



### Scotland's Global Footprint project

WWF worked with Aberdeen City, Aberdeenshire and North Lanarkshire Councils to reduce their local and global environmental impact.

The project:

- > measured footprint
- > developed a software tool to inform policy making
- > developed projects to reduce footprint and
- > produced education materials for schools.

The project explored some of the best examples of sustainable living and working by 'footprinting' different policy options for each area. What can achieve the greatest footprint reduction – an increase in recycling rates or improved energy efficiency, better public transport systems or car pooling?

For further details visit [www.scotlandsfootprint.org](http://www.scotlandsfootprint.org)

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Towards a low footprint Scotland

A report to  
Scotland's Global  
Footprint project

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**March 2007**



# Towards a low footprint Scotland

Living well, within  
our ecological limits



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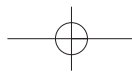
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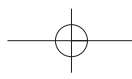
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# Executive Summary

Our homes, our communities and our lifestyles – what we buy and consume, the energy we use, what we do with our waste and how we interact with each other – have a huge impact on the global environment. The Ecological Footprint is a measure of this impact – it accounts for the resources we use to support our lifestyles, and compares it with what is available.



Today, humanity's Ecological Footprint is over 23% larger than what the planet can regenerate. In other words, it now takes more than one year and two months for the Earth to regenerate what we use in a single year. We maintain this overshoot by liquidating the planet's ecological resources. This is a vastly underestimated threat and one that is not adequately addressed.

In terms of Scotland's Ecological Footprint, if everyone in the world were to consume natural resources and generate carbon dioxide (CO<sub>2</sub>) at our rate, we would need three planets to support us. Of course, we only have one planet – and we're using its resources at a faster rate than it can replenish them.

The impacts are already being felt: collapsing fisheries, carbon-induced climate change, species extinction, deforestation, and the loss of groundwater in much of the world. And Scotland does not escape these impacts. For example, it is likely to suffer from increased flooding due to climate change, and its once great fishing fleets are reduced and operate under severe quotas.

### **Towards a low footprint Scotland**

This report demonstrates how we can live within the Earth's natural capacity and still enjoy a high quality of life. There are easy, affordable and attractive alternatives.

So what does a low footprint Scotland look like, and how do we get there?

In a low footprint Scotland we would live in warm, attractive homes that were highly energy efficient. These homes would be located close to our work, shopping, schools, and leisure facilities, reducing our need

**“we only have one planet – and we're using its resources at a faster rate than it can replenish them”**

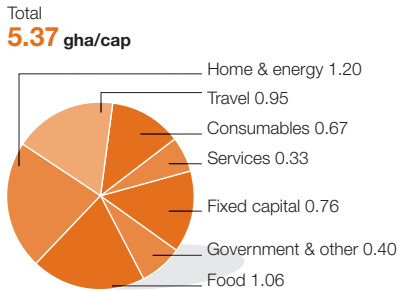
to travel. Our food would include a higher proportion of fruit and vegetables, from local and organic sources. We would have more time for our families and communities. Overall, it would be a high quality of life. Importantly, this quality of life would not come at the cost of other people or wildlife in other parts of the world. It would place Scotland at the leading edge of global initiatives to move towards more secure and more rewarding, low-carbon lifestyles.

But how do we know where to start? Which activities contribute most to our footprint and why? How much do we need to reduce our footprint and by when if we are to avoid serious global environmental damage?

### **Understanding Scotland's Footprint**

A sound understanding of Scotland's Ecological Footprint can go some way towards answering these questions. The largest components are transport, energy and food. These household activities make up over three-quarters of our footprint. How is this so?

The location of our homes and the quality and range of transport links have a great impact on how we travel to work or do our shopping. The quality of our homes determines how much energy we use. And the food we eat – where it comes from, how it is grown and packaged, and the type



#### Scotland's Ecological Footprint (gha/cap)

of diet – influence the size of our impact. In Scotland, transport accounts for over 20% of our Ecological Footprint, 30% for housing, and food makes up over 27%. Put in terms of our carbon footprint (carbon emissions based on consumption), these lifestyle choices make up a total of 6.54 CO<sub>2</sub> t/cap per year.

The key drivers behind the continuing growth in footprint are various. Current pricing mechanisms reward unsustainable behaviours – such as cheap weekend flights to Europe. Our consumer culture encourages the purchase of material goods beyond our needs, and evidence shows that such increased consumption no longer equals a growth in quality of life. Furthermore, the more we buy, the more we are outstripping any efficiency gains. It is clear that technology alone cannot fix the problem.

**“To achieve a low footprint Scotland, a 75% reduction in footprint is required by 2050.”**

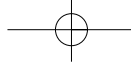
#### The goal – a low footprint Scotland

To achieve a low footprint Scotland, a 75% reduction in footprint is required by 2050. This target takes account of the fact that the area of bioproductive land and sea available on a global basis is due to diminish, based on UN projections for a moderate increase in population, resource use, and CO<sub>2</sub> emissions.

In terms of Scotland's own targets for CO<sub>2</sub> emissions reductions, Scotland needs to reduce its CO<sub>2</sub> emission level of 11.61t CO<sub>2</sub>/cap (58.6 Mt CO<sub>2</sub> in total) by more than two-thirds in order to reach the UK's self-imposed target of 3.5t CO<sub>2</sub>/cap in 2050. To put this in perspective, our housing carbon footprint already accounts for 3.24t CO<sub>2</sub>/cap on its own.

Obviously, this change will not happen overnight, but a reasonable course of action could achieve this change, while not diminishing quality of life. Indeed it could lead to a more equitable lifestyle for Scottish residents. Based on the evidence in this report, 50% of the required change must be delivered through resource efficiency and 50% through changes in consumption (e.g. choosing a more fuel-efficient car, insulating homes, eating healthier and travelling less).

To achieve this target, the analysis suggests a set of framework conditions, followed by a set of practical actions to set Scotland on the road towards a low footprint Scotland.



### Framework conditions for a low footprint Scotland

To enable communities to be sustainable, some basic fundamental conditions, implemented simultaneously, need to be put in place by the Scottish Executive:

> *Adopt the Ecological Footprint as a sustainable development indicator*

to inform decisions and develop strategies for a low footprint Scotland. Only by clearly understanding our environmental baseline will we be able to decide the necessary measures to move from 'three planet living' to 'one planet living'

> *With partners, develop the "It's Our Future" communications campaign*

so that it provides consistent information based on robust evidence followed up by clear policy commitments

> *Develop a strong community education component of 'Learning for our Future',*

Scotland's First Action Plan for the UN Decade of Education for Sustainable Development, based on the research outcomes of the SDC Report 'I Will if You Will'

> *Analyse each new infrastructure development*

to ensure that it contributes to sustainable consumption and production patterns. One bad decision could have consequences for years

"The Executive's good practice should lead the way for the rest of the public service."

to come. Building more roads destroys the concept of a compact city, building more runways will increase air travel. This means supporting projects such as decentralised renewable energy systems instead, as well as local transport networks

> *Explore all financial levers*

available to Scotland and work with the UK as appropriate, to remove unsustainable incentives and reward sustainable choices.

Within this framework, the following recommendations are proposed as *practical measures* which can be taken now to reduce Scotland's footprint:

> *Raise the energy efficiency of all houses*

**62%**

A comprehensive strategy needs to be in place that establishes how all existing houses in Scotland will be raised to a high energy-efficiency standard. To avoid the costs of retrofit in the future, all new homes should be zero direct carbon by 2016 at the latest. There is a potential for reduction in the housing footprint of 50%. A further reduction of 12% would be possible through behaviour change

> *Lead by example through public procurement*

**75%** The Scottish Executive should work to understand the impact of everything it procures along the whole supply chain, identifying areas to increase resource efficiency. The Executive should use this information to demand high standards in resource efficiency and requirements for continuous improvement. The Executive's good practice should lead the way for the rest of the public service and will generate new markets for sustainable products. There is a potential for reduction in the footprint of procurement of 75% by 2015

> *Set standards for sustainable healthy food in all public services*

**25%** Nutritional standards should be raised across public services such as hospitals, care homes and social services. Food represents a significant proportion of Scotland's footprint and this report demonstrates that a healthy diet, like the *Hungry for Success* initiative in schools, can also help reduce footprint. There is a potential for a 25% reduction in the food footprint of public services

> *Link transport and planning*

**30%** The National Transport Plan and regional transport strategies should explicitly link up with planning policies to achieve a reduction in the need to travel, stabilising CO<sub>2</sub> emissions from road transport by 2015 and setting them on a reducing trend. There is a potential for a 30% reduction in the transport footprint

> *Embed evidence based policy making in the Spending Review and National Planning Framework*

Both the National Planning Framework (and Strategic Development Plans in due course) and the Spending Review should be informed by the Ecological Footprint analysis and results presented to demonstrate how both will lead to a reduction in footprint. One mechanism to achieve this for planning could be through Strategic Environmental Assessments.

**Scotland's low footprint future**

Putting this road map into practice will be a serious and rewarding undertaking. This report has shown that people in Scotland are willing to adopt more sustainable lifestyles if they are given clear leadership by government. This leadership



must take the form of consistent and coherent policies which send the right signals to business and consumers. These signals should take the form of policies, fiscal levers, and communications and education. In particular, policies in the area of planning, transport, housing and food should be targeted. Last but not least, government should lead by example, with its own procurement and business travel.

This report has demonstrated how a low footprint lifestyle can be appealing and beneficial to society as a whole. Furthermore, it has discussed how the longer-term costs of not moving in this direction will far outweigh any investment made now to encourage lifestyle change. Scotland could be the first country in the world to seriously transform policy, communications and financial measures so that they reward sustainable living. Some of the measures may appear counter to traditional government pro-economic growth policies. In reality, these recommendations are a pro-Scotland, pro-quality of life approach which will secure Scotland's future.

“People in Scotland are willing to adopt more sustainable lifestyles if they are given clear leadership by government.”

# 1 Introduction

This report makes the case for a new vision for Scotland – a society enjoying a good quality of life, within the environmental limits of planet Earth. This should be the goal of any forward-thinking government in the 21st century. It means a secure future for its citizens, and contributes to the overall well-being of people and places around the world. To chart this course, first we must have a good understanding of what our environmental limits are, and how much of the planet's resources we are using already. This gives us a starting point against which to measure progress and guidance for setting our priorities.



Just as we now recognise the power of the global economy, we must also talk of global environmental impacts. Historically, we have addressed environmental impacts within our own borders – for example water and air pollution. To play its part in tackling climate change, Scotland has set targets to reduce its territorial emissions and is succeeding: greenhouse gas emissions have reduced between 1990 and 2005<sup>1</sup>, a period when the Scottish economy has grown by 29%<sup>2</sup>. This is a positive story and one of which Scotland should be proud.

However, to truly understand our *global* environmental impact is more complicated. We buy clothes from China, food from New Zealand and cars from Germany. The Scottish lifestyle is not solely underpinned by the Scottish economy. We need to look at the impacts of what we consume, wherever those impacts may occur. One of the best measures to assess this impact is the Ecological Footprint.

The Ecological Footprint measures the resources we use to support our lifestyles. Put in a global context, if everyone in the world lived as people do in Scotland, we would need three planets to survive. Clearly, we are living beyond the means of the planet, which is unacceptable in terms of social justice for now and the future. The Scottish Executive has already taken steps towards addressing this problem through its policies on waste, climate change and planning. Indeed, a key objective of Scotland's Sustainable Development Strategy is to reduce Scotland's global footprint<sup>3</sup>.

This report provides a route map for Scotland to move towards 'one planet living'

instead of 'three planet living'. It speaks in particular about the role of the Scottish government, though it acknowledges that everyone has a role to play – whether as individuals, business or government. It examines the current context of Scotland's consumption patterns including the key components of Scotland's Ecological Footprint and the main drivers behind current lifestyles. Based on this evidence, it then explores the most important opportunities in current and future government policy and practice.

The report concludes with a short set of recommendations which would set Scotland on the road to footprint reduction. They are radical, innovative, fresh ideas. Nothing less is required to meet the challenge of this generation – to live well, within the means of our planet.

## **SCOTLAND'S FOOTPRINT**

This report uses the Ecological Footprint to explore the ecological condition for the sustainability of Scotland. Occasionally it expresses this in terms of the 'Carbon Footprint' – or the carbon dioxide emissions from consumption – as this is such a key challenge for the future.

