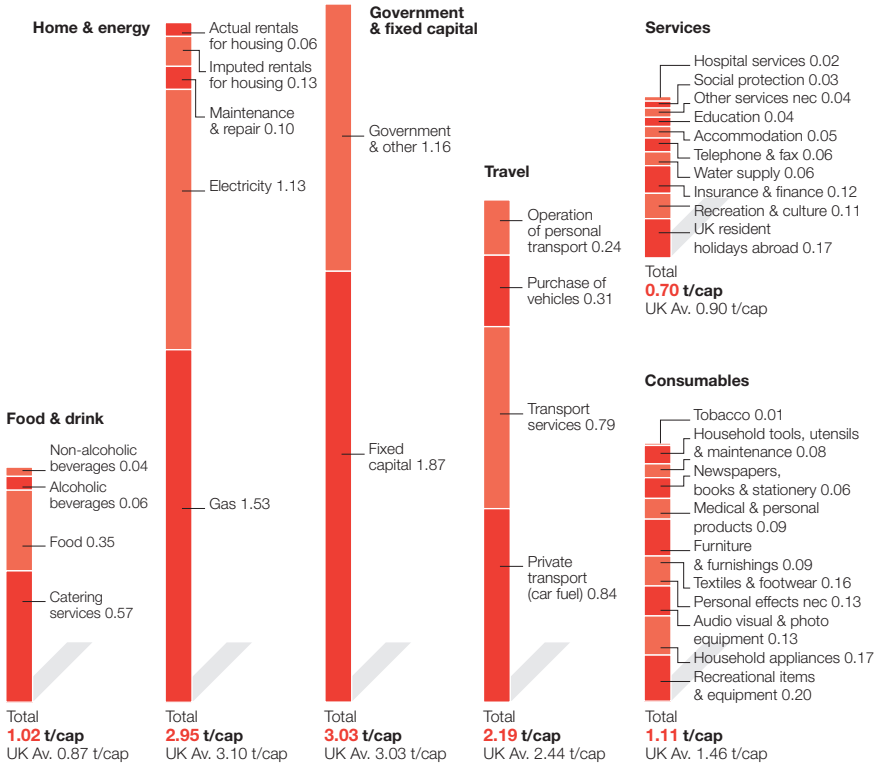
3 Office of the Deputy Prime Minister, 2003, *The Strategic Environmental Assessment Directive: Guidance for Planning Authorities on applying European Directive 2001/42/EC*, London, ODPM.

4 ERN (English Regions Network), with RDA Planning Leads Group, Office of the Deputy Prime Minister, Department for Transport, 2005, *Regional Futures: England's Regions in 2030: Final Report.*

GARY DOAK / WWF-UK

2 Baseline results:

Sustainability of the North East



CO_2 emissions

Territorial emissions from production
15.83 t/cap
UK Av. 10.76 t/cap

Emissions from consumption
11.01 t/cap
UK Av. 11.81 t/cap

Fig 1 **CO_2 emissions from consumption in the North East (t/cap)**

CO_2 emissions

The North East has the largest variation between "producer responsibility" and "consumer responsibility" CO_2 emissions of any UK region or devolved administration – a difference of 32 per cent. Emissions from regional production are close to 16 tonnes per person (tonnes per capita or t/cap) – among the highest in the UK – while emissions from consumption are only 11.01 t/cap. This is the lowest in the UK, 7 per cent lower than the regional average and 18 per cent lower than the South East (the region with the highest emissions from consumption).

The North East's role as a big CO_2 producer – primarily from generating electricity – gives it considerable influence over total emissions produced in the UK. Improved production efficiency could help offset high consumption elsewhere, whereas less efficient production will magnify the effects of consumption in other regions.

Why CO_2?

CO_2 is used as a headline indicator in this report. Although its effect is not as intense per tonne emitted as some other greenhouse gases, CO_2 is the most significant of any greenhouse gas in terms of total tonnes emitted and in terms of total effect on the global climate.

REAP can be used to calculate all greenhouse gases associated with consumption and production, including methane and nitrous oxide.

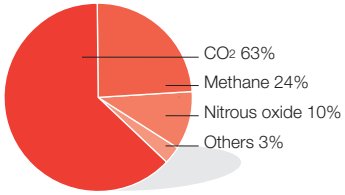


Fig 2 **The relative contribution to global warming over the next 100 years of current emissions of greenhouse gases**

Source: Climate Change Programme Review, Defra, 2006

CO_2 emissions from consumption and from production

Most governments and administrations in the UK measure the CO_2 emitted from production and direct fuel processes within a given region – an approach called producer, or territorial, responsibility. REAP offers an additional measure: CO_2 emissions from consumption. This accounts for all the upstream CO_2 emitted in the production of a consumed product, wherever it was produced, and assigns responsibility to the consumer. The CO_2 impacts of a television, a meal at a restaurant, or a GWh of electricity, are assigned to whichever region consumed that item, not whichever region produced it. This reflects how a region's consumption patterns contribute to global CO_2 emissions in a way that the conventional method does not. For a fuller discussion of this methodology, see the Ecological Budget UK report *Counting Consumption* at www.ecologicalbudget.org.uk

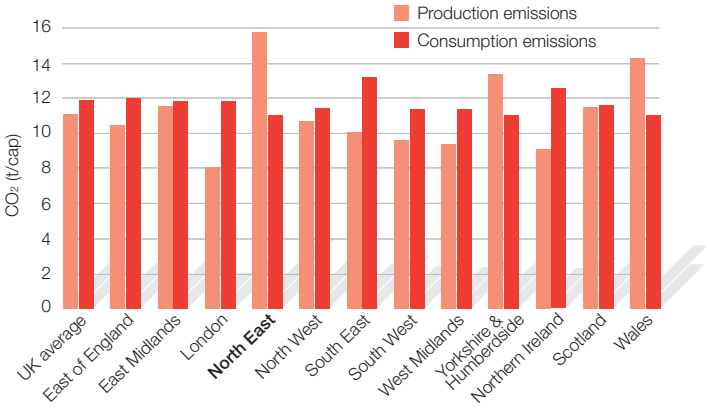


Fig 3 **Regional CO_2 emissions from consumption and production (t/cap)**

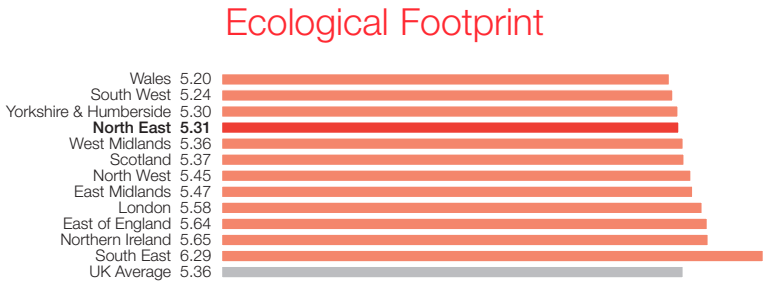


Fig 4 **The North East's Ecological Footprint (gha/cap) compared with other UK regions**

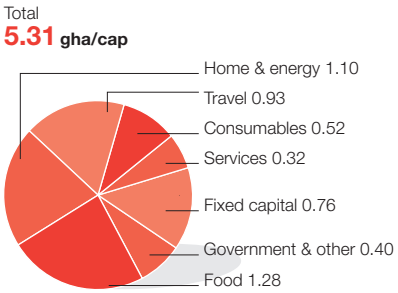


Fig 5 **The North East's Ecological Footprint (gha/cap)**

Ecological Footprint

The North East's total Ecological Footprint is 5.31 gha/cap, the third lowest in the UK. With the exception of food, all the major sectors that make up the region's Footprint have a below average Footprint.

The consumables and durables Footprint is 0.52 gha/cap – 20 per cent lower than the UK average (consumable and durables is a broad category which includes clothing, electrical items, home furnishings, newspapers and recreational equipment). Along with food, consumables and durables are responsible for most household waste. The most effective way of limiting waste from consumables is through waste minimisation initiatives. Recycling on its own is less effective in the long term, as it doesn't reduce the total flow of material through the economy. The North East's low consumables and durables Footprint masks the fact that it recycles a smaller percentage of household waste than any other region[1].

Services have a Footprint of 0.32 gha/cap, which is 22 per cent lower than the UK average. This reflects the region's status as a "producer economy". As the region undergoes industrial transition and the service sector grows, this part of the Footprint is expected to rise.

The North East's home and energy Footprint (1.10 gha/cap) is slightly lower than the UK average of 1.16 gha/cap. The transport Footprint is influenced by he North East's low levels of car ownership. Transport, energy and housing are discussed in detail later.

Food accounts for the largest proportion of the North East's Ecological Footprint at 1.28 gha/cap. This is the highest per capita food Footprint for any UK region – around 12 per cent higher than the UK average – and is due primarily to the North East's high use of catering services. Food and beverages consumed in the home are in line with the UK average.

The North East consumed 1.45m tonnes of food in 2001, of which some 20 per cent was disposed of as waste. Food packaging generated a further 240,000 tonnes of waste. It is difficult to see how such high levels are acceptable in a society where one in seven people over 65 is at serious risk of malnourishment[2] and each adult in the UK wastes food to the value of £420 each year[3].

Food waste is just one facet of the inefficiencies in the economy which can be tackled through innovative schemes such as FareShare.

1 There continues to be significant variations in household recycling rates between different regions. The highest recycling region in 2004/05 was the East (29.4 per cent) with the South West, East Midlands and South East all showing rates of 26 to 27 per cent. The North East had the lowest rate of 15.3 per cent – see www.defra.gov.uk/news/2006/060324a.htm
2 www.fareshare.org.uk/pdf/FS_info.pdf
3 News.bbc.co.uk/1/hi/uk/4443111.stm

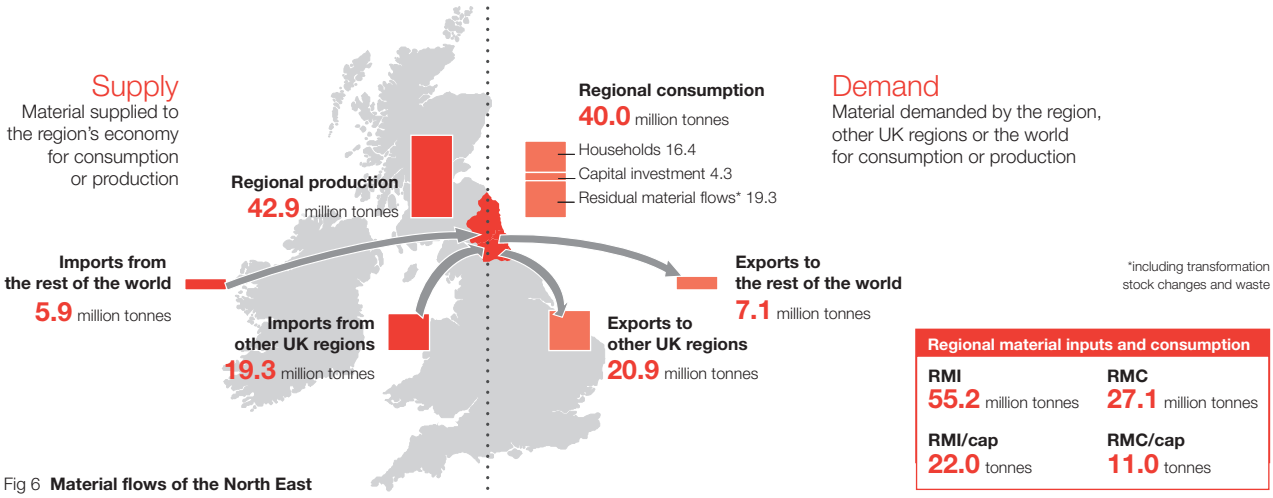


Fig 6 **Material flows of the North East**

FareShare – delivering surplus food to people in need

FareShare is a unique scheme that redistributes surplus food from the food industry to homeless and vulnerable people in the community. An independent charity, it works in partnership with companies such as Sainsbury's and Marks & Spencer to develop systems that ensure good food isn't wasted and sent to landfill.