### **What is the Ecological Footprint?**

The Ecological Footprint measures how much land and water area a human population uses to produce the resources it consumes and to absorb its wastes, including carbon dioxide emissions, under prevailing technology<sup>4</sup>. Today, the global Ecological Footprint is over 25% larger than that which

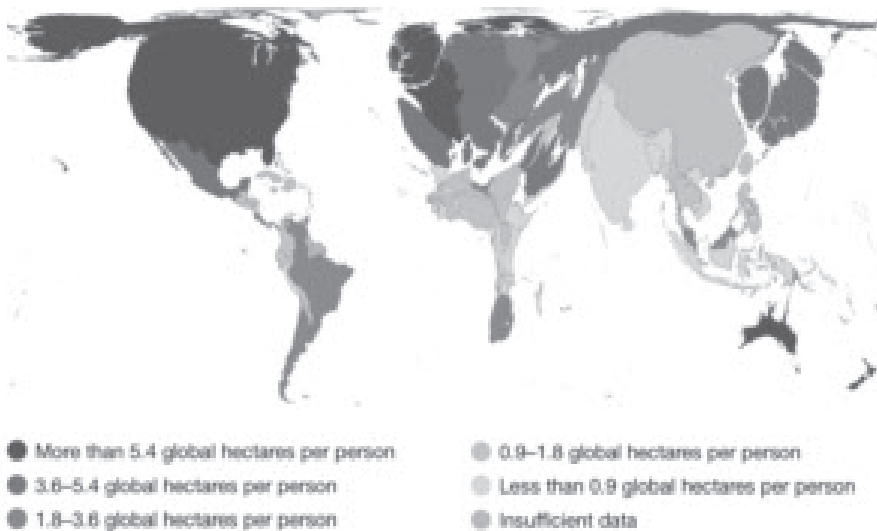
“In industrialised countries, typically 60-75% of the Ecological Footprint is made up from carbon dioxide emissions.”

the planet can regenerate. In other words, it now takes more than one year and three months for the Earth to regenerate what is used in a single year. This overshoot is maintained by liquidating the planet's ecological resources, which is clearly unsustainable in the long term.

The average Ecological Footprint of a person in Scotland is 5.37 global hectares<sup>5</sup>. This is slightly above the UK average and it ranks approximately 14th in the league table of national footprints as provided by

#### BOX 1 FOOTPRINTS ACROSS THE WORLD

In the map below, each country's size represents its share of the global Ecological Footprint. Scotland, along with most of the developed world, uses some three times what would be considered its 'fair share'. (Living Planet Report 2006, WWF)



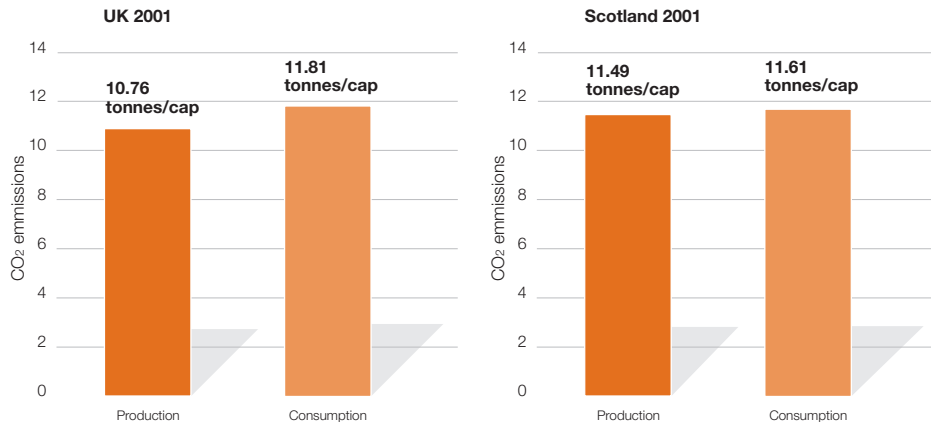


Fig 1 **Comparison between Production and Consumption based approaches to accounting for CO<sub>2</sub> emissions**

the *Living Planet Report*<sup>6</sup>. In contrast, if the Earth's resources were divided equally among the world's population, each person would have just under two hectares. The Ecological Footprint clarifies the relationship of resource use to equity by explicitly tying individuals' and groups' activities to ecological demands. These connections help decision makers more accurately and equitably shape policy in support of social and environmental justice.

In industrialised countries, typically 60-75% of the Ecological Footprint is made up of carbon dioxide emissions<sup>7</sup>. The remainder accounts for the land and sea required for food, timber, fish, biomass, clothing, etc. The fact that nearly three-quarters of the Ecological Footprint comes from carbon emphasises the vital importance of tackling climate change emissions.

The Scottish Executive is committed to measuring Scotland's footprint in 2008<sup>8</sup>, which when compared with earlier measurements,

should provide a good understanding of progress towards footprint reduction.

It should be noted that the Ecological Footprint does not measure the quality of the natural environment. A high quality environment benefits our quality of life, for example by maintaining the soils that we depend on for food production and water regulation, by enhancing our local surroundings, by supporting the wild animals and plants that we enjoy and make use of for medicines, food etc. So it is important that the footprint is seen alongside measures of biodiversity, as well as social and economic progress.

### **What is a Carbon Footprint?**

The Carbon Footprint measures the carbon dioxide emitted based on the domestic consumption of goods and services, rather than production. These arise in stages throughout production, distribution, use and disposal. It is therefore crucial to cover the

various stages of the lifecycle in a systemic way. The coverage of the complete supply chain of product groups in this way provides a full Carbon Footprint.

When calculating carbon emissions according to international climate change agreements, the responsibility for the emissions is attributed to the producer. Therefore, a country with a large industrial base will often have higher per capita emissions than countries based on a service economy. In Scotland, we have seen a significant shift towards a service-based economy and a decline in heavy manufacturing. This trend has been partly responsible for the reduction in carbon emissions (from a production perspective). However, the emissions calculated from a consumption perspective have not declined since people import more carbon intensive goods rather than producing them locally

The flip side of the coin is the increasing carbon emissions in China and other parts of Asia. A good proportion of those emissions are created by demand for Chinese goods and services in Scotland and elsewhere in the developed world. However, due to the current accounting system, these are not attributed to the consumers.

When based on consumption, the UK's emissions increase by between 10 and 16%<sup>9</sup> (see Figure 1). DEFRA has recently commissioned the Stockholm Environment Institute to produce a time series of this indicator and improve the robustness of the methodology, following on from a commissioned review of methodologies.

In Scotland, the variation is not so significant. In fact, emissions from production

**“A good proportion of China’s emissions are created by demand for Chinese goods and services in Scotland and elsewhere in the developed world.”**

and consumption are almost identical, i.e. Scotland consumes the same amount of material that it produces. This partly explains the reason the variation is so small. Scotland’s consumption carbon emissions are about 3% lower than the UK average. While this variation is small, the consumption approach provides a valuable set of accounts to assess the effects of policies aimed at changing behaviour.

### **Which footprint?**

The Ecological Footprint is an important resource accounting tool of which carbon forms a significant part. It is the best measure available for telling us whether or not we are living within the limits of the planet. It is a strong communicator and can be used as an indicator, to inform policy and in education.

While some concerns remain regarding its credibility, significant advances have been made in its methodology and an international standard was adopted in 2006<sup>10</sup>. In the UK, devolved administrations and many regions and local authorities have adopted it as a measure of progress towards sustainable development.

The Carbon Footprint has gained attention

more recently, given the profile of the climate change debate. There is little doubt that this measure is useful in climate change policy circles where discussions are already focused on carbon emissions. This report defines the carbon footprint as: “The Carbon Footprint is a measure of the total amount of carbon-based emissions that can be attributed to an activity, product or process taking into account the full life cycle.”

### **Footprints and Scottish Executive policy**

As noted above, the Scottish Executive is already committed to reducing Scotland's footprint. It supports Scotland's Global Footprint Project<sup>11</sup> along with other partners, promoting the use of the Ecological Footprint with local authorities and schools. In terms of carbon emissions, it has already set a target to exceed the ‘Scottish Share’ of territorial carbon dioxide emission savings required by the UK<sup>12</sup>.

By using the consumption approach, the Ecological Footprint tells us whether or not this target is being achieved by shifting the burden of responsibility to other parts of the world that are producing the goods – with Scotland still consuming at the same rate.

Looking at the big picture, Scotland needs to reduce its Ecological Footprint by 75% in order to achieve a ‘lower footprint Scotland’ by 2050. This means a year on year reduction of 3%. This target takes account of the fact that the area of bioproductive land and sea available on a global basis will diminish according to UN projections for a moderate increase

in population, resource use and CO<sub>2</sub> emissions. In terms of CO<sub>2</sub> emissions, Scotland needs to reduce its CO<sub>2</sub> emission level of 11.61 t CO<sub>2</sub>/cap<sup>13</sup> (58.6 Mt CO<sub>2</sub> in total) by more than two-thirds in order to reach the UK's self-imposed target of 3.5 t CO<sub>2</sub>/cap in 2050.

There is no doubt that this is a hugely challenging target. However, the Stern Review highlights the risks to the economy if no action is taken:

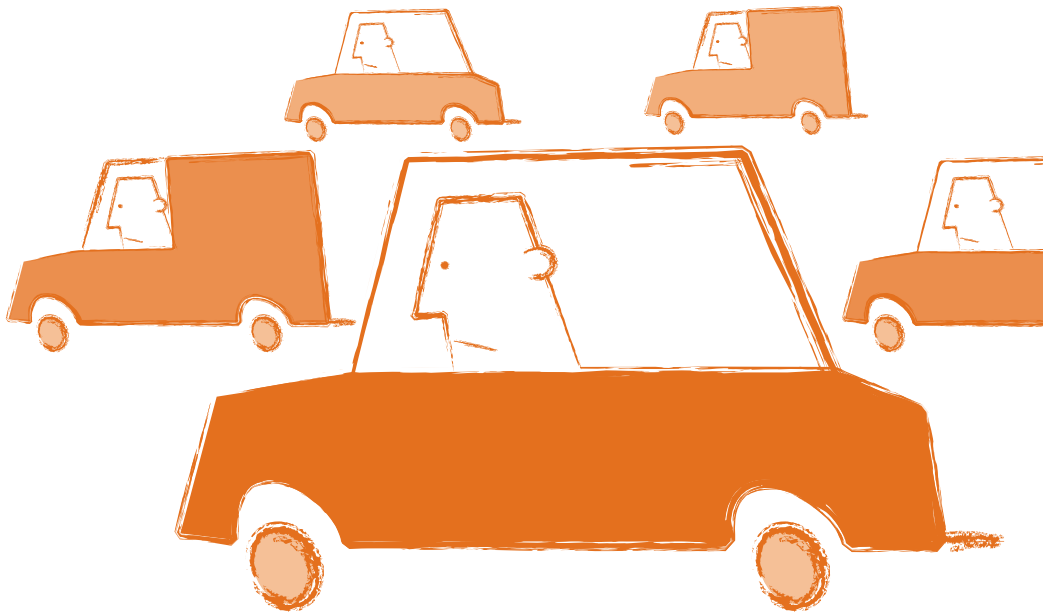
*“The overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider (and likely) range of risks and impacts (e.g. on environment and health, positive feedbacks, etc) is taken into account, the estimates of damage could rise to 20% of GDP or more<sup>14</sup>.”*

A ‘low footprint Scotland’ should be our goal. By looking at the way we live and the opportunities for change this report shows what needs to be done to get there.

**“By using the consumption approach, the Ecological Footprint tells us whether or not this target is being achieved by shifting the burden of responsibility to other parts of the world that are producing the goods – with Scotland still consuming at the same rate.”**

## 2 The Scottish picture

At the heart of Scotland's global environmental impact are our lifestyles. Three-quarters of Scotland's footprint, and its consumption emissions (8.57t CO<sub>2</sub>/cap)<sup>15</sup> are triggered by the choices of Scottish households in their everyday activities<sup>16</sup>. Tackling these goods and services – their production, distribution, choice, use and disposal – is the key priority for reducing footprint and for meeting climate change targets.





### THE BIG HITTERS

The 15 domestic consumption activities with the highest Ecological Footprint and Carbon Footprint, are shown in Figure 2<sup>17</sup>. These activities account for over 85% of the total household Ecological Footprint and Carbon Footprint in Scotland. They provide an excellent starting point for looking at how more sustainable lifestyles can be achieved. If we group these activities into key consumption areas, more than 60% (5.74 t CO<sub>2</sub>/cap), of carbon dioxide emissions are associated with consumption related to travel and housing: the latter represented in the chart as gas, fuel and electricity use in the home. The Ecological Footprint also reminds us of the importance of food, which represents 27% of the total household

footprint. These three activities are the focus of analysis in this report.