Food is collected, sorted and delivered by more than 250 volunteers and employment trainees. The scheme encourages homeless and vulnerable people to come into hostels, day centres and night shelters where they can be directed to appropriate support.
The money saved is used by local charities to provide other services such as housing advice, training and medical support, which in turn helps people start to rebuild their lives.

FareShare operates seven schemes in partnership with local charities in Brighton & Hove, Dundee, Edinburgh and Lothians, London, Manchester, Southampton and South Yorkshire (Barnsley). It services 34 towns and cities, and each year contributes food for 3.3 million meals to 250 local projects – helping 12,000 vulnerable people each day.

Last year, FareShare diverted some 2,000 tonnes of quality surplus fresh food from landfill. This is just the tip of the waste mountain generated by the UK every year and the charity now aims to expand its service across the country. Encouraging the growth of schemes such as FareShare is one way of meeting the government's commitment to reduce the volume of biodegradable waste, including food, from going to landfill by 60 per cent by 2016.

Source: www.fareshare.org.uk/pdf/FS_info.pdf

Material flow analysis

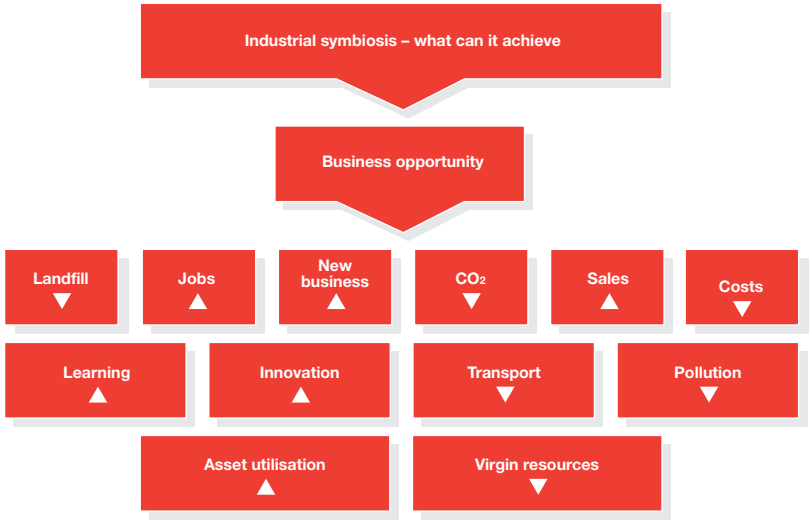
Historical environmental initiatives have focused on containing concentrated toxins and pollutants, but contemporary environmental impacts are a result of the sheer volume of resources required by the economy. Material flow analysis (MFA) catalogues the tonnages of material resources needed to supply every form of consumption and production in the UK, including the North East. MFA identifies resource-intensive production and consumption sectors for targeting. It also allows policy-makers to measure in material terms the effects of increased efficiency and lower consumption.

Material flow

Because the North East has high material production and low material consumption, many of its imported materials are used in production and then re-exported. The local economy requires 36m tonnes of materials to function, of which a considerable proportion is imported from other UK regions (19m tonnes) and a lesser proportion from the rest of the world (6m tonnes). Most of these resources (28m tonnes) are then exported to the rest of the world.

The North East has the lowest per capita household consumption in the UK at 6.5 t/cap. Those with the highest rates are the South East (9 t/cap) and London (8.5 t/cap). Since household consumption is the biggest driver of material production, even small variations in measurement have large ripple effects on the production chain and total resource use. The North East also has the lowest material flows into capital investment (1.72 t/cap) in the UK. In comparison, the national average is 2.31 t/cap. London inputs 3.13 t/cap of material flows into capital investment, the highest rate in the country.

As a high material producing region it makes sound environmental and economic sense for the North East to reduce its waste or find alternative uses and new markets for it. 'Waste to Resources' is the sustainable resource programme for the North East and provides businesses with coordinated support and advice to help them benefit from this approach. The programme focuses on resource minimisation and the use of waste as a resource. The National Industrial Symbiosis Programme provides one strand of support provided through this programme. Other organisations who contribute to the programme include WRAP, the Environment Agency, Envirowise, the Carbon Trust and Midas.



The National Industrial Symbiosis Programme North East

One way of improving the resource efficiency of the North East is to develop greater synergy between companies. Between January 2003 and December 2004 the Tees Valley Industrial Symbiosis Programme engaged with more than 90 companies and developed synergies between them to divert almost 150,000 tonnes of waste per annum from disposal. They also created millions of pounds worth of revenue for Tees Valley businesses.

Now, as part of the world's first truly National Industrial Symbiosis Programme, the aim is to be bigger and better. NISP-NE aims to deliver a reduction in waste sent to landfill and CO_2 emissions alongside the creation of jobs, new businesses and improved economic conditions for the region's industry. And as one company's waste is another's raw material or resource, this is a real opportunity for the North East to be at the cutting edge of resource efficiency.

Source: NISP-NE (National Industrial Symbiosis Programme – North East)

Recommendations

The North East could:

> use REAP to develop a refined set of environmental objectives and targets which have a clear purpose and can be monitored regularly. Progress towards these objectives could be measured through REAP's headline indicators – the Ecological Footprint, CO_2 emissions and material flow.

> monitor progress towards environmental objectives annually. A clear line of responsibility could be set for responding to negative trends in the indicators.

> use REAP in strategic environmental Assessments and Sustainability Appraisals to assess how the region's environmental objectives will be affected by new plans and strategies.

Applications to policy

Sustainability in the North East is monitored in a number of ways. At the national level, the UK government has published regional versions of its sustainable development indicators but doesn't provide annual regional statistics[4]. In the North East the annual State of the Region report monitors nine environmental trends alongside demographic and economic statistics. This series of reports doesn't directly link objectives or organisational responsibility.

The IRF provides a structure for sustainable development in the North East and sets 17 regional objectives, seven of which relate directly to the environment. The IRF uses a series of indicators to measure progress against the region's objectives. These provide a framework for Sustainability Appraisal in the North East but are not all easily measurable. In particular, renewable energy and household energy consumption targets are used as a proxy for CO_2 emissions.

The IRF is accompanied by a 35-point Integrated Regional Matrix – a checklist that businesses and other stakeholders can use in decision-making to help achieve the shared vision for the region. This provides a useful list of issues to take into account, but no real way of quantifying the impact of organisational decisions.

With so many indicators, objectives and targets – but with fewer ways of accurately measuring them, let alone allocating responsibility – it is difficult for decision-makers to identify the key issues or prioritise actions in the region. REAP provides a way of overcoming this by providing aggregate indicators of environmental performance and showing where decision-makers should target their efforts.

4 www.sustainable-development.gov.uk/regional/index.htm

3 Spotlight on energy

"The North East consumes less energy than the UK average, but even so produces nearly 28m tonnes of CO_2 a year."

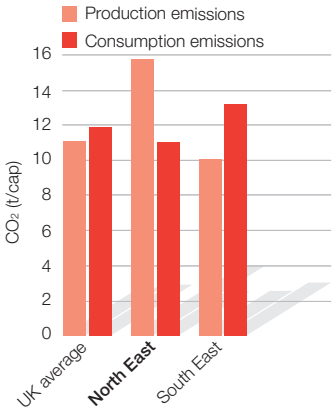


Fig 1 **Regional CO_2 emissions from consumption and production (t/cap)**

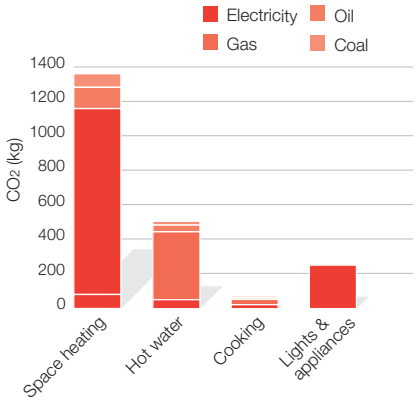


Fig 2 **CO_2 emissions from household energy consumption in the North East**

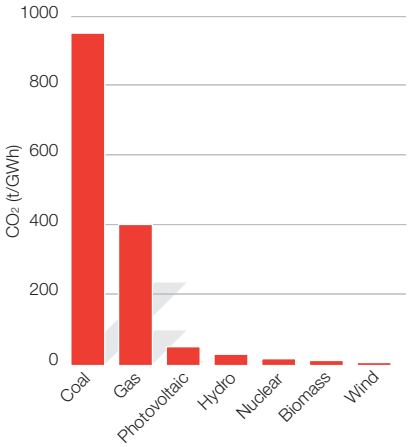


Fig 3 **The CO_2 emissions from different fuels**

Energy headlines

The North East consumes less energy than the UK average, but even so produces nearly 28m tonnes of CO_2 a year. Its emissions from energy consumption are 11 t/cap compared with a UK average of 11.8 tonnes. Emissions from production are 15.8 t/cap, the highest in the UK. This is the largest difference in consumption and production emissions of any region.

Emissions from production come from a range of sources including manufacturing, industry and electricity generation. The North East produces some 26,060GWh pa of electricity, which is an estimated 174 per cent of electricity consumption in the region[1]. This is one of the main factors behind the difference in the region's consumption and production emissions and means a large proportion of the electricity generated in the North East is consumed by neighbouring regions.

Per unit used in the UK, gas currently produces less CO_2 than electricity, but accounts for the greatest proportion of energy use in the home. In the North East, gas represents 69 per cent of all the KWh energy used in households, but accounts for only 50 per cent of CO_2 emissions from household consumption. Electricity accounts for 19 per cent of energy used by households in the North East, but 42 per cent of emissions (see Figure 2).

Most electricity in the UK comes from coal, gas or nuclear generation and the North East's three main electricity production plants – ALCAN, Hartlepool AGR and Teesside Power – run on coal, nuclear and gas respectively. In September 2004 the proportion of renewable electricity generated in the North East was about 1 per cent[2]. Wind represents the region's most significant untapped resource, the potential of which is explored in detail in the Regional Renewable Energy Strategy (RRES) for the North East.

The extent to which wind power can be developed is subject to a number of factors, including landscape character and sensitivity. The natural environment is one of the region's great assets, so different environmental priorities need to be weighed in the balance. From a climate change perspective, the advantage of wind power over other forms of electricity generation is very clear. Figure 3 shows the CO_2 emissions by fuel type based on direct emissions from electricity generation and embedded emissions from construction, transport and maintenance[3].

The publication of the RRES sends a clear message that the North East is committed to developing its renewable electricity generating capacity. As a net exporter of electricity, the move towards renewable electricity puts the region in a position to contribute to an overall reduction in the UK's CO_2 emissions. The challenge lies in meeting consumption demands in the UK that may continue to grow.

The RRES was prepared on the basis of no growth in energy consumption but recognises Department of Trade and Industry (DTI) projections of 1 per cent consumption growth per annum. It also refers to a national electricity consumption increase of 5.3 per cent between 2003 and 2004.

It is difficult to imagine a year on year increase in demand for electricity of 5.3 per cent. However, this growth rate has been included in the scenario, along with other growth rates, to demonstrate the CO_2 emissions if demand is always met by increased supply. REAP can show what could happen in different electricity consumption and production scenarios.

GRAEME PEACOCK / COLLECTIONS PHOTOLIBRARY

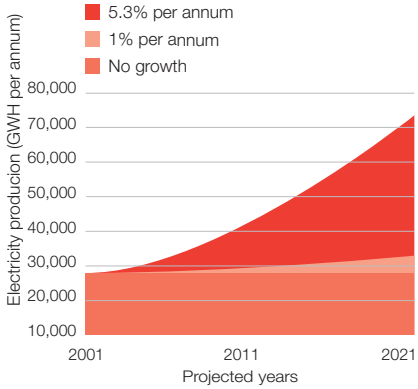


Fig 4 **Potential growth in electricity production to meet increased rates of consumption**

A nation of importers

The UK has become a net gas importer and is becoming a net oil importer. It's likely to be importing around three quarters of its primary energy (raw fuel used in production processes) by 2020.

Source: *Our Energy Challenge: Securing Clean, Affordable Energy for the Long Term*, DTI

Energy outlook – scenarios for the future

The REAP energy scenario looks at projected CO_2 emissions from electricity production. Each component scenario contains different production-based targets for renewable energy between 2001 and 2021.

> The *baseline scenario* presumes minimal expansion of existing renewable resources between 2001 (1 per cent) and 2021 (3 per cent).

> The *RRES scenario* presumes RRES renewable energy projections are met. In this scenario, 8 per cent of electricity produced is generated from renewable sources by 2011 and 10 per cent by 2021.

> In the *government scenario*, the UK targets for renewable energy are met: 10 per cent of electricity generated is renewable by 2010 (and 2011), and 20 per cent of electricity is generated by 2020 (and 2021).

> The *Factor Four scenario* shows what would be needed to achieve a 75 per cent reduction in CO_2 emissions by 2021.

Each component scenario has been run three times with a different rate of electricity consumption factored in. The first assumes no growth, in line with the RRES. The second assumes 1 per cent growth per annum or 22 per cent growth in consumption by 2021, in line with DTI projections. The third assumes a rather frightening rise in consumption of 5.3 per cent per annum, or 281 per cent by 2021.

Taking 26,060 GWh as the present regional generating capacity, Figure 4 demonstrates the increase in electricity production needed to match each rise in demand. The most extreme scenario could increase electricity production to more than 70,000 GWh per annum. The 1 per cent increase per annum would mean a 26 per cent rise from 26,000 GWh to nearly 32,000 GWh per annum.

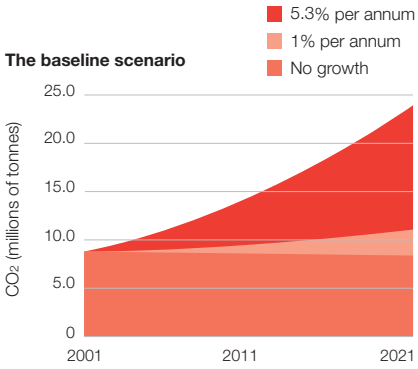
For all scenarios, CO_2 emissions from non-renewable fuels are based on the assumption that the three main power plants in the region are responsible for the following electricity outputs:

> Hartlepool (nuclear) 1,210 MW
> Teesside (gas fired) 1,875 MW
> Lynemouth (coal fired) 420 MW

Using the potential electrical output as a proxy for supply, this means that in 2001, 35 per cent of electricity produced in the region was generated by nuclear power, 52 per cent by gas power and 12 per cent by coal power. The remaining 1 per cent was generated from renewables. The assumed renewable mix for all scenarios is based on the RRES projected renewable electricity mix for 2020: 77 per cent wind, 15 per cent biomass, 4 per cent methane, 2 per cent photovoltaic and 2 per cent hydro.

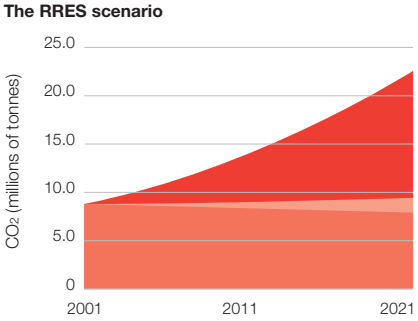
Based on these assumptions, the baseline CO_2 emissions from electricity production in 2001 amounted to 8,800,345 tonnes.

1 North East Regional Renewable Energy Strategy, North East Assembly, March 2005.
2 Ibid.
3 These figures are based on the World Energy Council publication *Comparison of Energy Systems using Life Cycle Assessment*. Load factors and net thermal efficiency are taken into account along with lifecycle carbon emissions.



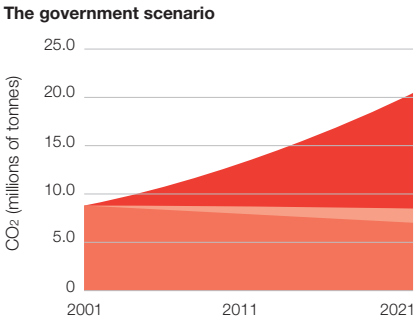
The baseline scenario

Under the baseline scenario, 3 per cent of the North East's electricity generation will come from renewable sources by 2021. If there is no growth in consumption during this period, this creates a saving in CO_2 emissions from electricity production of just under 2 per cent. A 1 per cent growth in electricity demand would cancel this out and deliver a 19 per cent increase in CO_2 emissions. A 5.3 per cent per annum growth would almost triple the emissions from electricity production.



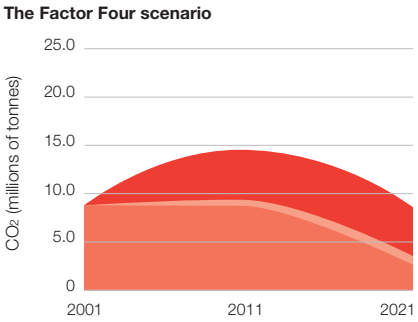
The RRES scenario

This scenario is based on the best estimated projections of renewable electricity production in the North East in the RRES. In a no demand growth scenario, this would bring about CO_2 savings from energy production of nearly 9 per cent. However, these gains are reversed once a 1 per cent growth in demand is factored in. This would bring about an 11 per cent increase in emissions by 2021.



The government scenario

The government scenario pushes the boundaries of what's possible in the North East under current renewables planning conditions. In a no-growth scenario, it should be possible to secure a reduction in CO_2 emissions from electricity production of more than 18 per cent. If the North East achieves the target of 20 per cent renewable electricity production by 2021 in a 1 per cent growth scenario, CO_2 emissions would be held at their current level. A 5.3 per cent growth scenario would more than double carbon emissions during the period.



Factor Four scenario

To secure a Factor Four (or 75 per cent reduction) in CO_2 by 2021 would require 80 per cent of electricity to be generated by renewable resources in a no-growth scenario. This is beyond what's credible or possible under current conditions. Just to stabilise CO_2 emissions when there is a 5.3 per cent increase in electricity demand would require 67 per cent of electricity generation to come from renewable sources.

Fig 5 **CO_2 emissions from projected electricity production in the North East**

"The North East's continued reliance on gas and coal, its position as a net exporter of electricity, and the untapped potential of renewables in the region demonstrate the need for renewable electricity"

Applications to policy

Energy policy continues to rise up the agenda in the UK due to two key concerns – energy security and climate change. Climate change is an increasingly accepted, understood and imminent reality. Meanwhile, the security and availability of UK energy supplies is in question. These issues necessitate a move away from a continued reliance on fossil fuels towards diversity of supply. Renewable energy technologies will be an essential part of the future energy mix.

In this context, the North East's continued reliance on gas and coal, its position as a net exporter of electricity, and the untapped potential of renewables in the region demonstrate the need for renewable electricity. The RRES shows that the region is taking the first steps to meeting these needs – but the energy scenarios show that technological improvements alone will not bring about a reduction in carbon dioxide emissions.

The scenario projections have a clear relevance to objective 7 of the IRF: to reduce the causes and impacts of climate change. At present the main indicator for objective 7 is the percentage of renewable energy consumed in the region. Results from the energy scenario suggest that this is an inappropriate indicator for the objective, as CO_2 emissions could well increase even as renewable energy coverage expands.

The scenario also has relevance to future planning and strategic initiatives. Historical growth and consumption trends show that a no-growth scenario is unlikely. The North East needs to be active in promoting initiatives and setting guidelines that reduce electricity demand. The Northern Way initiative[4] could provide a means of working with neighbouring regions to reduce demand outside the North East. It is also worth exploring how technology can help control electricity demand. New technologies such as "dynamic demand" control[5] are emerging, but require a supportive policy environment. Investigating further what can be done now to reduce CO_2 emissions in these ways will help protect against the more painful transitions that may be needed in the future.

Temperature increase above pre-industrial	Impacts
1-2°C	Major impacts on ecosystems and species; wide ranging impacts on society
2-3°C	Greenland ice cap starts to melt, major loss of coral reef ecosystem; considerable species loss; large impacts on agriculture; water resources; health; and economies. Terrestial carbon sink could become a source
1-4°C	North Atlantic circulation at increasing risk of collapse
2-4.5°C	West Atlantic ice sheet at increasing risk of collapse

Source: Climate Change Programme Review, Defra, 2006

Climate change in the North East

The North East needs to combine supply side improvements with a concerted effort to hold or reduce electricity consumption from existing levels – and it needs to do so today. The latest figures on climate change show that unless there is urgent and strenuous action over the next 20 years, the world is almost certainly committed to temperature rises of between 0.5°C and 2°C by 2050, relative to today. Similarly, the UN Intergovernmental Panel on Climate Change estimates that global temperatures could rise by 5.8°C by the end of this century.[6]

To put this in context:

- a temperature rise of 1°C to 3°C above pre-industrial levels will have increasingly damaging implications for the economy, the environment and society; and
- over the last 150 years, temperatures in the North East have increased by an overall 0.5°C, with most warming taking place over the last 75 years.[7]

The warning for policy-makers is that delaying action now will require greater action later on. Scientists warn that even a delay of five years could be significant, and if action to reduce emissions is delayed by 20 years, rates of emission reduction may need to be between three and seven times greater to meet the same temperature target.

Recommendations

The North East could:

- change the indicator set for objective 7 of the IRF so that it more accurately reflects the region's ability to reduce CO_2 emissions;
- set shared energy demand reduction targets with neighbouring regions. The Northern Way initiative and future planning around the city regions could provide a framework for this. REAP can be used to explore viable demand reduction targets;
- advocate and promote the development of demand control technologies. New technologies such as dynamic demand could provide a more efficient power grid and remove some barriers to renewable energy generation. The North East should explore how it could help implement pilot projects for these technologies.