### Who lives a one planet lifestyle?

Environmental impacts of lifestyles in Scotland can vary significantly. In Figure 3, this is shown in terms of the Ecological Footprint on a spatial scale. West Dunbartonshire has the smallest Ecological Footprint. The residents of Edinburgh, along with Orkney, closely followed by the north-east local authorities have the highest. The variation in Ecological Footprint of households by local authority area is nearly 20%. However, in none of the local authority areas do people live close to a one planet lifestyle.

At a glance, it is easy to see that the more affluent parts of Scotland tend to have a higher footprint than those in areas of

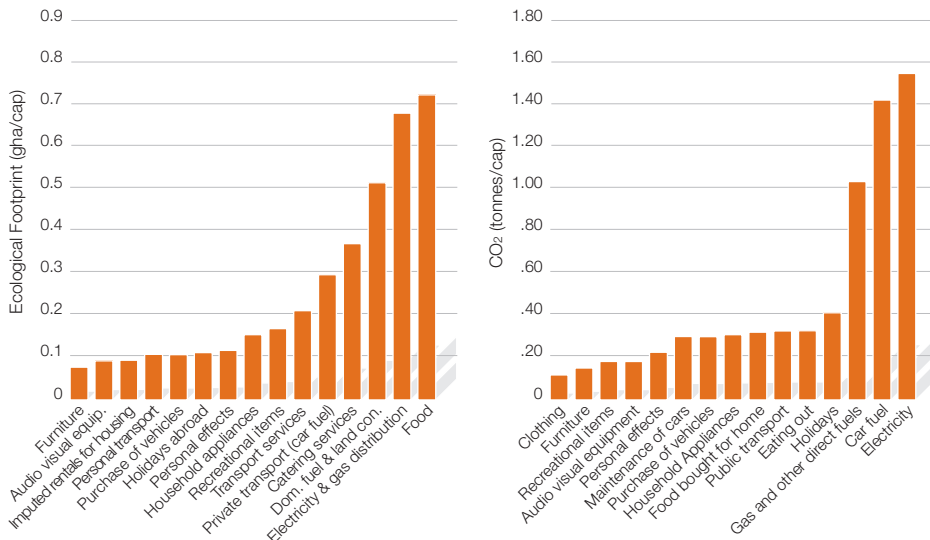


Fig 2 The 15 highest impact consumer items in Scotland, for Ecological Footprint and Carbon Footprint

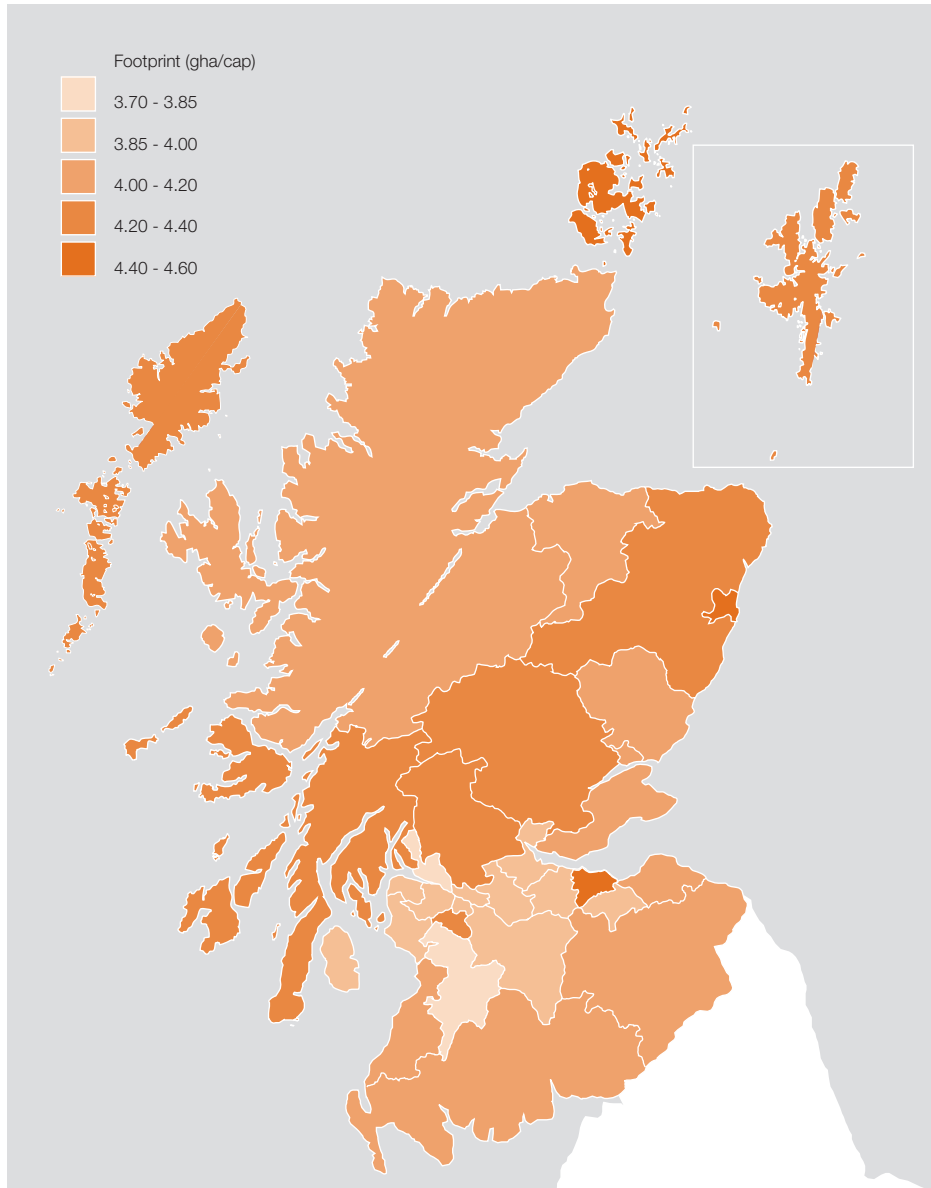


Fig 3 Ecological Footprint of Household<sup>18</sup> Consumption in Scotland by local authority area

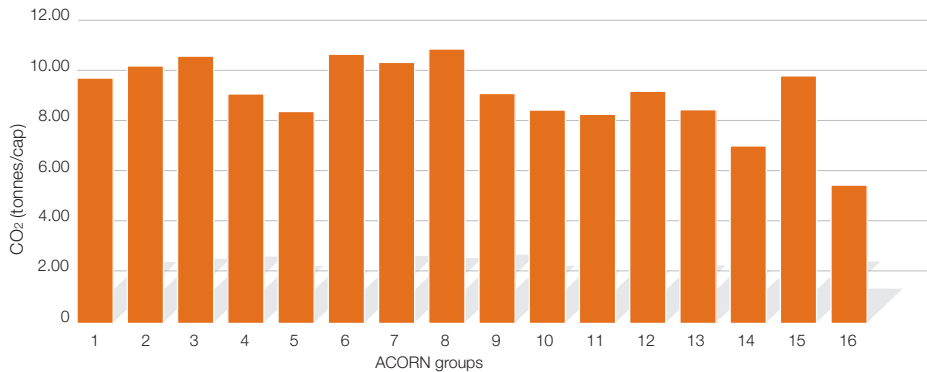


Fig 4 Carbon dioxide emissions of ACORN groups

deprivation. So the challenge for policymakers is not a simple ‘reduce your footprint’ message. It is how to achieve a good quality of life for all in Scotland, while reducing our overall footprint. This may mean parts of Scotland which already have a low footprint, such as North Lanarkshire, will seek to eradicate poverty without increasing footprint, while areas like Aberdeen City will seek an outright reduction.

Bigger variations among individuals can be observed by comparing socio-economic groups. Figure 4 focuses on the per capita CO<sub>2</sub> emissions from shopping baskets of 16 different Scottish households clustered according to the ACORN classification<sup>19</sup>. The CO<sub>2</sub> emissions of Group 8 “Better-off Executives”, for example, are twice as high as those of Group 16 “People in multi-ethnic low income areas”. However, the latter is still 2t CO<sub>2</sub>/cap above the government’s target of 3.5 t CO<sub>2</sub>/cap by 2050 without even factoring in emissions from government and capital investment. These results are also available as Ecological Footprints.

To form effective policies, it is crucial to understand the driving forces behind these consumption patterns. Income and expenditure levels of households in Scotland are by far the most important in determining their footprint<sup>20</sup>. Even though people make greener *choices* with increasing income, their global environmental impact tends to increase as they can buy more things. Although better-off people may buy better quality – and longer lasting – items, they also buy bigger ones.

Besides income and expenditure levels, there are a number of factors behind the global environmental impact of Scottish households. Increasing house size *increases* CO<sub>2</sub> emissions from households, while increased occupancy *reduces* impact on a per person basis. The influence of education is more mixed. While more-educated households tend to emit larger amounts of CO<sub>2</sub> in absolute terms, their impact per pound spent is lower. This either means that people with higher levels of education make more informed choices (with respect to the

environment) or that people with lower levels of education – usually with lower incomes – cannot afford to live a “greener lifestyle”. Both explanations are of relevance and have important policy implications.

Interestingly, households that use the internet tend to have lower CO<sub>2</sub> emissions. By moving from books to bytes, from compact discs to MP3s, from cheque books to ‘clicks’, and reducing the need for travel, the internet does offer opportunities to “dematerialise”, “decarbonise” and “demobilise” Scottish society<sup>21</sup>.

## KEY DRIVERS TO A RISING FOOTPRINT

### Consumer society

We are living in an age of *over-production* and *over-consumption*. At current resource prices, producers will sell more and consumers will buy more than in a situation where the full costs were reflected in the market price. We also live in a consumer culture, where billions of pounds are spent every year on the generation of new wants for goods. Many of the material objects we

“Policies aimed at achieving well-being rather than economic growth as an over-riding objective are appealing to many and may provide the necessary new perspective to achieve a strong, healthy and just society within global limits.”

buy have taken on a deeper social meaning, for example, in terms of status or our identity.

There is a close relationship between consumption and well-being, but only until basic needs are met. Once these needs have been met, as they have been for most people in Scotland, the relationship breaks down and additional consumption does not necessarily increase human well-being<sup>22</sup>.

Despite these facts, talking about merits and positive welfare implications of thriftier lifestyles will be ignored by the majority of people. People are just not willing to “sacrifice” consumption. But policies aimed at achieving well-being rather than economic growth as an over-riding objective are appealing to many and may provide the necessary new perspective to achieve a strong, healthy and just society within global limits. This would not only have positive environmental effects. As a cross-cutting issue, freeing up more “time for life” could also contribute to the establishment of healthier communities, the strengthening of social cohesion, and improving people’s quality of life.

### Current pricing rewards unsustainable lifestyles

Figure 5 shows the carbon dioxide emissions per £ spent on different domestic consumption activities. Again, transport and household energy use have the highest emissions per £ spent, closely followed by holidays. Within each of these consumption categories, there are more and less carbon intensive activities. Current pricing mechanisms tend to encourage activities that produce more rather than less

emissions. For example, although prices vary, it is fair to assume that it is now possible to buy a return ticket from London to Barcelona for £70. That £70 covers a journey of 2,200km at the expense of 0.17 tonnes of carbon dioxide: 2.5kg of CO<sub>2</sub> per £ spent. In terms of climate change, this short flight has a far higher impact per £ spent than any of the other consumption activities.

This analysis becomes very important when we look at the “Rebound Effect” in the next section.

### The rebound effect

Many of the gains that are often made in energy efficiency, or even changes in our consumption patterns, can be lost due to the rebound effect. Rebound effects occur because efficiency improvements make

“Many of the gains that are made in energy efficiency can be lost due to the rebound effect.”

certain activities cheaper compared to others. Fuel efficiency improvements in a car, for example, not only save fuel and CO<sub>2</sub>, they also reduce the price of car travel. This could lead to an increase in the demand for car travel, using up some of the CO<sub>2</sub> savings. At the same time, it might leave some money in the pocket of the consumer, who will spend the saved money on other consumption activities, cancelling out more carbon savings.

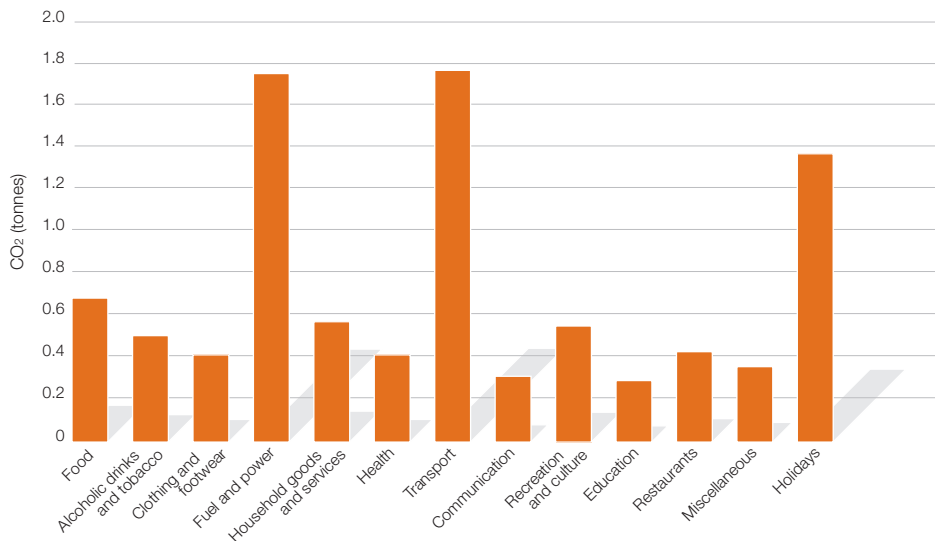


Fig 5 The carbon dioxide emissions per £ spent on different consumer items<sup>23</sup>

Rebound effects are not only triggered by resource and energy-saving innovations, but also by time saving. Two effects of the introduction of time-saving devices on energy use need to be distinguished.

First, the introduction of time-saving devices often increases the energy required for the service. A good example is transport, where faster modes are usually more energy intensive per mile travelled. Other examples are washing machines, dishwashers or tumble dryers.

Second, time-saving innovations can increase households' demand for the service. For example, most Edinburgh to London train journeys take five hours. A high speed train could reduce travel time to three hours. This will encourage more people to take the train, who might otherwise have taken the car. It might also stimulate new demand, because the time saving offers new opportunities. People might decide to live in Edinburgh

and work in London or visit a friend for a day.

The only way to counteract the rebound effect is through fiscal levers. Incentives, subsidies and grants can provide a pricing framework which minimises the rebound effect by rewarding more sustainable behaviours.

### Technology alone can't fix it

Can we solve global environmental problems solely through technology? Can resource and energy efficient re-design of products and services and the use of the best available technology in their production, distribution, use and disposal provide the answer – without changing the way we live and consume? How far have we got to improve the efficiency in our use of energy and resources to achieve this?

Figure 6 shows the relationship between energy consumption and growth in economic output since 1990 in the UK. Triggered by substantial energy efficiency improvements, there is a clear process of de-coupling taking place between the two. However, it is only relative de-coupling: while less energy was required per unit of economic output, energy consumption still increased overall. Hence, energy savings were "eaten-up" by the energy required for more production. In order to achieve the Scottish Executive's Climate Change targets, a process of absolute de-coupling will be required, which reduces the total amount of energy used every year.

Serious attempts to change consumption patterns, which can only be triggered by a comprehensive change in incentive systems including prices, have never been made by any government in the world.

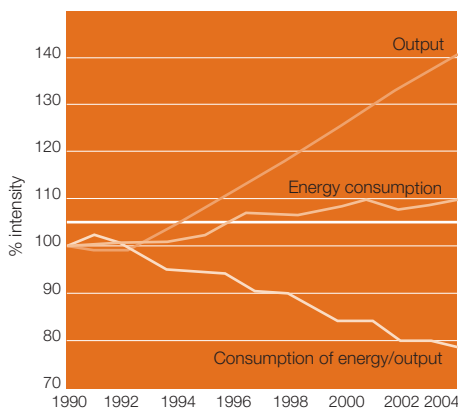


Fig 6 The relationship between energy consumption and growth in economic output since 1990 in the UK (ONS, 2006)

“A change in consumption patterns can only be triggered by a comprehensive change in incentive systems including prices.”

### CONCLUSIONS – SCOTTISH CONTEXT

The analysis of the Scottish context results in the following conclusions:

- > Scotland’s Ecological Footprint is three times its ‘fair share’
- > Over three-quarters of Scotland’s footprint comes from household consumption – mainly energy, transport and food
- > High income and expenditure levels result in higher footprints.

The key drivers are:

- > Current pricing rewards unsustainable behaviours
- > Increasing consumption is outstripping efficiency gains
- > Efficiency savings can lead to a ‘rebound effect’ – leading to increased footprint.

This analysis raises some key areas for policy consideration. First, there is a link between wealth creation and increasing footprint. While government policy may talk about decoupling the economy and environment this is clearly not happening. Second, there is considerable variation in the footprint of people in Scotland. Finally, the current situation is unsustainable and reductions of 75% are required to achieve

a sustainable lifestyle for everyone in Scotland.

While achieving this change towards a low footprint Scotland may seem impossible, this analysis actually provides the direction and focus needed to frame policies which will work:

- > Priority must be given to home energy use, food and transport
- > Solutions need to be tailored to different geographical locations and different socio-economic groups
- > Pricing signals must reward sustainable behaviour
- > Government policies should aim for increased well-being and not economic growth per se.

The following section discusses the opportunities at hand given this analysis and focuses on infrastructure and housing, transport, food, and communities and individuals.

# 3 Unleashing the opportunities

The infrastructure in which we live helps determine our environmental impact. It determines where we shop, how we get around and what we do in the evenings. The long-term nature of infrastructure gives it a particular importance in the context of a sustainable development. With each project we bind ourselves to a certain development path.





Over three-quarters of Scotland's Ecological Footprint (or 60% of all household carbon emissions) is related to three consumption categories – housing, travel and food. As these categories are so important, this report focuses on the policy opportunities related to them.

## HOUSING

With 30% of the Ecological Footprint, or 3.24 tonnes of CO<sub>2</sub> per person per year, housing has the highest footprint across household consumption categories in Scotland. The significance of this figure becomes clear as soon as we consider that it is the declared goal of the government to reduce the *total* CO<sub>2</sub> emissions per person in the UK to 3 tonnes by 2050. The technology is available and economically viable to do this, but only very modest progress has been made so far.

For example, the heat loss of the average house in the UK reduced by 31% between 1970 and 2001. Figure 6 shows that in 2001 energy consumption would have been 46% higher without the energy savings taking place since 1970. However, these efficiency improvements have just been sufficient to restrain the growth in direct energy demands of the housing stock<sup>24</sup>, which continues to rise<sup>25</sup>.

In order to design effective policies to maximise energy efficiency, it is important to understand the underlying barriers to change:

### > *Lack of price incentives*

There is no great price incentive for households to reduce their energy bill. Increased competition triggered by the

privatisation of energy markets in the UK since the 1980s has let energy prices fall. While the average family in 1970 spent 6.3% of its income on energy, this was only 2.9% in 2001. We now spend more on alcohol than we do on energy, and energy use continues to rise<sup>26</sup>.

### > *Lack of enforcement and institutional barriers*

Even though it is economically the best long-term solution, new houses built at Eco-Home Excellent Standard require a higher initial capital investment of 2% more than conventional houses. While 84% of buyers are prepared to pay this, the construction industry remains conservative<sup>27</sup>. Fear of competitive disadvantages through this higher investment and a lack of awareness of climate change concerns have resulted in a stand-still. A recent BRE study found that one-third of new homes did not achieve even the current energy efficiency standards. The new requirement in England for all new houses to be 'zero-carbon' by 2016 will hopefully drive significant gains in this area<sup>28</sup>.

### > *Turn-over period of houses*

Every year less than 1% of the housing stock is replaced with new homes. This dictates the pace with which less energy-efficient houses can be replaced with more efficient ones. Even if all new houses were built to achieve Eco-Home Excellent Standard, this would only compensate for the additional energy demand from

## BOX 2 THE ENERGY WASTERS

A recent comparison<sup>30</sup> of energy wasting habits in five European countries revealed that people in the UK have the most wasteful patterns of energy use in their everyday life. British people often leave their appliances on stand-by, electric chargers plugged-in, lights switched on even though nobody is in the room, use the car for short journeys, or leave the engine running while the car is stationary. The same report claims that Scottish people are even slightly more wasteful in their energy use than the average Briton. The study predicts that £11bn and 43 million tonnes of CO<sub>2</sub> emissions will be wasted in the UK by 2010 unless energy wasting habits are curbed. The amount of energy wasted would power seven million homes for one year based on current energy efficiency standards. As energy use has one of the highest climate change impacts per £ spent, reducing this wastage is essential.

the increased number of households. This increase in households is driven by reducing occupancy rates<sup>29</sup>.

### > *Other demand-side barriers*

A significant reduction in CO<sub>2</sub> emissions from housing also requires retrofitting of the whole housing stock with better insulation, boilers, draught-proofing, etc. The lack of environmental knowledge and the difficulty in finding appropriate information are important issues behind the lack of willingness to invest in making our homes more energy efficient. Within the current incentive systems, energy providers are interested in selling more units, while consumers prefer to invest in a second house rather than retrofitting their current one.

### **Opportunities for housing: changing the way we do business**

Three key opportunities exist in reducing the

footprint of the housing sector:

- > build better houses
- > retrofit old ones
- > reward resource efficiency

In terms of building better houses, the technology is in place; the cost to build houses to a high energy standard is minimal and the construction industry is calling out for a “level playing field”. All this points toward a Scottish Executive response imposing radically high buildings standards combined with an education programme for the construction industry and rigorous enforcement.

While important, Figure 8 demonstrates that such a policy will compensate for the change in household occupancy but nothing more, as housing stock turns over only 1% a year.

Therefore, retrofitting is by far the most important policy option for the Scottish Executive. This can be achieved in a number of ways – through subsidies, grants, and

### BOX 3 DRIVERS OF ENERGY CONSUMPTION IN THE HOME

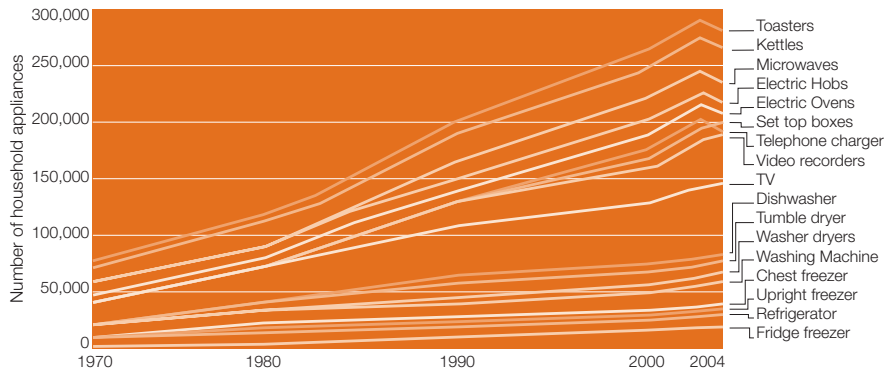
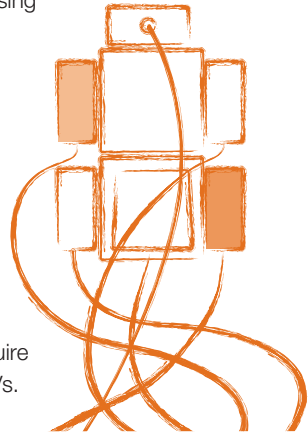


Fig 7 The drivers of energy consumption in the home

A-rated household appliances such as fridges, freezers or dishwashers have penetrated the UK market within the last five years. The least efficient new freezer currently available, for example, consumes less than half the energy of the least efficient freezer eight years ago<sup>31</sup>. However, the total energy requirement to feed all domestic appliances has more than doubled since the 1970s and is still increasing.

Households use more and more household appliances in their daily activities.

The number of TVs, for example, has been steadily increasing since 1970. In 2003, there was more than one TV per person in the UK. Moreover, there are more and more electrical devices appearing on the market for household use (such as mobile phones and home computers). Many of the electrical goods are also becoming bigger, cancelling out many improvements in resource efficiency, e.g. computer screens, TVs, but also fridges and freezers. Finally, not all innovations in product developments are more energy efficient. While LCD screens reduced the energy consumption of computer screens by more than half, high definition plasma TVs require four times the amount of energy compared to traditional TVs.