4 The Northern Way was initiated by the Office of the Deputy Prime Minister and is led by three regional development agencies: One North East, Yorkshire Forward, and the North West Regional Development Agency. See www.thenorthernway.co.uk/index.html

5 See www.dynamicdemand.co.uk

6 *Avoiding Dangerous Climate Change – Scientific Symposium on stabilisation of Greenhouse Gases*. Executive summary of the conference report, Defra, 2006

7 *And the weather today is – Climate Change in the North East*, North East Assembly / Sustaine, 2002

4 Spotlight on housing and sustainable communities

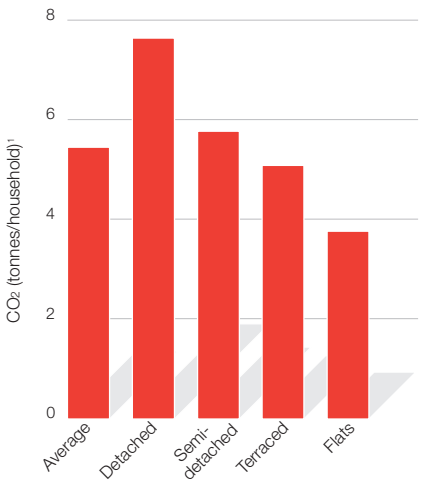


Fig 1 **CO_2 emissions from household heat loss**

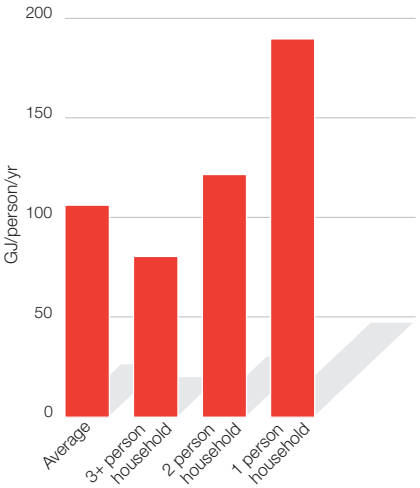


Fig 3 **Per capita energy consumed by North East households of different sizes[2]**

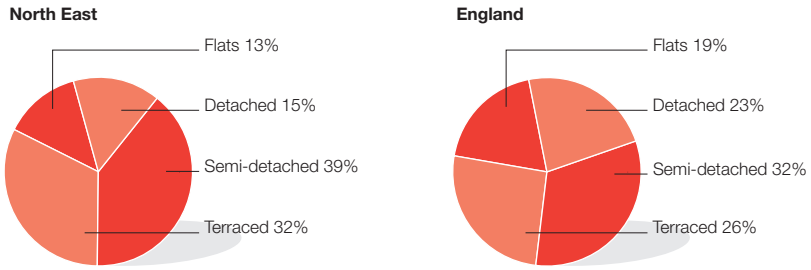


Fig 2 **The North East's and England's housing mix**

Housing headlines

Compared with the English average, the North East has a lower percentage of detached housing and a higher percentage of semi-detached and terraced housing. This will partly account for its housing Footprint, which is slightly lower than the average for the UK.

Better energy efficiency leads to lower CO_2 emissions. For example, detached and semi-detached homes usually have higher CO_2 emissions than flats or terraced housing mainly because the more wall space one home shares with another, the fewer external walls it has and the less heat it loses through them. Flats and apartments are usually smaller than detached homes, so have less total space to heat.

On average, there are 2.32 residents per household in the North East which, like the rest of the UK, has seen a decline in household size over the past four decades. Figure 3 shows the per capita energy requirements of households of different sizes in the North East. Many household energy requirements – heating, for example – remain the same whatever the household size, so per capita energy efficiency drops as the number of residents per household goes down. Declining household size trends necessitate the construction of additional properties. This of course increases demand on the construction sector.

The construction sector – buildings, infrastructure and the built environment generally – is the largest single material user, waste generator and energy user in the UK. Industry studies show the sector has a total material requirement of 420m tonnes, only 360m of which are incorporated into construction products – the remainder become waste, mostly from quarrying[3].

Figure 4 shows the Ecological Footprint associated with different building materials. Those used in the greatest quantities to construct a house do not necessarily have the greatest CO_2 impact. Two tonnes of metal products are used in the average house. Metal products make up 1.3 per cent of materials used to build a home but are responsible for the most CO_2 emissions associated with housing construction. Material flow analysis calculates the impacts of different materials by taking into account indirect impacts associated with the extraction of iron ore and the energy used to produce and transport metal products.

New housing

Housing development accounts for a significant proportion of the construction sector's impact – a fact recognised in the North East where a sustainable construction guide already exists[4]. The RSS includes requirements for all residential developments to implement Building Research Establishment (BRE) EcoHomes standards and to source 10 per cent of their energy supply from renewable sources.

The RSS plans for 7,500-8,500 new homes to be built every year until 2021. Of these, 6,295 will be net additions to the total housing stock (a net addition of 107,000 by 2021) and a further 1,200-2,200 homes will replace the existing housing stock.

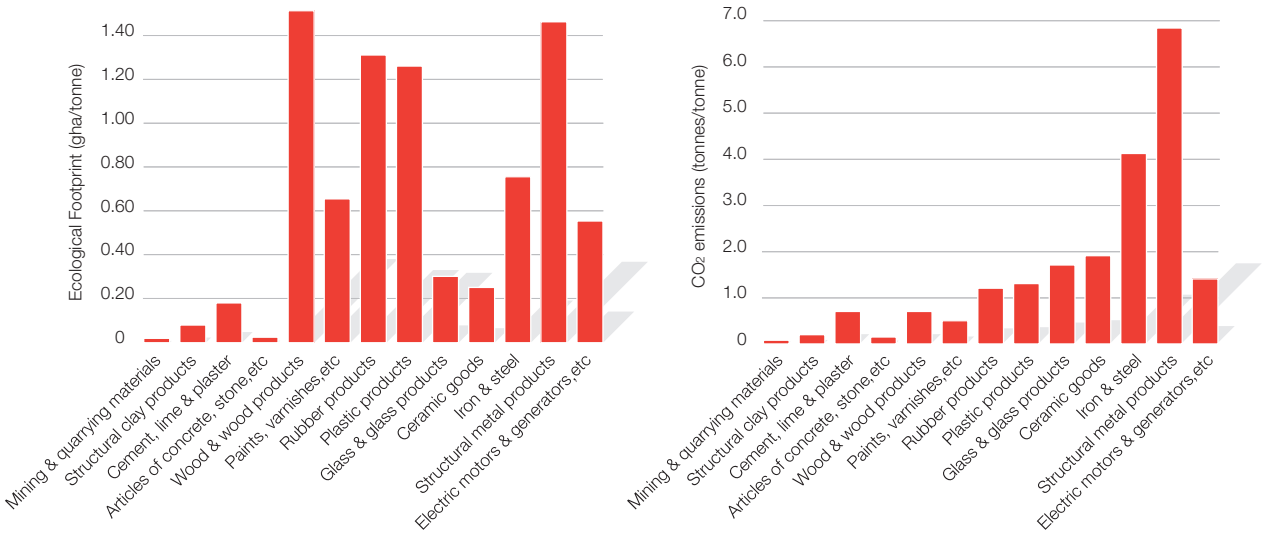
The durability of new housing greatly impacts upon its total CO_2 emissions. The longer the lifetime of a building, the lower its construction impacts are over time. The average new house lasts 60 years, so the 60 tonnes of CO_2 from its construction average one tonne a year. But if it lasts 120 years, the average drops to 0.7 tonnes a year (Figure 7).

All homes emit CO_2 through daily operation as well as from their construction and maintenance. Emissions from construction are similar for all housing types, but those from energy use for existing homes are more than twice those for a new house built to EcoHomes standards, as Figure 5 shows.

The housing scenario looks at projected housing mixes in the RSS and illustrates the carbon savings that can be achieved through different policy interventions in the housing and construction sector.

GARY DOAK / WWF-UK

Fig 4 **Ecological Footprint and CO_2 emissions per tonne of building material**



Housing scenarios – outlook for the future

In 2001, the North East IRF set a progressive target to improve the energy efficiency of 600,000 homes by 2004. The RSS continued the region's focus on energy efficiency by setting EcoHomes standards for all new developments, but there are less prominent regional targets for energy efficiency measures in existing homes.

Construction of additional homes will increase the region's CO_2 emissions and Footprint unless they are built to high environmental standards; an emphasis on EcoHomes standards is therefore welcome. However, questions remain as to what extent these standards will be introduced in each development and to what extent this policy will bring benefits if older housing is left in its present state. The following housing scenarios look at future housing projections and identify where the greatest opportunities lie for bringing about a reduction in CO_2 emissions by 2021.

The housing scenario comprises four components:

- The *baseline scenario* assumes that between 2001 and 2004, the IRF objective was met by installing draught stripping and a hot water jacket in each of the existing 600,000 homes (54 per cent of housing stock). The 107,000 new houses built by 2021 meet building regulations but don't go beyond.
- The *retrofit scenario* shows the additional impact of a complete retrofit of the existing housing stock as detailed in Figure 8 over the period. As heating has the greatest impact on CO_2 emissions, most retrofit options concentrate on reducing this. All 107,000 new houses built by 2021 meet building regulations but don't go beyond.
- The *new build scenario* assumes no further retrofit of the existing housing stock beyond the baseline between 2001 and 2004. All new homes are built to the EcoHomes excellent standard.
- The *Factor Four scenario* uses the full range of policy levers with a behaviour change strategy built in. This strategy succeeds in encouraging 80 per cent of residents to take simple energy efficiency steps: turning lights off when leaving the room, turning the thermostat down by 1°C, reducing the use of standby on electrical appliances and replacing 50 per cent of baths with showers. In addition, 80 per cent of existing houses are retrofitted using the measures listed in Figure 8, and 80 per cent of new houses built reach the EcoHomes *excellent* standard. This is the same as allowing a period of three years before implementing a 100 per cent EcoHomes *excellent* standard for all new developments.

1 Statistical error margin of 9 per cent.
2 This graph is cited in *Towards Greener Households: Products, Packaging and Energy*, INCPEN, 2001, ISBN 1901576507.
3 Smith, R.A., Kersey, J.R. & Griffiths, P.J., 2002, *Mass balance of the construction industry*, Viridis.
4 www.buildinginsustainability.co.uk

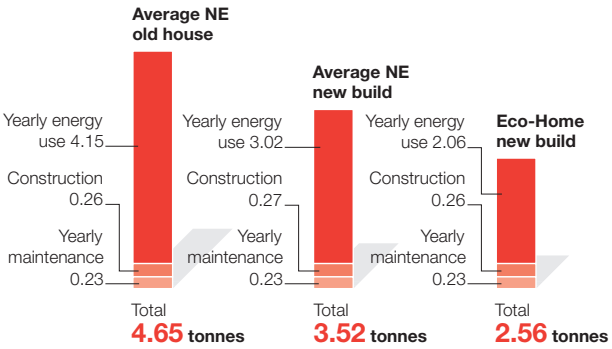


Fig 5 **The annual CO_2 emissions from selected North East house types**

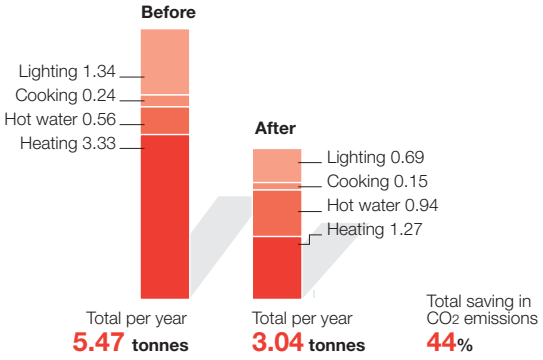


Fig 6 **The CO_2 emissions savings per year achieved from retrofitting an average North East home**

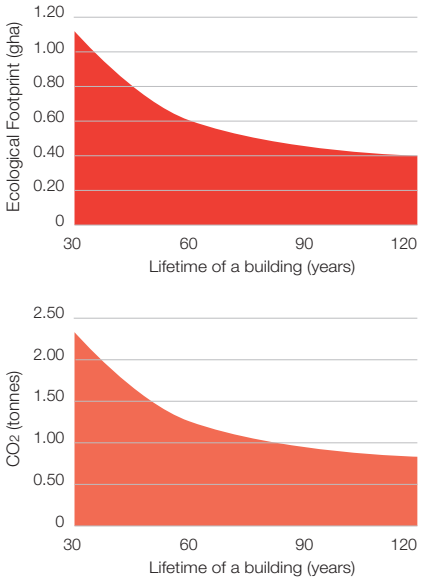


Fig 7 **Ecological Footprint and CO_2 emissions of a building's construction**

Loft insulation (0 mm - 200 mm)
Cavity wall (post 1976) where possible
Draught stripping
Double glazing
Gas central heating controls
Filling gaps between floorboards
Condensing boilers
Replacement of standard light bulbs with compact fluorescent lights (CFLs):

Fig 8 **Retrofit measures included in the Retrofit and Factor Four scenarios**

The scenarios assume that the average new home lasts for 60 years and that each household comprises 2.33 people, the average for the North East.

CO_2 emissions include those associated with use and construction for new homes. Historic emissions are excluded; this means the construction emissions of old homes haven't been included in the calculations.

The annual replacement of homes has not been factored into this scenario. No historic energy efficiency retrofit measures are assumed. This assumption helps factor in the likely improvements in retrofit measures over the next 15 years.

In 2001 the North East's CO_2 emissions from home and energy were 2.95 t/cap. This accounts for 27 per cent of the region's total emissions (11 t/cap).

The baseline scenario shows a 4 per cent increase in household CO_2 emissions from a 10 per cent increase in housing stock. Limited energy-saving measures in existing homes bring about a 2 per cent reduction in emissions by 2021. The average new house produces 38 per cent less CO_2 than the existing stock, but the overall increase in housing stock still offsets the limited energy efficiency savings.

The retrofit scenario brings about a 37 per cent reduction in household CO_2 emissions by 2021. Extensive retrofitting brings the average existing house's energy efficiency up to the level of an average new home. Figure 6 breaks down the CO_2 savings that can be achieved by carrying out a full retrofit in a single home.

An EcoHomes *excellent* house is 33 per cent more energy-efficient than the average new house. **The new build scenario** means emissions in 2021 will be 2 per cent less than the baseline scenario in 2021, but overall emissions will still increase by 3 per cent.

The Factor Four scenario brings about a 43 per cent reduction in household CO_2 emissions by 2021. The behaviour change component accounts for 16 per cent of this. While a Factor Four scenario requires an overall reduction of 75 per cent, it is assumed that this is unrealistic by 2021 and that 57 per cent of the required reduction can be achieved by this date.

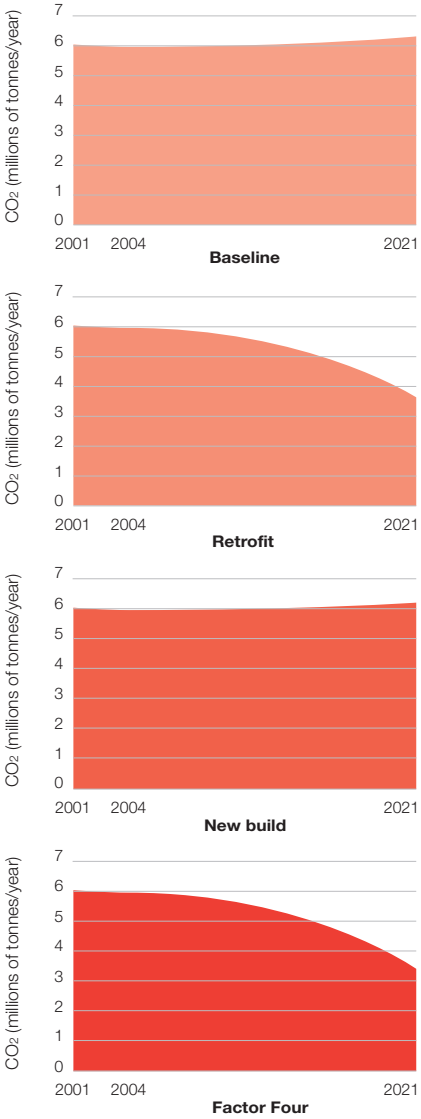


Fig 9 **Household CO_2 emissions by 2021 for housing scenarios in the North East**

Applications to policy

Around 75 per cent of homes in the UK will still be here in 2050[5]. The housing scenario shows that improved housing development standards will not place an adequate check on CO_2 emissions, but that making better use of energy in existing homes will provide a far greater contribution. In the drive towards better housing development standards, it is important that the energy efficiency of old homes is not forgotten.

Increased energy efficiency in housing is a central public policy goal[6] and has a strong link to improving living standards for more vulnerable members of society. Although down from 15.6 per cent in 2001, 10.8 per cent of households still experience fuel poverty[7] and sustainable housing is still far from a reality in the North East. The sustainable development publication *Home Truths*[8] sums up the situation in the UK as a whole:

"If home is where the heart is, it's also where the wastage is. Draughty windows, appliances on standby, dripping taps and overflowing bins – we could all do better."

The North East Housing Strategy[9] aims to tackle fuel poverty by improving the energy efficiency of homes beyond the level required by the Decent Homes Standard – a government measurement to bring all public sector homes up to set standards of decency by 2010[10]. With 47 per cent of local authority homes and just under 26 per cent of private homes failing to meet this standard, a considerable opportunity exists to improve energy efficiency in the region.

Providing the appropriate mix of high-quality housing contributes to the creation of high-quality living environments and sustainable communities. While retrofitting remains the most promising policy intervention from a climate change perspective, well planned and durable new homes further the social and economic pillars of sustainable development as housing policy impacts on many sectors at once.

The RSS commitment to EcoHomes standards is a positive move that sends out a strong message to house-builders. However, this commitment would benefit from the introduction of targets if developers are to do more than pay lip service to the standards. Past analysis by SEI shows that existing technology can bring further savings than those achieved through an EcoHomes excellent accreditation. BedZED – Beddington Zero Energy Development – in the London Borough of Sutton is a good example. Compared with a typical suburban home, BedZED delivers a 60 per cent reduction in total energy demand and a 90 per cent reduction in heat demand. Incentives should be introduced for developers wanting to utilise existing technology and go beyond the EcoHomes standards.

The introduction of a North East Advice Centre run by the Energy Saving Trust provides a focus for residents and businesses seeking advice on energy efficiency. The housing scenario shows that further CO_2 savings can be made if regional initiatives target existing homes in particular. In the long term, retrofitting can save money but the initial high cost of measures such as double glazing can militate against region-wide schemes and individual household investment alike.

Policies that encourage behaviour change are an effective low-cost alternative to retrofitting, although they are best introduced in tandem with other energy efficiency measures. In the Factor Four scenario, the successful targeting of 80 per cent of households through a behaviour change strategy brings about an additional saving of 16 per cent in CO_2 emissions by 2021.

The new Climate Change Programme Review signals the UK government's intention to provide further energy efficiency savings through the Energy Efficiency Commitment (EEC). The Sustainable Development Commission recommends offsetting the impact of new homes in the South East through the establishment of "energy offset regions" which would incorporate EEC energy efficiency measures in existing homes. At the very least, this is an option worth considering for the 107,000 new homes planned for the North East. Energy suppliers are committed to offering their customers discounted products and services that promote energy efficiency – which means funding already exists. By working with these companies more closely and setting "energy offset" targets, the North East could ensure that this funding achieves greater results[11].

Combining the low consumption housing scenarios with those for renewable energy production shows the benefit of targeting energy supply and demand in tandem. By meeting the government's renewable energy targets and implementing the Factor Four scenario, an overall reduction of 54 per cent in CO_2 emissions could be achieved. This is well on the way to achieving a Factor Four reduction.

Finally, one policy area that has not been covered in the scenarios is decentralised energy production: houses producing their own energy from renewable sources. If a reduction of 1.2 tonnes of CO_2 per household could be attained through decentralised systems, a Factor Four reduction would be achieved. In this scenario 20 per cent of required energy would be provided by the houses themselves.

Recommendations

The North East could:

- set clear EcoHomes targets for housing developers and provide incentives that encourage them to go beyond EcoHomes standards;
- combine energy efficiency initiatives with those to meet the Decent Homes Standard and identify the most cost-effective measures that can be installed in every renovated home. New technology such as Dynamic Demand control could play a role here;
- make the North East an "energy offset region" for the 8,000 houses built each year by creating an EEC partnership with energy companies to install energy efficiency measures in existing homes;
- use all the policy levers available by combining a regional policy that encompasses substantial retrofitting of houses, extremely high standards for new build, a centralised renewable energy strategy and decentralised energy production.

5 Oxford Environmental Change Institute, 2005.
6 The 2004 Housing Act commits the Secretary of State for the Environment to at least a 20 per cent reduction in residential energy efficiency in England by 2010 from 2000 levels. See www.defra.gov.uk/environment/energy/review/
7 Fuel poverty defines a household that spends more than 10 per cent of its income on maintaining an adequately heated home.
8 For more details see the SDC publication *Home Truths – Our advice to Government on UK Housing.* Downloadable from www.sd-commission.org.uk/publications/downloads/SDC-Home-Truths.pdf
9 For further information go to www.nehb.org.uk/strategy.htm
10 For further information go to www.odpm.gov.uk/index.asp?id=1153924
11 See footnote 8.

5 Spotlight on transport

Relatively low levels of car ownership in the North East have not mitigated against the appearance of major congestion hotspots in the Tyne and Wear and the Tees Valley city regions.

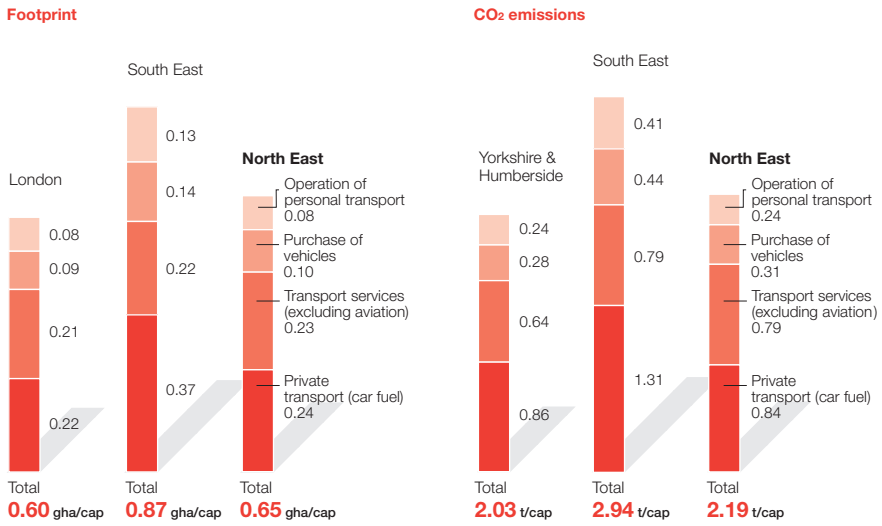


Fig 1 **Land transport Footprint and CO_2 emissions of the North East compared with high and low regions**

Transport headlines

The North East's travel Footprint, excluding aviation, is 0.65 gha/cap, compared with a high of 0.87 gha/cap in the South East and a low of 0.60 gha/cap in the dense and public transport-dependent region of London. The main components of the Footprint are transport services (mainly buses and trains) and private transport (car use). Private transport is generally more Footprint-intensive per kilometre than transport services; this pattern is repeated with CO_2 emissions.