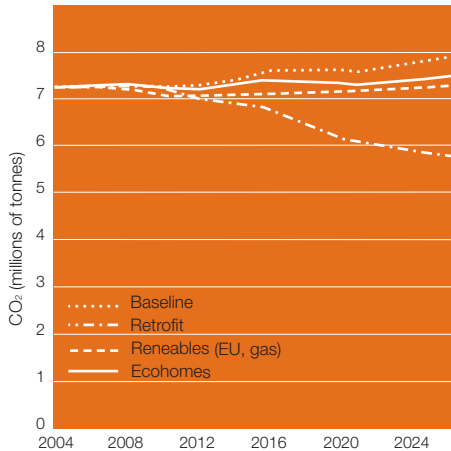


Fig 8 Potential reduction in the CO<sub>2</sub> Emissions of different housing options for the Leeds City Region

extending building regulations to require improvements in existing homes, e.g. replacement of inefficient heating systems.

At a UK level, a change in the way energy and other services are provided to the home could provide the right incentives. Energy Service Companies will sell the service (a warm home) rather than the product (units of electricity). They will have a greater interest in durability rather than “in-built-obsolence”, in saving resources rather than selling as many as possible.

In the case of housing, energy service companies will have an incentive to retrofit houses and put in more energy efficient heating equipment. Households will benefit from cheaper energy bills. Such a system is currently being piloted in England and the Scottish Executive should participate in the study to gain maximum advantage of its results.

Finally, policies which favour energy efficient products and prohibit product developments which are big consumers are necessary. While product regulation is a UK or EU matter, there are opportunities for the enterprise network to exact high resource efficiency standards from those businesses it supports, and for all public services to demand such standards through their procurement.

## TRANSPORT

Transport represents 22% of Scotland's footprint, or 2.5 tonnes of CO<sub>2</sub> per person per year. Despite fuel efficiency improvements in the range of 10% since 1997, the direct emissions from private transport have risen, driven by an increase of 450 to 500 billion vehicle kilometres. However, people not only travel more by car, they also fly more and travel more by train. Overall, Scottish people left the UK almost twice as often in 2003 than in 1993. Because this happens most often by plane, it is not surprising that it is estimated that CO<sub>2</sub> emissions from aviation will overtake those from road transport within the next 10 years<sup>32</sup>.

We are travelling further and further each year. More roads, better train connections and more airports stimulate additional demand for travel. Even though there is technological potential to make travelling more efficient, there is a need to reduce the absolute amount of travel to reduce our footprint. There are two major barriers:

- > The price signals in the transport market

## “The greatest opportunities exist in urban planning based on the concept of a compact city.”

people will spend their holidays further and further away from home.

- > We have locked ourselves not only into an infrastructure that favours car travel, but also long distance travel in general. It gets easier and easier to commute long distances and we need to drive further and further to buy goods.

### **The compact city**

Instead of identifying a range of transport options such as car sharing, restricted parking, road pricing and car clubs, this report argues that the greatest opportunities exist in urban planning based on the concept of a *compact city* with short distances between residential areas, working, and shopping locations. A *locational approach* recognises that new plants and offices need to be located close to public transport links and ideally be accessible by walking and cycling (“business in the right place”).

Policy measures include the National Planning Framework and Regional Development Plans focusing on mixed-use developments which are accessible and supported by public transport. There are several cities across Europe which have taken this approach in the last 20 years. Groningen in the Netherlands is one of the best where incorporation

of environmental criteria into traffic control policy and the systematic creation of infrastructure that favours bicycle use have ensured that 66% of all journeys are undertaken by walking or cycling<sup>33</sup>.

Considerable opportunity exists in integrating housing and transport policy and creating successful, vibrant communities that are low footprint because they are places where people want to live, work and play. Regeneration projects in particular are a place to start. There is no excuse for areas of social exclusion and economic disadvantage to suffer from poorly planned infrastructure which is far away from jobs, services and keeps them in fuel poverty – placing residents at further disadvantage.

Scotland’s Sustainable Development Strategy notes, “We need to get much smarter at planning for and delivering sustainable development at the outset, whether through new infrastructure investment...housing development or community regeneration<sup>34</sup>.”

### **FOOD**

Food represents 27% of Scotland’s footprint, or 0.8 tonnes of CO<sub>2</sub> per person per year. A recent study for Scotland’s Global Footprint Project demonstrates that improving people’s diets will provide benefits for the environment and individuals’ health<sup>35</sup>. Lifestyle change can sometimes be much better encouraged by identifying areas where environmental improvements go hand-in-hand with improvements in health.

Not only are we eating too much, but also too much of the wrong things and

too little of the right things. After smoking, Scottish eating habits are the second most important cause of the nation's poor health. The average Scottish diet is low in cereals, vegetables and fruit but high in confectionery, fatty meat products, sweet and salty snacks, cakes, and excessive amounts of sugary drinks and alcohol. Poor diet contributes to a range of serious illnesses, which include coronary heart disease, certain cancers, strokes, osteoporosis and diabetes.

In Scotland, more than 65% of men and 59% of women are overweight, including 35% of primary school pupils and around 65% of 11 to 12 year olds. The *Hungry for Success* initiative by the Scottish Executive<sup>36</sup> has begun to address health education and health promotion in schools. For the first time in the UK, national nutrient-based standards for school lunches have been introduced, and are expected to become legally binding.

### Healthy diet, healthy planet

A healthy food selection consists mainly of fruit and vegetables, wholegrain products, potatoes, legumes, milk and dairy products, nuts and seeds. If such a change in diet takes place, the consumption of meat, fish and eggs is reduced<sup>37</sup>.

At the same time, food production, processing and consumption have significant environmental impacts, and certain eating habits place unnecessary burdens on the environment. Results show that a healthy food selection also reduces the environmental impact of food. In essence:

- > A healthy diet based on nutrition recommendations can reduce the footprint

by 15 to 25% compared to the average Scottish diet

- > The Ecological Footprint can be reduced further by choosing vegetarian options and by buying local and organic food
- > A diet that does not contain meat but high amounts of dairy and egg can have a higher Footprint than a healthy option that includes animal products in moderation.

A "Best Diet" that serves both health and the environment is one that combines all four criteria (healthy, vegetarian, local, organic) and can reduce the Scottish food footprint by around 40%. Introducing such a diet in all meals provided by public services would reduce Scotland's footprint, enhance healthy eating at those venues, and create a demand for local and fresh foods.

### LOOKING AT COMMUNITIES FOR INDUCING CHANGE

Mounting evidence highlights that behaviour change is usually linked to some kind of community action. The *I will if you will*<sup>38</sup> report provides many reasons for this, principally suggesting that at the community level we think as a collective and not as an individual, believing that a greater good will prevail. Individuals working together do not feel that their contribution to a more sustainable lifestyle is worthless. The community acts to define acceptable and unacceptable behaviour.

This report provides two examples of communities which have achieved more

towards footprint reduction by working together rather than as individuals: an Eco-Team in Nottingham and the Findhorn Community.

### The Eco-Team project

The Eco-Team project, which has been running for the past three years in Rushcliffe, has now expanded across Greater Nottingham. An Eco-Team is a group of 6-8 households who meet once a month for four months to share ideas and work together to learn simple yet effective lifestyle changes to become more environmentally friendly whilst improving their quality of life. During these meetings the group discusses personal experiences, ideas and achievements related to environmental household behaviour. They share different ways to reduce their use of electricity, gas and water as well as decrease the amount of rubbish they throw away.

By the end of three years, the Eco-Team

had reduced their Ecological Footprint by 13%<sup>39</sup>.

### Consuming differently and consuming less

The Findhorn Community, while not typical of most Scottish communities, offers some lessons in sustainable living. This community has one of the lowest footprints of any community in the UK. The average Ecological Footprint of a Findhorn resident is 2.7 gha/capita – 50% lower than the average Scottish resident.

Looking at the separate consumption categories, the food footprint is 60% lower than the Scottish average due to a diet very low in animal products, combined with local and organic food. A significant proportion of food is produced “on-site”. In terms of housing, the community benefits from on-site renewables. Certain renewable energy

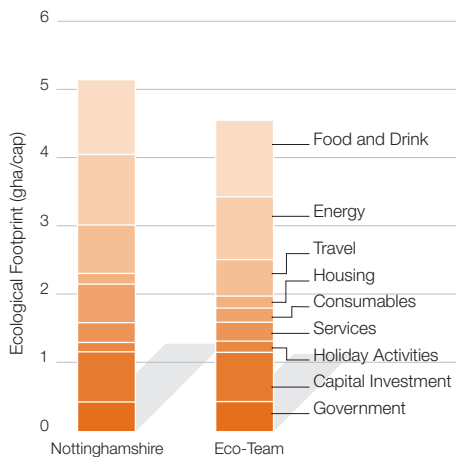


Fig 9 The Ecological Footprint of an Eco-Team in Nottingham

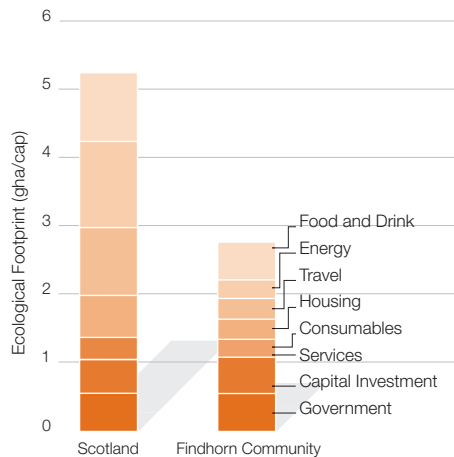


Fig 10 The Ecological Footprint of the Findhorn Community

renewables. Certain renewable energy systems work best when providing energy for a number of houses.

The land travel footprint is more than 70% lower than the national average. More sustainable transport modes are used but, more importantly, the distance travelled is significantly reduced. The average Findhorn resident travels about 3,750 kms a year compared to the national average of 10,000 kms. All leisure, work, residential and shopping facilities are provided within one location. This touches on the idea of “zoning”, ensuring that all major facilities can be located within a certain distance of one’s home. It also has the added advantage of introducing a sense of community.

In terms of consumables and services, it has a 40% lower footprint than the national average. Findhorn residents simply buy less and share resources. This lifestyle is reinforced in a place like the Findhorn community where it is unlikely that you would receive positive praise for buying energy-wasting appliances or cars.

Where Findhorn is different from more mainstream attempts to build sustainable communities is the conviction of the individuals. While some housing association developments in Scotland are car-free and boast energy efficient designs, the residents are not necessarily committed to the lifestyle change, failing to take advantage of the potential for footprint reduction<sup>40</sup>. Winning the “hearts and minds” of the community to live sustainably is clearly a bigger challenge than building an Eco-home.

Education has a key role to play in that it is a process of learning how to make decisions

that consider the long-term future of the community. Involvement in problem solving and decision making is likely to foster the values, behaviour and lifestyles required for a sustainable future.

Communities Scotland, the government body responsible for housing and regeneration, has distinct opportunities to work with housing associations to support sustainable lifestyles in order to maximise the potential of resource efficiency innovations. A survey of current developments could help inform current policy and future developments.

### **Opportunities for individuals**

While communities offer the greatest opportunities for significant reductions in footprint, there is much an individual can do. Five individuals were footprinted for this report to demonstrate the opportunities for footprint reduction, and their willingness to do so. In each case, the footprint is based on the previous year’s consumption, and is broken down by the following categories:

- > Housing
- > Transport
- > Food
- > Consumer Items
- > Private Services<sup>41</sup>:

The case studies confirm the priorities for footprint reduction as analysed by this report:

- > Tackle housing and transport
- > Get the pricing signals right
- > Devise different solutions for different people
- > Win ‘hearts and minds’ through information and education
- > Wealth creation (not well-being) leads to higher footprint.



Case studies >>>

## Case Study 1 Helen McKay

Helen has lived for the past five years with her husband Angus in a beautiful old farmhouse in the country a few miles from Inverurie. Helen has an Ecological Footprint of 9.2 global hectares (gha), nearly double the Scottish average. In terms of carbon dioxide this equates to 23 tonnes per year. This is considerably higher than the national average of 8.5 tonnes.