The average North East resident travels 9,500km a year (London is the only UK region or devolved country whose residents travel less). The North East has a low material requirement for mobility and lower CO_2 emissions than most other regions.

Some recent trends in the North East show a move away from sustainable travel practices. Between 1985/86 and 2002/03, the region experienced a 39 per cent decline in passenger journeys by bus. Light rail journeys have also declined, as have the greenest forms of travel to work by foot and bicycle.[1]

Although car ownership in the region is steadily increasing, 38 per cent of households in the North East have no access to a car – a higher percentage than any other region including London. This is partly due to the reliance on bus services, which account for 11 per cent of journeys made[2].

Meeting demand

Relatively low levels of car ownership in the North East have not mitigated against the appearance of major congestion hotspots in the Tyne and Wear and the Tees Valley city regions. To alleviate burdens on the transport infrastructure, the temptation is to develop further infrastructure capacity.

The advantage of expanding transport infrastructure is that it can decrease congestion and increase the ability of people to access places of work, learning and recreation. The disadvantage is that this can be costly and often offers only short-term gains. There is a limit to the extent to which transport infrastructure can be expanded.

To accommodate growth in transport demand over the longer term, there is a need to deal with existing infrastructure efficiencies. Car occupancy in the North East stands at only 31 per cent and local bus occupancy is 20 per cent. Although 61 per cent of commuters travel to work by car, 49 per cent take less than 20 minutes. There are opportunities here to manage demand by making the best use of existing infrastructure and public transport.

Improving infrastructure efficiency also provides an effective means of reducing CO_2 emissions from transport. It sits alongside three other broad policies that can be used together to relieve traffic congestion, improve access and reduce impacts on the environment:

- modal shift – the public is encouraged to switch to more sustainable forms of transport such as buses, trains, walking or cycling;
- technology – technological improvements in cars or other forms of transport reduce carbon emissions; and
- sufficiency – planning policies that reduce the need to travel are enforced.

Examples of these policies are examined in more depth in the transport scenario.

Transport outlook – scenarios for the future

The transport scenario uses REAP to look at the savings in carbon dioxide emissions that can be brought about by introducing variables that influence car use.

The baseline scenario assumes a "do nothing" approach. Car occupancy rates decline in line with national trends and hover at just over one person per car in 2020. The distance travelled by car increases by 36 per cent by 2020.

The technology scenario uses the same variables as the baseline but assumes

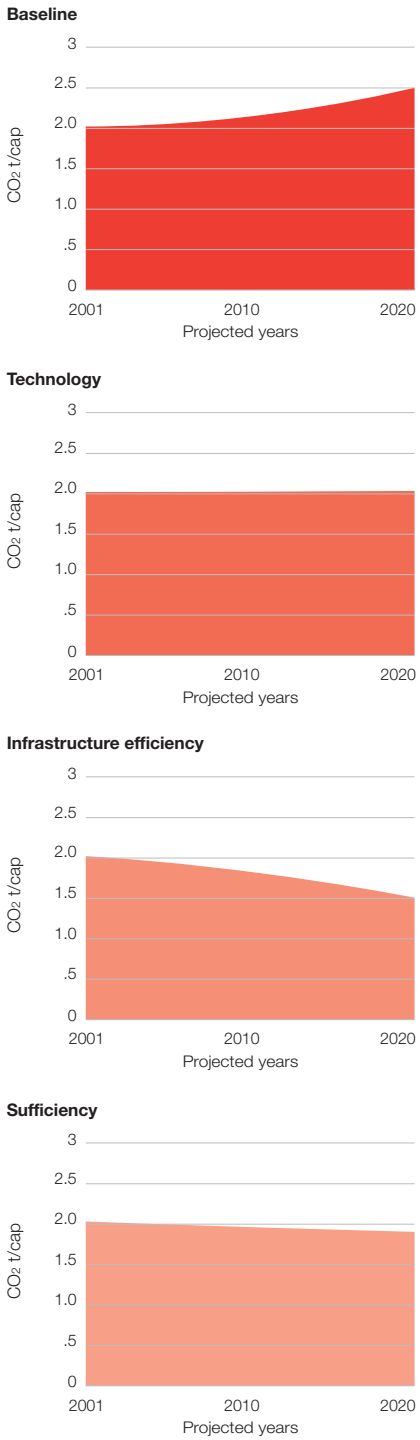


Fig 2 **CO_2 emissions (t/cap) for different transport scenarios**

a 19 per cent increase in the efficiency of cars by 2020.

The infrastructure efficiency scenario assumes no change to existing infrastructure or distance travelled, but occupancy rates increase to 50 per cent in cars and 75 per cent in buses by 2020.

The sufficiency scenario assumes that access to local goods and services improves and people live closer to work. This reduces the distance travelled by car by 25 per cent by 2020. No change in car occupancy rates is assumed.

Applications to policy

Improving transport links in and beyond the North East is seen as essential to the region's renaissance. The Draft RSS recognises that this has to be achieved within the principles of sustainable development. This implies the development of initiatives that manage demand, reduce the need to travel, make best use of existing infrastructure and encourage the use of public transport.

The RSS supports measures to improve infrastructure efficiency in the North East. Low-cost initiatives that can bring about behaviour change will be especially important given current funding constraints, but these should not be seen as short-term measures only. By introducing a range of complementary policies, it is possible to move away from large-scale infrastructure schemes and bring about real reductions in congestion and carbon emissions. The way these can be implemented will differ in local areas and will be reflected in local transport plans, but a degree of regional coordination will need to remain.

Increasing bus patronage in line with the Northern Way targets[3] would provide a useful first step towards greater infrastructure efficiency. An important factor in meeting this target will be the region's ability to combine improved services with other measures that make bus use more attractive. School and workplace travel plans are already improving car occupancy rates and taking traffic off the roads and this should be encouraged further as the infrastructure efficiency scenario shows what is possible.

Inequalities in access do exist in the North East, but this is not simply a result of transport policy. Planning and housing development have major implications for the type of transport people need to use and the distance they travel. The sufficiency scenario shows the environmental savings that come when people live near, and are able to walk or cycle to, commercial centres and their place of work.

The technology scenario doesn't provide an argument for policy-makers to take the "do nothing" approach. A rebound effect is associated with the improved fuel efficiency of cars as it reduces the marginal cost of driving. This causes demand for travel in the more fuel-efficient vehicles to rise. For example, a 5 per cent fuel efficiency increase may result in a 4 per cent fuel and carbon dioxide saving as drivers respond to a fall in the cost of driving by driving more often or further[4].

Planning a transport policy

Planning determines the spatial distribution and location of the goods and services people need. In doing so, it not only affects the use of resources – especially land – but also influences how people will choose to travel, and how far. Low-density rural housing tends to be accompanied by high transport demand, but high car travel also makes urban areas less attractive through diminished air quality and streets that are unsafe for walking and cycling. The *Counting Consumption* report shows that high-density housing developments lead to a lower Ecological Footprint for transport.

The UK government's Planning Policy Statement 1 sets out how sustainable development should be delivered through the planning system. At a regional level this should include getting the urban and rural balance of development right so that people live near their place of work and don't have to travel long distances to access the services they need.

Recommendations

The North East could:

> set infrastructure efficiency targets for public transport and cars, and prioritise infrastructure efficiency initiatives in local transport plans.

1 Regional Spatial Strategy for the North East Submission Draft, June 2005. Technical Background Paper No.10 Transport.
2 Ibid.
3 The Northern Way aims to reverse the decline in bus usage in city regions by 2007 and to grow patronage by 6 per cent by the year 2010, alongside general support for increases in other public transport usage.
4 An economic analysis to inform the Air Quality Strategy Review Consultation, Defra, April 2006.

6 Spotlight on Sunderland

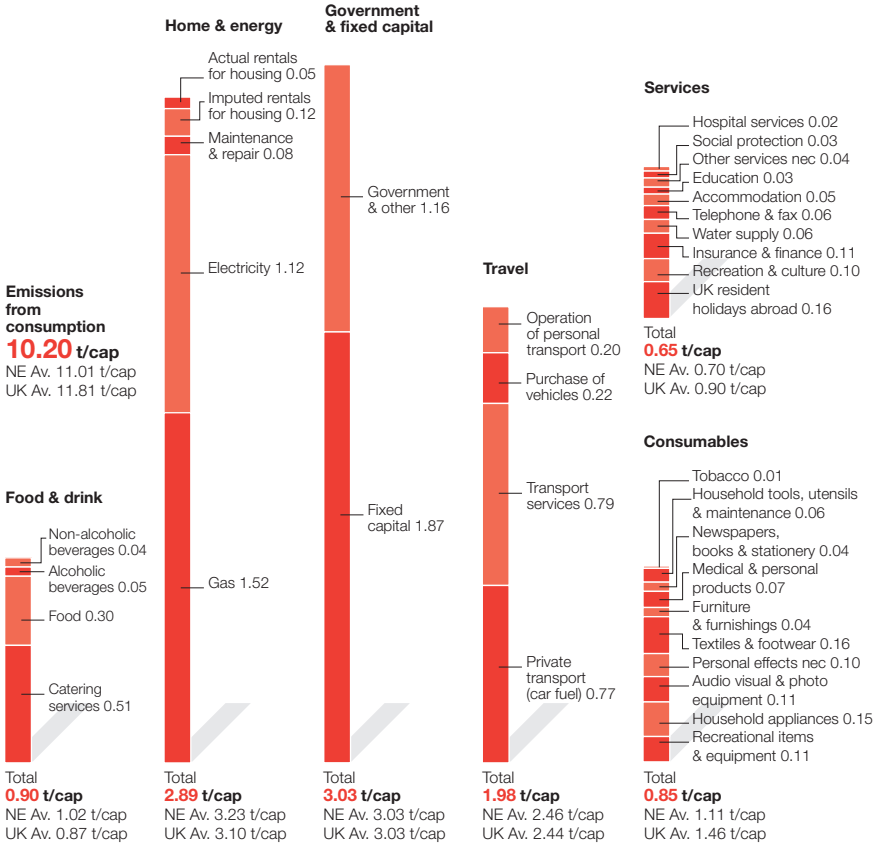


Fig 1 **CO_2 emissions from consumption for Sunderland (t/cap)**

While Sunderland's Ecological Footprint follows roughly the same contours as those of the North East, it is below the North East average. This is evident through small but consistent savings across most Footprint sectors, with the exception of consumables and durables.

Sunderland's CO_2 emissions from consumption are 7 per cent lower than the North East and 14 per cent lower than the UK average. CO_2 emissions from transport are 20 per cent lower in Sunderland than the North East, which accounts for more than half the difference between Sunderland and North East emissions. Consumption emissions from 'Home and energy' are 11 per cent lower in Sunderland than the North East, although only 7 per cent lower than the UK average.

Carbon emissions from food (embodied emissions from the manufacturing and distribution of food products) are 12 per cent lower than the North East, but just higher than the UK average.

Sustainable community development in Sunderland

The city of Sunderland is part of the Tyne and Wear City Region. Sunderland City Council is an example of a local authority taking the lead on sustainable community development. Its Sustainable Development Strategy is being incorporated into the Community Strategy, and the Ecological Footprint is used as an environmental indicator.

The council has also launched a sustainability appraisal of its key strategies, beginning with the Local Development Framework. This has highlighted the key sustainability challenges facing Sunderland including migration, an ageing population and high levels of land-filling.

The next step is to make sustainable communities the prime focus of Sunderland's Local Development Framework. Housing and community renewal is a priority and participatory appraisal has been widely used to increase community involvement in housing developments, improve community satisfaction, and test support for more sustainable designs. The Lambton Cokeworks housing development and Hetton sustainable transport project are examples of where this has worked well.

Five ways to reduce the Ecological Footprint of your food

> Maintain a five-a-day diet. Besides being more healthy, a high vegetable and fruit diet (at least five portions a day) has a significantly lower Footprint than a high meat diet.

> Buy local food. Less energy goes into distributing local food than food which is transported hundreds or thousands of miles and requires refrigeration and complex distribution systems.

> Cook from scratch. Processed food involves energy-intensive processes. Unprocessed food is often more healthy – lower in the amounts of sugar, fat, salt and preservatives that are often found in processed food.

> Eat seasonal food. Seasonally available food is fresh, and likely to have taken less energy to transport, store and produce before reaching the plate.

> Plan your meals. By planning ahead you buy only the food you need. This can save money and reduce waste.

Reducing the amount of meat in a population's diet, combined with a move towards fresh and seasonal food, can bring about a 30 per cent decrease in the food Footprint[1].

These are all actions that can be taken at the individual level, but there is room for encouragement at the local and regional level and a strong link with the public health and procurement agendas. Public sector food procurement can help local authorities take a high-profile lead, support a healthy workforce and promote the local food economy.

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The Community Ecological Footprint tool

Delivering sustainability at a community level is a way for people immediately and directly to reduce their Ecological Footprint and CO2 emissions. Because of the smaller size of an individual community, residents can often move forward very quickly with their efforts, and make a substantial impact around the UK and the world.

The Ecological Footprint as a tool for sustainable communities is under constant development. One example is the Community Ecological Footprint tool planned by WWF-UK and the Stockholm Environment Institute. Although the tool's feasibility is still being studied, Sunderland City Council and WWF-UK have already used the Footprint with different communities in various ways.

The Footprint has been used to promote cycling and walking initiatives, local food and box delivery schemes, and the distribution of leaflets outlining sustainable household practices. In each project, facilitators rely heavily on feedback from community groups and local community development workers. Eventually, the tool will enable community organisations to measure the different components of their Ecological Footprint, and plan targets to reduce it.

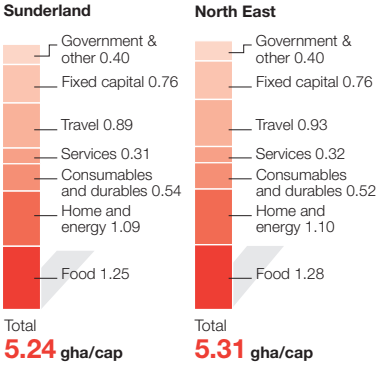

Fig 2 **The Ecological Footprint of Sunderland (gha/cap) compared with the North East**

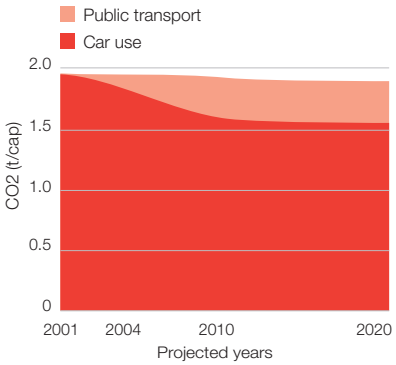

Fig 3 **Projected CO_2 emissions (t/cap) from travel in Sunderland**

Transport in Sunderland

As emissions from all other sectors are set to decline, transport emissions in the UK are forecast to increase. Recently the national cost of road congestion has been estimated at £20bn, the cost of physical inactivity at £8.2bn, and the cost of pollution-related emissions at at least £60m[2]. The real costs of these impacts are hard to estimate and intangible to the public. In contrast, the freedom that the car brings is highly valued – which is why, among other reasons, government at all levels shies away from placing any kind of control on car use. From a political perspective it is more positive and constructive to improve transport services, to encourage walking and cycling and invest in transport infrastructure. But this infrastructure is still biased towards the car, which remains our preferred mode of transport unless the alternatives are of exceptional standard. With this in mind, it is worth re-focusing on transport in the context of the Sunderland Strategy.

While the Sunderland Strategy doesn't set a clear target for public transport, it does have a broad objective – to slow the decline in the take-up of public transport and increase walking and cycling.

The expectation of the transport objective is that public transport measures will reduce dependency on cars in Sunderland. This may be the case to a limited extent, but there are no corresponding objectives and targets relating to car use. The limited impact of setting objectives for public transport only can be considered by comparing CO_2 emissions scenarios for car travel and bus use interventions.

- The public transport scenario assumes that Sunderland meets its objective in line with Northern Way targets for bus use. Bus occupancy increases by 1.5 per cent a year to 2020 when buses are 50 per cent full. It is assumed that all other transport variables stay the same.
- The car use scenario assumes that the kilometres travelled by car are reduced by 10 per cent by 2020 and that cars have a 50 per cent occupancy rate by 2010. It is assumed that all other transport variables stay the same.

1 Barrett, J, Birch, R, Cherrett, N, Wiedmann, T, 2005. *Reducing Wales' Ecological Footprint – Main Report*. Stockholm Environment Institute, University of York; published by WWF Cymru, Cardiff. March 2005. www.walesfootprint.org.

2 Sustainable Development Commission, Barker Review of Land Use Planning, March 2006.

"By directly targeting car use and occupancy, Sunderland Council would be able to reduce the CO_2 emissions of transport by 20 per cent by 2020."

By directly targeting car use and occupancy, Sunderland Council would be able to reduce the CO_2 emissions of transport by 20 per cent by 2020. And by directly targeting public transport, emissions would be reduced by 2 per cent by 2020.

These scenarios don't take into account the indirect effects of policy on other modes of transport, but indirect impacts are not always clear and can be more difficult to measure. Car use is a policy issue that should be tackled directly because it is more likely to respond to direct interventions and because it brings about a greater reduction in CO_2 emissions. The task for local authorities such as Sunderland is to identify publicly acceptable and effective interventions that directly reduce dependency on cars. The Congestion Charge in London provides an obvious example of what government can achieve by targeting car users and successfully reducing congestion, traffic volume and CO_2 emissions, but non-governmental organisations also have a role to play.

Applications to policy

Future transport initiatives in Sunderland will be guided by the Second Local Transport Plan for Tyne and Wear, which is wide-ranging and incorporates bus use and cycling strategies. For all this, car ownership and use is rising at rates significantly higher than the national average and the car is the preferred mode of transport for those who have a choice: only 9 per cent of people with a mode choice favour public transport. High growth projections also suggest that overall, the number of public transport trips will decline by 3 per cent while car trips will increase by 20 per cent[3].

Although the new transport plan for Tyne and Wear reports these facts, there are few measures that target car users specifically. Means need to be found that change the way people use cars in the North East if Tyne and Wear wants to stabilise or reduce CO_2 emissions.

Car share schemes – targeting transport priorities

Car clubs have a potential in the North East, where car ownership is low and some people can't afford the upfront costs of car ownership. Clubs are being set up all over the UK and can be run in a number of ways. Some are small-scale and non-commercial cooperatives, while others have local authority backing, or are run in partnership with public transport or car manufacturers.

Launched in San Francisco in 2001, City CarShare provides members with 24-hour access to 80 cars at nearly 40 locations and for rental periods of between 15 minutes and 15 days. A study of the scheme showed that:

- 30 per cent of households using the scheme have sold one or more cars;
- 67 per cent have chosen not to purchase an additional car;
- car travel has dropped 47 per cent;
- use of public transport, walking and cycling has increased; and
- each day City CarShare saves 21,000km of vehicle travel.

Source: 16 pain-free ways to save the planet, The National Consumer Council, 2005

3 Local Transport Plan, Tyne and Wear, 2006-2011.


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7 A socio-economic analysis

Locally specific resource accounting is important for local policy-making. Just as regions require customised approaches to achieving sustainability, so do local authorities. By analysing the characteristics of consumer groups in different areas, it is possible to tailor policy interventions that reduce the Ecological Footprint[1].