The graph shows that it comes down to two key consumption categories: transport and housing. In this analysis, we have included holidays under transport – a key reason why Helen's impact is so high. A 12,000 mile round trip to South Africa to see relatives last year as well as 3 internal flights contributed 4 tonnes of carbon dioxide to the total and an Ecological Footprint of 1.1 gha. Concerning land travel, the fact that she owns a 4 x 4 also means a higher footprint than average because they are 50% less efficient than the average car in the UK and 300% worse than the most efficient car on the market. Helen is also the only person in the car, again increasing the impact as 80% of the car is empty.

Her energy footprint is also high. Living in a big draughty house that is dependent on oil rather than natural gas for heating increases her footprint, and electricity use is high. "I feel like we probably try much harder than your average person to rein in our waste and energy but we are very aware of the fact that our house seeps out heat in the wintertime," commented Helen.

Helen is hoping to reduce her footprint by

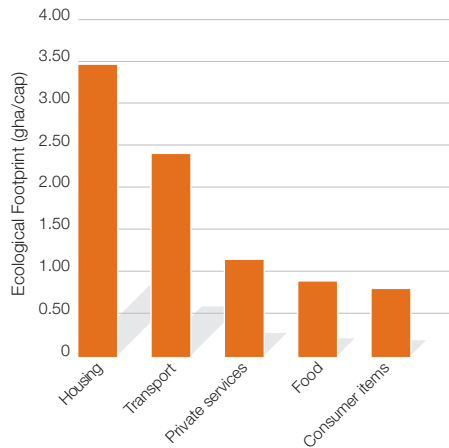


Fig 11 Helen McKay's Ecological Footprint for household consumption

looking into energy efficiency measures and micro-renewables for a new extension and signing up to a green energy tariff. She has also recently bought a motorcycle to use to get to Aberdeen in place of her car in the summer. Shocked by the contribution of her flight to South Africa to her footprint, she says that this is the first long haul flight she has taken for seven years, so is not typical of her lifestyle.

However, she realises that living in the country means that her footprint is far higher than if she lived in a small flat in a city with easy access to public transport.



## Case Study 2 Sabita Stewart

Sabita lives in a semi-detached house with her husband and two girls in the village of Lochwinnoch in Renfrewshire. Her Ecological Footprint is over 25% lower than the national average.

She doesn't travel as far as the average Scottish person and also uses the train to commute into Glasgow to study physiotherapy while her girls are at school. Her new-build house is fairly energy efficient and has gas central heating – a more energy-efficient option than oil. She is also careful to minimise the waste produced and energy consumed by her household by turning off lights and keeping the thermostat turned low. This resulted in lower carbon dioxide emissions from housing (25% lower than national average).

Sabita would like to install solar thermal panels, but the long pay-back time means that she is unsure the investment will be worthwhile if she moves house within the next ten years.

Sabita is planning to make more small changes to help reduce her footprint even further. She has already switched to a green electricity tariff and would like to cut down on the amount of meat the family eats, as the quantity of land needed to produce meat is far greater than that which is needed to produce the equivalent calories from grain or vegetables. She would also like to buy more local food but has found that all the smaller shops in her village have closed down and her only choice is to look for locally-sourced food in the bigger supermarkets.

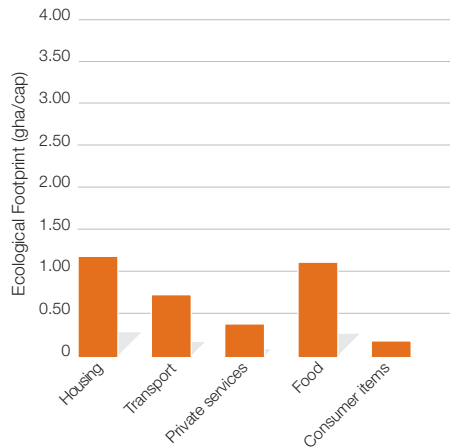


Fig 12 Sabita Stewart's Ecological Footprint for household consumption

“She would like to buy more local food but has found that all the smaller shops in her village have closed down.”



## Case Study 3 Ginny Slater

Ginny lives in the small village of Kingston, near Fochabers on the Moray coast with her husband Finley and two daughters. Her Ecological Footprint is 5.22 gha, just less than the average for Scotland – although she emits 30% more carbon than the national average.

This may reflect her dependency on her car to get to work – her transport footprint is 25% higher than the national average. She travels over 12,000 kms a year by car, the national average being approximately 8,000 kms. Living in a rural area, public transport is just not practical for a mother who works full time.

Gas is not available in her area so her house is heated by oil. This is compensated because four people share this heat and she uses a renewable energy supplier for electricity, resulting in an average footprint for Scotland. Ginny has looked into installing micro-renewables, but finds them prohibitively expensive. “Under the current grant system

**“Over 90% of the food that the family eats is sourced organically from local suppliers”**

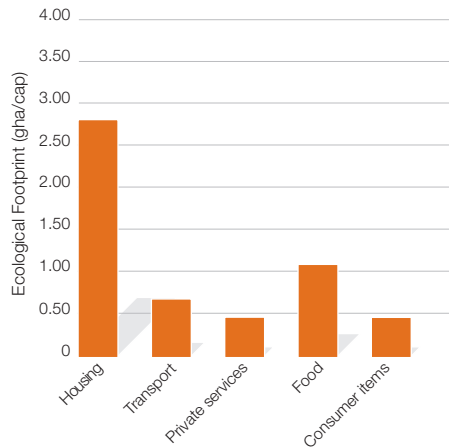


Fig 13 **Ginny Slater's Ecological Footprint for household consumption**

you still have to fork out all the money up front and then apply for some of the money back,” said Ginny. “With such limited help for people it seems like going green is only an option for those who are affluent enough to afford it.”

Lower than average meat consumption combined with the fact that over 90% of the food that the family eats is sourced organically from local suppliers, means that the footprint is half the national average for food. “I am a big believer that what you put in you get out. The kids that eat hamburgers three or four times a week have got no interest in doing anything, my two come home and play in the garden all evening,” commented Ginny.



## Case Study 4 Brian and Tricia Rae

Brian and Tricia are both retired and live in a detached four-bedroom house in a village near Kilsyth in Stirlingshire. Their Ecological Footprint is just 4% below the national average. Despite this, their footprint for housing is very high – mainly because the occupancy rate of the house (two people) is low while the house is large. This ensures that their gas consumption is very high (12,500 kWh per person compared to a national average of 6,000 kWh).

Brian and Tricia's energy footprint will probably reduce in the next year as they have just taken steps to upgrade the insulation in the house and put in more efficient radiators. It will reduce even further if their plans to install a wood-chip boiler are successful. However, they are finding it difficult to find information to help them make the right choice, and this is compounded by the problem that wood chips currently have to be imported from Ireland. It may be that they opt for an efficient gas boiler instead.

They compensate for their high housing footprint because other parts of their footprint are much lower: Even with insufficient public transport, their use of the car is about half of the national average, they seldom travel abroad for holidays and a considerable proportion of their food is organic.

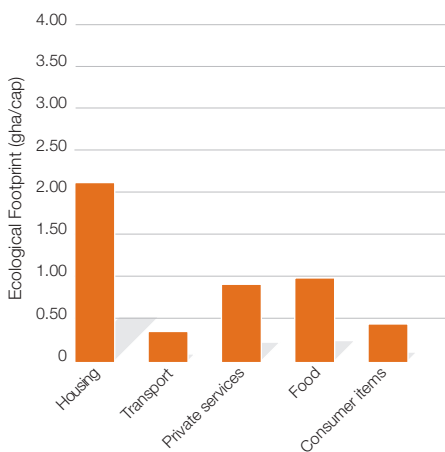


Fig 14 Brian and Tricia Rae's Ecological Footprint for household consumption

“They have just taken steps to upgrade the insulation in the house and put in more efficient radiators.”





## Case Study 5 **Laura Digan**

Laura lives in a housing estate in a small village near Airdrie in North Lanarkshire with her parents and six year old son. Her Ecological Footprint is over 50% higher than the national average. This is due to two consumption areas: housing and transport. As with many of the examples, these are the categories that vary most significantly. The key factors for housing are often the household occupancy rate and choice of fuel for home heating. In Laura's case it is because electricity is used to heat the house.

In terms of transport, travelling 400 miles a week by car takes it toll. This is four times higher than the national average. Laura would like to take the bus or train, but the service is too infrequent and parking at the station very limited. A couple of flights to Jersey also adds to her transport footprint.

Laura is very keen to reduce her ecological footprint. She has been cultivating a small vegetable patch in her back garden for the past couple of years and always buys British produce when she has a choice. The fact that both Laura and her son are vegetarian helps reduce her footprint even further.

Laura would also like to buy clothes made of organic cotton, but finds the prices too expensive.

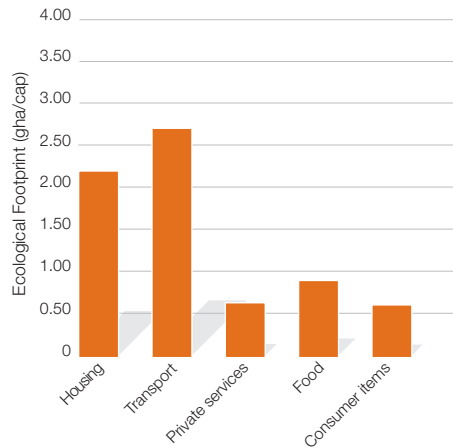
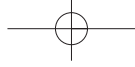
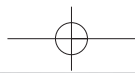


Fig 15 **Laura Digan's Ecological Footprint for household consumption**

**“The fact that both Laura and her son are vegetarian helps reduce her footprint.”**



#### BOX 4 FIVE EASY STEPS FOR INDIVIDUALS TO SIGNIFICANTLY REDUCE THEIR GLOBAL ENVIRONMENTAL IMPACTS (gha)

	Before	After
<p><b>1. Explore Britain</b></p> <p>While the UK government is encouraging us to fly by subsidising the aviation industry it is difficult to expect individuals to fly less frequently. However, as individuals we can make a significant difference. Taking holidays within Britain instead of going abroad would substantially reduce an individual footprint.</p> <p>By flying just once every three years rather than every year a travel footprint could be cut down by two thirds.</p>	0.12	0.04
<p><b>2. Buy cleverly</b></p> <p>The secret is to buy "quality" and not "quantity". Earlier in the report we explored the re-bounce effect. One way to reduce this is to buy more expensive, high quality items that are going to last. For example, if you always purchased a cheap kitchen table and needed to replace it every 5 years, it would have been better to buy a more durable and expensive product that doesn't need replacing. The impact per £ spent is lower as well.</p>	1.35	1.00
<p><b>3. Be healthy</b></p> <p>A healthy balanced diet that is low in meat and high in locally sourced and organic produce can deliver a significantly low footprint.</p>	1.23	0.74
<p><b>4. Keep fit</b></p> <p>Over 40% of our journeys are under 3kms, perfect for cycling or walking. These are often the most harmful journeys per mile travelled as they are often in city centres at very low speeds which is very fuel inefficient.</p>	0.71	0.51
<p><b>5. Save energy and support renewables</b></p> <p>By insulating, using energy-efficient heating systems and appliances, and switching off lights and changing to a renewable electricity supplier, the energy footprint of even an old house can be reduced by 40-60% with minimal investment.</p>	1.25	0.45
<p><b>Total Ecological Footprint for these activities</b></p>	<b>4.66</b>	<b>2.74</b>

ALMOST  
**50%**  
SAVING

The individual case studies reveal the magnitude of the challenge ahead. Importantly, they also show, through this small sample of Scottish residents, that people are willing to make changes when made aware of the problems and the solutions and given the opportunity to act.

### **ENABLING PEOPLE TO MAKE LIFESTYLE CHANGES**

A 'low carbon economy' can only be built by a 'low carbon society'. Government and regulatory authorities therefore need to 'help people help climate change' by making lifestyle changes/solutions easier to take up<sup>42</sup>. This starts from helping people understand the problem, supporting them in their choices through the provision of information, and adjusting the incentive system to reward sustainable lifestyles.

The problem is huge and appears overwhelming to many people. A set of well communicated and easy ways in which people can change their lifestyles is an important way to involve people in the footprint challenge. Taking this first step can make it easier to change more deep-rooted behaviours in the future. Most of the tasks are easy to complete and are associated with personal gains. It is key to show the individual that his or her change is making a difference.

In the box, left, we have highlighted two lifestyles: the Scottish average, and an individual who has adopted the "5 Easy Steps". The difference in their Ecological Footprint for these activities has been shown.

### **CONCLUSION**

This section focused on three opportunities which can deliver the greatest footprint reduction in Scotland. These are:

- > radically improved energy efficiency standards for all housing (new and existing)
- > reducing the need to travel by providing services, work, leisure, and residences at close proximity
- > raising the nutritional standards of food provided through public services.

In addition, this section discussed the ways in which communities offer the best opportunities for behaviour change, through shared resources and peer support. Motivated individuals can reduce parts of their Ecological Footprint by as much as 50% through simple changes to their current lifestyles.

These conclusions lead us to a route-map for a low footprint Scotland which is discussed in Section 4.

## 4 Towards a low footprint Scotland

The size of the challenge cannot be underestimated. Fundamental shifts in attitudes and behaviours of people, government and business are required for living a one planet lifestyle. Change will only occur if individuals know what to do and decide for themselves, have the means and opportunity to act, and understand that their contribution is important. In other words, they believe that they can make a difference with their own actions<sup>43</sup>.



The Scottish Executive needs to lead the way as a catalyst of change by providing a framework for collective action. People and businesses cannot be expected to swim against the tide. It requires whole-hearted commitment from the Scottish Executive through leadership, regulation, incentives and spending policies. More than this, it requires engagement with stakeholders to re-design infrastructure and institutions, and provide information and education. Importantly, decisions must be informed by an analysis of the impact of our consumption, and progress measured against this benchmark. The Ecological Footprint provides the indicator of our position in relation to ecological limits, and the Carbon Footprint is useful in assessing progress towards climate change targets.

Leading the way towards a one planet lifestyle is not an easy route to take, but it is the only sensible and responsible one. It will be rewarded with an improved quality of life for all and a more secure future for Scotland.

### **A HANDSHAKE BETWEEN GOVERNMENT, BUSINESS AND PEOPLE FOR MORE SUSTAINABLE LIFESTYLES**

People, government and businesses need to make an equal contribution towards a low footprint Scotland, with government taking the lead. Recent experiences from stakeholder engagement show that both business and individuals are increasingly willing to adapt to a smarter, more sustainable lifestyle, “but on reassurance that others, whether your neighbours at home or your competitors in business, act likewise”<sup>44</sup>.

Each policy needs to equally address production and consumption patterns. This report has presented evidence from various sources that one-sided approaches have failed to curb carbon emissions or reduce the Ecological Footprint. Therefore, a rule of thumb can be applied: 50% of the required change needs to be delivered by reducing the impact of goods and services per pound spent (efficiency of production). This could begin with government procurement policies which could create significant demand for environmentally friendlier products. The other 50% needs to come from changes in consumption: e.g. choosing a more fuel-efficient car, insulating our houses, healthier eating and travelling less.

A 50% increase in production efficiency combined with a 50% reduction through changing consumption would deliver a 75% reduction in Ecological Footprint.

We have organised this section by exploring what is required to enable people, government and business to achieve this change. This is followed by key policy suggestions that need to be adopted now to start this reduction in footprint.

“People, government and businesses need to make an equal contribution towards a low footprint Scotland, with government taking the lead.”

There are four over-arching policies that must be put in place:

- > Communicating change
- > Providing information and education
- > Financial levers to reward low footprint products and services
- > Infrastructure to support sustainable living.

Section 4 reviews each of these policy areas in turn, and concludes with a route map towards a low footprint Scotland, with short-term and longer-term actions.

### Communicating change

The bottom line of changing consumer behaviour and lifestyles is that people are aware of the problem and that they think it matters to them today. Research commissioned by the Scottish Executive in 2005 from TNS System Three indicates that while there is widespread awareness of environmental issues, most rarely consider the issues on a day-to-day basis. The most common top-of-mind issues include global warming, pollution and recycling.

However, familiarity with the issues does not necessarily result in behaviour change. Apathy and lethargy prevail, and a tendency to think of the issue in global terms accentuates feelings of powerlessness. Many cite a lack of political willingness to contribute to environmental concerns as one of the reasons they feel it is pointless to 'act green'.

Follow-up research commissioned by the Executive from Barkers in 2005 looked at parents and it reinforced these insights. It pointed to an increase in awareness but confirmed that understanding of the issues remains limited: environmental issues are

**“The majority find it difficult to perceive a direct link between the broader or global issues and individual behaviour.”**

perceived as intangible and difficult to understand. A plethora of messages exist and the public do not always understand why they are asked to act in a certain way and what the benefits are in doing so. Beyond recycling and switching off lights, there is a perception that not everyone cares enough to make a real or worthwhile contribution.

The majority find it difficult to perceive a direct link between the broader or global issues and individual behaviour. Those who regard climate change as a pressing problem feel that it is too big a problem for them to affect by their individual actions.

Looking at the scale of the challenge ahead, above all, the Scottish Executive needs to build capacity to deliver ambitious climate change policies by raising awareness and changing attitudes towards climate change via a pro-active and consistent communication strategy<sup>45</sup>. This is where the Ecological Footprint can continually be employed to deliver a complex message in an easy to understand format<sup>46</sup>.

The Scottish Executive launched the “It’s Our Future” communications campaign in 2006 to get people thinking about their legacy for future generations. It includes a dedicated website and a range of practical steps that we can all take for a more sustainable Scotland, as well as highlighting projects up and down the country which are



helping the environment<sup>47</sup>. To be effective, this campaign needs to go beyond websites and advertisements. It needs to reward behaviour change and provide inspiring leadership and tangible policy commitments from government.

Some specific suggestions include:

- > Set and communicate a clear and inspiring vision of what a low footprint Scotland could look like, making a clear and easily understood case for why we need to change our behaviour
- > Extend targets for raising awareness and understanding of sustainable development issues among the public and set clear targets for achieving behaviour change
- > Embed these targets within other relevant government policies such as the Transport Strategy
- > Provide incentives to kickstart and maintain behaviour change
- > Prioritise and communicate a set of behaviour changes that will achieve maximum environmental impacts and inspire that change through a clear exposition of the options for change and the benefits of changing behaviour
- > Continue to provide tangible, relevant and consistent information to the public based on footprint analysis, including more personalised and interactive tools such as a personal footprint calculator

- > Use new technology to create virtual communities of lifestyle changers to mainstream the issues and provide support
- > Create a partnership ethos so that government leads by example and outlines its own clear policy commitments to a low footprint Scotland.

### Providing information

In our consumer society, we can choose between thousands of products every day. These products have different means of production, come from different countries and have different implications for waste treatment and/or recycling. In such circumstances consumers feel helpless and are discouraged from thinking “green” due the complexities involved in the choice process. It is crucial to enable greener consumption choices through the provision of easy-to-grasp, easy-to-access information. Though most labelling schemes are EU or UK regulated, the Scottish Executive has the opportunity to review existing Scottish labelling schemes and extend them where appropriate and possible.

The Scottish Executive can also provide advice and guidance on what a sustainable lifestyle looks like. Lifelong Learning strategies provide an opportunity to ensure that individuals have access to learning and skills development so that they can make informed choices.

Past evidence has shown that citizens will not take advice on board unless they see action directly taken by government. Therefore, the Scottish Executive needs to list

## BOX 5 PROVIDING INFORMATION TO CITIZENS – EXAMPLE OF AVIATION

### Information for citizens

Climate change is the most significant threat that we face today. If we fail to act now, millions of people in less developed countries face devastating consequences. We will feel the effects in Scotland too, for example, increased risk of flooding. Flying accounts for about 7% of household emissions in Scotland and is growing rapidly. This is why the Scottish Executive is asking individuals to think about how and where they travel. We are doing our bit as well.

### How is the Scottish Executive supporting this?

We will not support new runway developments and will support and campaign for the removal of subsidies from the aviation industry in the UK government. We think that every industry should be treated fairly.

### What are we doing ourselves?

At the Scottish Executive, we have an internal policy that means that no one is allowed to fly within the UK, they must teleconference or take the train or bus. Finally, we have a target for 30% of all meetings that would require travel to be undertaken by telephone or video conference.



the policies it has introduced to make it easy for the citizens to take action. Finally, “getting your own house in order” adds further strength to the argument.

Specific, consistent and robust advice on the high impact consumption activities is required. Box 5 provides an example for air travel.

### Financial levers – rewarding sustainable lifestyles

Throughout the report it has been highlighted that there are fundamental problems with

highly distorted incentive systems, which often favour unsustainable consumption choices. This is not only environmentally disastrous, but also economically inefficient and ultimately costly for society. Many of these incentives are financial ones. Investing in energy-saving technology, even though already profitable today, does not enter many consumers’ minds, partly because energy accounts for such a small proportion of people’s spending.

Other incentives, which discourage sustainable choices today, are non-monetary

### BOX 6 THE ECONOMICS OF THE SKY

The importance of the aviation industry for climate change cannot be overestimated. Even though only responsible for about 7% of the CO<sub>2</sub> emissions today it is the fastest growing emission source<sup>48</sup>. However, it is also where the emissions are released, which makes flying an activity with such a high impact on the environment. Several studies show that in the higher, more sensitive air strata, where these emissions typically occur, one tonne of kerosene burned has two to four times the impact than if it was released from the ground. Therefore, the quoted 7% could be as high as 28% of the impact.

The aviation industry receives yearly tax exemptions of about £10bn in the UK. While car fuels are subject to a fuel duty and VAT, airlines do not pay tax on fuel. The Treasury's own estimates show that taxing kerosene in the same way as car fuels would raise an annual revenue of £5.7bn. The air industry also does not pay any VAT, equating to another £4bn. Overall, the Heathrow Association for Aircraft Noise has calculated that these tax exemptions cost a single person on the average wage of £25,000 an additional income tax of £557 every year<sup>49</sup>.



in nature: the way we build our infrastructure, and the flexibility we grant in work-leisure decisions. These incentive systems are often not consistent with our political objectives. One key step, which will largely determine the success of climate change policies, will be to comprehensively review and correct these incentive systems. Rewarding sustainable choices and lifestyles must be the bottom-line of Scotland's way towards reducing our footprint.

Some of the required policy changes, such as in aviation, are largely reserved matters.

However, there are several financial levers the Scottish Executive and local authorities can use to exercise influence in these important household consumption areas:

- > council tax
- > parking charges
- > prices for public transport systems
- > congestion charges
- > infrastructure development that favours sustainable transport modes
- > grants and incentives.

Furthermore, the Scottish Executive can

## BOX 7 GREEN FINANCIAL LEVERS

The purpose of green financial levers should be to benefit society: by taking away the tax burden from resources we want to use more of, such as the workforce, and directing it towards inputs we want to use less of, such as natural resources and fossil fuels.

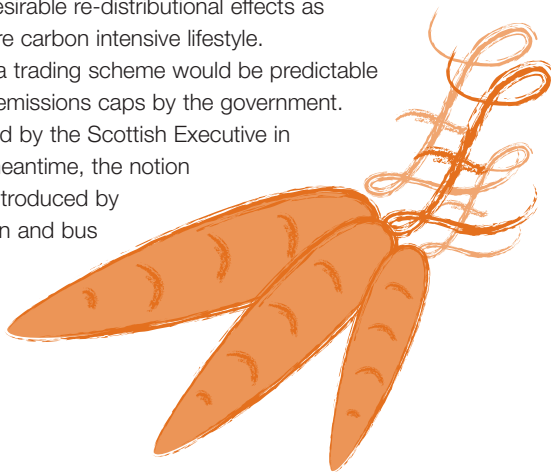
Financial incentives for high carbon industries need to be removed and directed towards the support of low carbon technologies. Of course, an international green taxation effort would be most promising, but the case of Germany has shown that introducing green financial “carrots and sticks” in a unilateral and stepwise process does not damage the economy – indeed it can foster new businesses in green technologies.

The Scottish Executive should review all subsidies and direct them away from high carbon industries in a stepwise process. The money could be used to support new emerging low carbon technologies.

### Individual carbon trading

A smart solution for rewarding sustainable lifestyles is the establishment of personal carbon accounts. Every year each person is awarded a carbon budget. Within this budget people are free to make their choices. However, if they use up the carbon, they need to buy additional carbon credits on the market from people who have used up less carbon credits than they need. This would reward not only investment in energy-saving technology around the house, but also sustainable lifestyle choices. Such a trading mechanism would also have desirable re-distributional effects as wealthier people also live a more carbon intensive lifestyle.

Key to the success of such a trading scheme would be predictable and clearly signalled individual emissions caps by the government. Such a scheme could be piloted by the Scottish Executive in selected communities. In the meantime, the notion of carbon accounts could be introduced by providing carbon figures on train and bus tickets and websites to raise awareness of the carbon savings made by using public transport.



have an influential voice in the UK debate, and has opportunities to pilot projects to test their suitability and practical implementation.