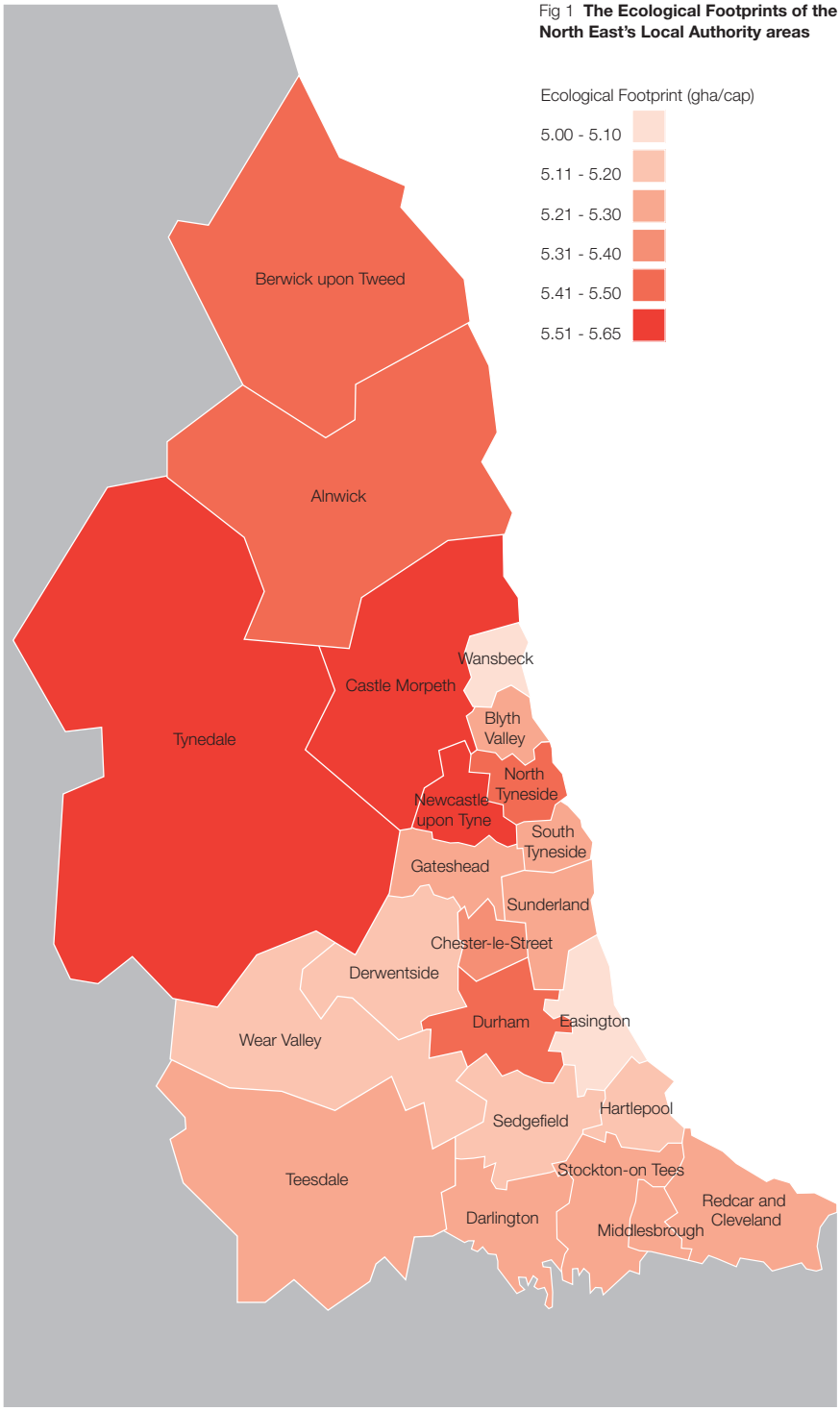

Fig 1 **The Ecological Footprints of the North East's Local Authority areas**

Area Name	Ecological Footprint
Wansbeck	5.07
Easington	5.08
Hartlepool	5.12
Wear Valley	5.14
Derwentside	5.17
Sedgefield	5.17
Middlesbrough	5.21
South Tyneside	5.24
Sunderland	5.24
Gateshead	5.25
Redcar and Cleveland	5.25
Stockton-on-Tees	5.27
Blyth Valley	5.3
Darlington	5.3
Chester-le-Street	5.32
Alnwick	5.44
Berwick-upon-Tweed	5.45
Teesdale	5.45
North Tyneside	5.46
Durham	5.48
Newcastle upon Tyne	5.55
Tynedale	5.62
Castle Morpeth	5.65

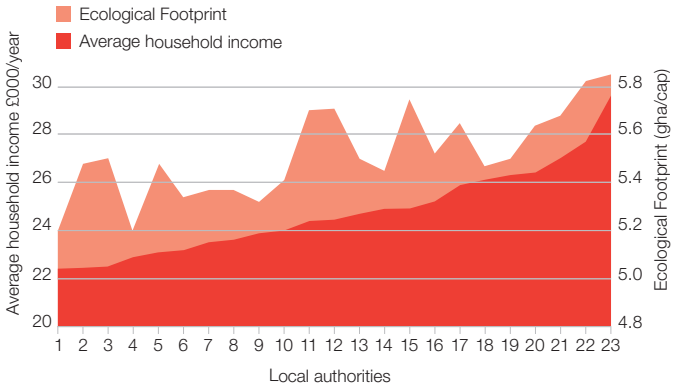

Fig 2 **North East local authority area Ecological Footprints and average incomes**

February 2006 saw the release, for the first time, of the Ecological Footprint and CO_2 from consumption of every UK local authority area. Although the North East's is among the lowest in the UK, rates vary significantly among local authorities.

The North East local authorities of Castle Morpeth and Wansbeck are neighbours. They also represent the North East's Footprint extremes – Castle Morpeth is the largest (5.65 gha/cap) and Wansbeck the smallest (5.07 gha/cap), with a Footprint 10 per cent smaller than Castle Morpeth's. One way of understanding this difference is through a socio-economic analysis. Figure 3 points to some of the reasons why the neighbours have different Footprints. Figure 2 builds on this by comparing the Footprint and average income of different North East local authorities.

As present policies stand, wealth is strongly correlated to a higher Footprint – but quality of life is not. The challenge of sustainable economic development is to raise the quality of life in the North East while reducing the Ecological Footprint.

This means introducing measures that reduce fuel poverty but improve energy efficiency, that improve access to services but reduce the need to travel, and that minimise waste creation in the economy but increase competitiveness.

Local authorities (or, by extrapolation, any population) with similar income levels may have significantly different Footprints. Although income is an important contributing factor to the size of Ecological Footprint, it is mediated by consumption choices, which differ radically from person to person. The Footprint of people who spend more money on items with a high Footprint per £ spent – such as electricity, food or recreational equipment – is higher than that of people who spend more on items with a lower Footprint per £ spent – clothing or education, for example[2].
To some degree it is possible to decouple income from the Ecological Footprint; what's more, real Footprint savings are possible even within existing income and current economic structures.

Castle Morpeth – a high-Footprint local authority

Most common: A high percentage of residents own large detached homes, have multiple cars and live in suburban, rural or semi-rural areas. They have high incomes, use financial services at a high rate, and are likely to take several holidays a year. This group is economically and socially well-off but has a very high Footprint.

Wansbeck – a low-Footprint local authority

Most common: A high percentage of residents are older, own or rent flats, have moderate incomes or are retired, and enjoy a comfortable standard of living. They are active in charity work and interested in music and art. Most own only one car. This group is socially and economically comfortable and has a lower than average Footprint.

Fig 3 **The consumer make-ups of the highest and lowest Footprint local authorities in the North East.**

Targeting households

Sustainability in production can often be accomplished by streamlining centralised manufacturing processes or by reducing CO2 emissions in energy production. Consumption patterns are acted out by millions of individual consumers, whose behaviour is more difficult to predict and influence.

It is because of complex consumption patterns that income levels do not always correlate with the Ecological Footprint. Decision-makers can use REAP to target areas of domestic consumption that are particularly high in their area. They then need to choose the right policy measures to bring about the outcomes they want to achieve.

1 Barrett, J, Birch, R, Cherrett, N, Wiedmann, T, 2005. *Reducing Wales' Ecological Footprint – Main Report*. Stockholm Environment Institute, University of York; published by WWF Cymru, Cardiff, March 2005. www.walesfootprint.org

2 Wiedmann, T, Minx, J, Barrett, J, Wackernagel, M, "Allocating ecological footprints to final consumption categories with input-output analysis", *Ecological Economics*, 2005.

8 Conclusion and recommendations

Ecological Budget North East is a significant step in understanding how the decisions we take every day affect the environment around us. It is also an essential step in creating a platform to enable us to move from the current North East "Three Planet Economy" to a One Planet Economy.

The overall messages from the results in this report are clear:

- the Footprint measure shows that consumption by North East residents is using up the Earth's resources at several times their per capita share;
- as the North East undergoes industrial transition it is exporting its environmental impacts by importing goods from overseas, even as the region becomes cleaner and greener;
- the UK government's long-term target for a 60 per cent reduction in carbon emissions requires early action at local and regional levels;
- resource efficiency improvements can be both cause and effect of economic growth and competitiveness; and
- this can be achieved through the principle of market transformation. We interpret this as environmental sustainability combined with technological, economic, organisational and social change.

Only when the North East economy is clearly moving on this strategic path towards a Factor Four step change can the challenge of the UK Sustainable Development Strategy be taken up. This will move the North East towards a real One Planet Economy – an economic system of production and consumption which respects environmental limits, while being financially and socially sustainable. The concept of the One Planet Economy was referred to in the UK Sustainable Development Strategy, but not defined, measured or otherwise followed up at that point. This is the cue for the Ecological Budget UK.

Achieving a One Planet Economy

These are the principles behind the proposals for moving the North East towards a One Planet Economy:

The first is integrated asset management, covering economic, social and environmental capitals and risks – in other words, the North East economy should manage itself as intelligently as would any other large complex organisation.

This leads to the polluter pays precautionary principle – that users of environmental services should pay for the risk or damage caused, locally or globally. While this idea is not new, the issue here is applying it either to producers, intermediaries or consumers.

This should be followed through on an integrated supply chain principle, i.e. by tracking material and energy resources from cradle to grave, and from supply sides to demand sides.

This adds up to a full market transformation programme in each sector, for low-impact technologies and sustainable consumption patterns.

Such a programme should be financially viable, aiming at net gains in both national and individual costs and benefits.

Such a programme should also be socially responsible, aiming towards equalising the differences between social groups, between regions, and between the UK and the developing world.

To implement this requires a practical business case to be developed for each economic sector, policy level, product type and so on.

Next steps

Ecological Budget North East has set out the beginning of a longer-term programme of research and development. Our understanding of the flows of materials and energy through the region demands much more detailed investigation if we are serious about moving it towards a One Planet Economy.

As a follow-on to Ecological Budget UK, the One Planet Economy Network (OPEN) Strategy is being launched. This is outlined at www.ecologicalbudget.org.uk. The OPEN Strategy is arranged in three parallel streams:

- *building the evidence base:* accounting and analysis of UK consumption and production;
- *building the applications:* applying this evidence to the challenge of achieving a One Planet Economy in consumption and production; and
- *building the capacity:* promoting networks in order to mobilise the potential of public, private and civic sectors.

Ecological Budget North East is a significant step in understanding how the decisions we take every day affect the environment around us. It is also an essential step in creating a platform to enable us to move from the current North East "Three Planet Economy" to a One Planet Economy.

Contact details

Established in 1999, the Centre for Urban & Regional Ecology (CURE) carries out multidisciplinary research in three inter-related programme areas:

> Sustainable City-Regions;
> Landscape Impacts & Futures;
> Land Restoration & Management.

The common theme is the organisation and interaction of complex communities, both natural and human, at various scales from the local to the European. The research is underpinned by an advanced technical capability for spatial analysis, modelling and visualisation.

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SEI is an independent, international research institute specialising in sustainable development and environment issues. It works at local, national, regional and global policy levels. SEI has been engaged in major environment and development issues for a quarter of a century and has become established as a leading expert on the subject of Sustainable Consumption within Europe and especially the UK. Working closely with the European Environment Agency as well as national, regional and local governments, has ensured that the research is applied, relevant and timely. The Sustainable Consumption (SC) Group contributes to the overall SEI mission statement by bridging the gap between science and the policy arena.

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Established in 1961, WWF works to conserve endangered species, protect threatened habitats and address global threats, seeking long-term solutions that benefit both people and nature. WWF is committed to exploring alternative lifestyles based around sustainable consumption; this is a vital task which requires us to understand and measure the global environmental impact of our everyday decisions and actions. We also need to know where change is most beneficial and most needed – whether at a policy, economic, business or personal level. WWF's Ecological Footprint Programme has been developed to meet this need, providing all levels of government with the information and tools they need to make informed decisions, and developing models and case studies to demonstrate footprint strategies in action.

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Biffaward Programme on Sustainable Resource Use

Funded by:

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Objectives This report forms part of the Biffaward Programme on Sustainable Resource Use. The aim of this programme is to provide accessible, well-researched information about the flows of different resources through the UK economy based either singly, or on a combination of regions, material streams or industry sectors.

Background Information about material resource flows through the UK economy is of fundamental importance to the cost-effective management of resource flows, especially at the stage when the resources become 'waste'.

In order to maximise the Programme's full potential, data will be generated and classified in ways that are both consistent with each other, and with the methodologies of the other generators of resource flow/waste management data.

In addition to the projects having their own means of dissemination to their own constituencies, their data and information will be gathered together in a common format to facilitate policy making at corporate, regional and national levels.

More than 30 different mass balance projects have been funded by Biffaward. For more information on the Mass Balance UK programme please visit **www.massbalance.org**

The mission of WWF – the global environment network – is to stop the degradation of the planet's natural environment, and to build a future in which humans live in harmony with nature, by:
· conserving the world's biological diversity;
· ensuring that the use of renewable resources is sustainable;
· reducing pollution and wasteful consumption.

www.wwf.org.uk

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