### **Financial levers – rewarding resource efficient businesses**

Providing the right incentives and a level playing field for business is a crucial cornerstone on the way towards a low footprint Scotland. Even though many of the most important policies are reserved, there are ways the Scottish Executive can take action to help to meet the 50% contribution on the production side.

The simple conclusion of the Stern Report is that the benefits of strong and early action on climate change far outweigh the economic costs of not acting. Providing incentives for a low carbon economy will not only move Scotland towards a one planet lifestyle, it will also create new business opportunities. These markets could grow to be worth hundreds of billions of pounds each year, and employment in these sectors will expand accordingly<sup>50</sup>.

Two key ideas are explored below.

#### **> The Top Runner Programme**

It is crucial to provide the right incentives to businesses to continuously improve the energy efficiency of their product portfolios. The Japanese Top Runner Programme is based on the concept that some manufacturers make products that have greater energy efficiency than competing products in a specific product group that are currently sold on the market. Hence, the most energy efficient product sets the standard that the average product portfolio

**“Strong and early action on climate change far outweigh the economic costs of not acting.”**

of companies in this product group needs to comply with by a set target year.

While the Scottish Executive does not have the powers to implement such a programme, it could use the same approach in setting resource efficiency standards for its procurement. This would continuously foster innovation and create demand for greener products.

#### **> Product service companies**

The product service literature has provided powerful propositions for new business models, which reward the minimisation of (material) inputs to provide a service instead of maximisation of product sales. They allow businesses to keep operating profitably and consumers to receive the same level of service. Housing and travel are without doubt the two key areas where such a rethinking of business models is most urgently needed.

DEFRA is exploring the potential for such a transformation in the household energy sector through Energy Service Companies. The Scottish Executive should maintain a strong interest in this study and ensure one of the pilot projects takes place in Scotland. The project can be used to raise awareness and engage consumers.

## “Housing, transport and other infrastructure developments cannot be seen in isolation from each other.”

There is no doubt that such a market transformation will be a gradual process. For businesses such a solution is certainly best for securing their long-term interests in an otherwise shrinking energy market. And it would also provide a way of retro-fitting the existing housing stock without the need for major investment by governments and consumers.

### Changing infrastructures – towards sustainable communities

Infrastructure developments are physical manifestations of a society’s development path in time. In this sense, their importance can hardly be over-rated. They influence people’s well-being, determine their travel choices and have a substantial influence on society’s resource and energy use patterns. This report has highlighted that housing, transport and any other infrastructure developments cannot be seen in isolation from each other. There is an urgent need for an integrated policy approach which considers the interaction between the different elements (see Section 3).

Firstly, all *new infrastructure* developments need to be developed to the highest environmental standard:

- > Building regulations should require any new building fulfils at least the Eco-Home

Excellent standards (however as trade-offs exist with the accreditation scheme it would better if a sole energy efficiency standard was established by the Scottish Executive)

- > Building regulations should strengthen energy efficiency standards year on year ultimately improving upon England’s commitment that all new houses will be ‘zero-carbon’ by 2016
- > The National Planning Framework and City-Region Development Plans should use location approaches like the compact city concept at the centre of all new infrastructure developments.

However, because the infrastructure landscape changes so slowly, it will be crucial to alter the *existing infrastructure* in order to promote more sustainable lifestyles:

- > Initiate a programme to retrofit the existing housing stock over the next 15 years through a combination of incentives for homeowners and landlords and requiring improvements in existing homes through building regulations and planning
- > Promote car-free city centres
- > Development Plans should include the introduction of zoning policies to encourage residential, work, shops and leisure facilities to co-exist, thus promoting a “lifestyle of small distances”
- > Stop unsustainable developments like the

development and extension of new airports and the building of additional roads. Evidence shows that building more roads induces more traffic and the new capacity is often filled within a few years<sup>51</sup>.

### **ROUTE MAP TOWARDS A LOW FOOTPRINT SCOTLAND**

The Ecological Footprint informs us that we currently need to reduce our footprint by 75% by 2050. This translates to a year on year reduction of 3%. Given that Scotland's footprint is slowly increasing in line with the UK's, the seriousness of this challenge cannot be underestimated. Carbon dioxide emissions require a similar reduction to combat the effects of climate change.

To achieve such a significant change in this period of time, this report has demonstrated the need to ensure that environmental impacts are not shifted from one consumer item to another. To achieve this, consistency in government policies is required. Therefore, the following recommendations must be implemented simultaneously to create the necessary framework for a low footprint Scotland.

**“There are solutions at hand which can enable this transformation, while at the same time improving health, quality of life, and creating a low-carbon economy.”**

### **Framework conditions for a low footprint Scotland**

To enable communities to be sustainable, five fundamental conditions need to be put in place by the Scottish Executive:

- > *Adopt the Ecological Footprint as a sustainable development indicator* for assessing our environmental limits and to inform policy decisions and develop strategies for a low footprint Scotland. Only by clearly understanding our environmental baseline will we be able to decide the necessary measures to move from three planet living to one planet living
- > *With partners, develop the “It’s Our Future” communications campaign* so that it provides consistent information based on robust evidence followed up by clear policy commitments
- > *Develop a strong community education component of ‘Learning for our Future’,* Scotland’s First Action Plan for the UN Decade of Education for Sustainable Development, based on the research outcomes of the SDC Report ‘I Will if You Will’
- > *Analyse each new infrastructure development* to ensure that it contributes to sustainable consumption and production patterns. One bad decision could have consequences for years to come. Building more roads destroys the concept of a compact city, building more runways will, not surprisingly, increase air travel. This means supporting projects

“All new infrastructure developments need to be developed to the highest environmental standard.”

such as decentralised renewable energy systems instead, as well as local transport networks

> *Explore all financial levers*

available to Scotland and work with the UK as appropriate, to remove unsustainable incentives and reward sustainable choices.

Within these broad recommendations are some practical measures which have been discussed in this report. These can be taken forward now – the technology exists and the evidence shows these changes will make a significant contribution to reducing Scotland’s footprint.

**Five practical policy recommendations for the Scottish Executive**

> *Raise the energy efficiency of all houses*

**62%** A comprehensive strategy needs to be in place that establishes how all existing houses in Scotland will be raised to a high energy-efficiency standard. To avoid the costs of retrofit in the future, all new homes should be zero direct carbon by 2016 at the latest. There is a potential for reduction in the housing footprint of 50%. A further reduction of 12% would be possible through behaviour change.

> *Lead by example through public procurement*

**75%** The Scottish Executive should work to understand the impact of everything it procures along the whole supply chain, identifying areas to increase resource efficiency. The Executive should use this information to demand high standards in resource efficiency and requirements for continuous improvement. The Executive’s good practice should lead the way for the rest of the public service and will generate new markets for sustainable products. There is a potential for reduction in the footprint of procurement of 75% by 2015.

> *Set standards for sustainable healthy food in all public services*

**25%** Nutritional standards should be raised across public services such as hospitals, care homes and social services. Food represents a significant proportion of Scotland’s footprint and this report demonstrates that a healthy diet, like the *Hungry for Success* initiative in schools, can also help reduce footprint. There is a potential for a 25% reduction in the food footprint of public services.

> *Link transport and planning*

**30%** The National Transport Plan and regional transport strategies should explicitly link up with planning policies to achieve a reduction in the need to travel, stabilising CO<sub>2</sub> emissions from road transport by 2015 and setting them on a reducing trend. There is a potential for a 30% reduction in the transport footprint.



> *Embed evidence based policy making in the Spending Review and National Planning Framework*

Both the National Planning Framework (and Strategic Development Plans in due course) and Spending Review should be informed by the Ecological Footprint analysis and results presented to demonstrate how both will lead to a reduction in footprint. One mechanism to achieve this for planning could be through Strategic Environmental Assessments.

## CONCLUSION

### Reaping the rewards of a low footprint Scotland

This report has demonstrated the serious challenge that lies ahead. We know that Scotland's footprint is too big and that we have to consume less as well as consume differently if we are to come close to achieving a 75% reduction by 2050.

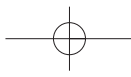
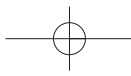
While it may appear an impossible and unappealing task, this report has shown the opposite is true – there are solutions at hand which can enable this transformation, while at the same time improving health, quality of life, and creating a more secure, low carbon economy. We have to focus on the big hitters of our consumption – energy, transport and food. We need to be mindful of how current financial levers can encourage (or discourage) low carbon technologies and choices. We need to provide consistent information and inspiring leadership. And we need to act decisively, and now.

“Only by clearly understanding our environmental baseline will we be able to decide the necessary measures to move from three planet living to one planet living.”

# Appendix

	Greenhouse gases (t/cap)	Carbon dioxide (CO <sub>2</sub> ) (t/cap)	Methane (CH <sub>4</sub> ) (kg/cap)	Nitrous oxide (N <sub>2</sub> O) (kg/cap)	Ecological Footprint (gha/cap)
Food	0.73	0.32	7.70	0.80	0.62
Non-alcoholic beverages	0.07	0.05	0.44	0.04	0.05
Alcoholic beverages	0.07	0.05	0.48	0.05	0.05
Tobacco	0.04	0.02	0.42	0.04	0.03
Clothing	0.12	0.11	0.09	0.01	0.03
Footwear	0.03	0.03	0.07	0.01	0.01
Actual rentals for housing	0.07	0.06	0.18	0.01	0.03
Imputed rentals for housing	0.15	0.13	0.41	0.03	0.08
Maintenance and repair of the dwelling	0.10	0.10	0.12	0.01	0.06
Water supply and miscellaneous dwelling services	0.01	0.01	0.25	0.00	0.00
Electricity and gas distribution	1.73	1.55	7.61	0.07	0.58
Furniture, furnishings, carpets and other floor coverings	0.15	0.15	0.06	0.01	0.06
Household textiles	0.04	0.04	0.04	0.00	0.01
Household appliances	0.33	0.30	0.74	0.05	0.15
Glassware, tableware and household utensils	0.03	0.03	0.02	0.00	0.01
Tools and equipment for house and garden	0.05	0.05	0.04	0.00	0.02
Goods and services for routine household maintenance	0.02	0.02	0.02	0.00	0.01
Medical products, appliances and equipment	0.03	0.03	0.04	0.00	0.01
Out-patient services	0.01	0.01	0.02	0.00	0.00
Hospital services	0.01	0.01	0.02	0.00	0.00
Purchase of vehicles	0.30	0.29	0.25	0.01	0.10
Operation of personal transport equipment	0.30	0.29	0.37	0.02	0.10
Transport services	0.79	0.77	0.34	0.04	0.21
Postal Services	0.01	0.01	0.01	0.00	0.00
Telephone and telefax equipment	0.00	0.00	0.00	0.00	0.00
Telephone and telefax services	0.07	0.06	0.09	0.01	0.02
Audio-visual, photo and inf. processing equipment	0.19	0.17	0.29	0.02	0.07
Other major durables for recreation and culture	0.01	0.01	0.03	0.00	0.01
Other recreational items & equipment	0.26	0.17	1.74	0.19	0.17
Recreational and cultural services	0.11	0.10	0.24	0.02	0.04
Newspapers, books and stationery	0.08	0.08	0.08	0.01	0.03
Education	0.04	0.04	0.09	0.01	0.02
Catering services	0.54	0.41	2.59	0.23	0.36
Accommodation services	0.06	0.04	0.26	0.02	0.04
Personal care	0.09	0.08	0.11	0.01	0.03
Personal effects n.e.c.	0.24	0.22	0.54	0.04	0.12
Social protection	0.06	0.05	0.13	0.01	0.02
Insurance	0.10	0.10	0.15	0.01	0.04
Financial services n.e.c.	0.09	0.09	0.14	0.01	0.03
Other services n.e.c.	0.06	0.05	0.12	0.01	0.02
Overseas tourists in the UK	-0.14	-0.12	-0.55	-0.05	-0.08
UK resident holidays abroad	0.20	0.16	0.75	0.07	0.10
Domestic fuel and land consumption	1.43	1.41	0.52	0.01	0.50
Private transport (car fuel)	1.08	1.02	0.14	0.17	0.29
<b>Total</b>	<b>9.73</b>	<b>8.54</b>	<b>27.22</b>	<b>2.00</b>	<b>4.03</b>

Fig 16 The gas emissions and Ecological Footprint of household consumption in Scotland



# Endnotes

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