



Reducing the South East's Ecological Footprint and carbon emissions: a route map

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Reducing the South East's Ecological Footprint and carbon emissions - a route map.

A report by **CAG Consultants**
in association with the **Stockholm Environment Institute**,
Cambridge Econometrics and **the Centre for Urban and
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Executive Summary

What's the problem?

For some time, scientists and policy-makers have been concerned about climate change caused by man's CO₂ emissions, particularly those from burning fossil-fuels. The impacts of climate change appear to be accelerating, and scientists now warn that significant reductions in CO₂ emissions are required to reduce the risk of very serious climate change. Our current way of living is clearly not sustainable. If significant action is not taken now, it is likely that more drastic measures will be needed in future.

Rising oil and food prices are now hitting our pockets. Increasing global demand for energy, particularly in emerging economies, is raising concerns about 'Peak Oil' – do higher oil prices mean that growing demand is outstripping supply of this finite resource? Rising world food demand, combined with increasing production of bio-fuels, is also pushing up food prices around the globe. These are complex and difficult issues: solutions to one problem (e.g. substitution of bio-fuels for fossil-fuels) may in turn contribute to other problems (e.g. competition between food and bio-fuel production). We need to find more sustainable ways of living, but how can we do this without inadvertently causing other problems or dramatically reducing our quality of life?

What does this study do?

In this study, we examine the South East's use of resources and set out a 'route map' towards sustainable living in the South East. The study has been commissioned by the South East England Regional Assembly (the Assembly), the South East England Regional Development Agency (SEEDA) and WWF-UK. It has been led by CAG Consultants, in a consortium with the Stockholm Environment Institute (SEI), Cambridge Econometrics (CE) and the Centre for Urban and Regional Ecology at Manchester University (CURE).

The Regional Economic Strategy and the Regional Spatial Strategy both make a commitment to reduce the South East's 'Ecological Footprint'. The Ecological Footprint is a measure of our overall use of resources and helps us to examine whether we are living within sustainable limits. The Ecological Footprint measures both the 'real land' required to grow our food, support our buildings and other infrastructure, and the 'energy land' notionally required to absorb the CO₂ generated by our use of fossil fuels. The footprint is measured in land terms and stated in 'global hectares per capita'. It is closely related to our 'carbon footprint', but takes account not only of CO₂ emissions from fossil fuels but also of competition between different land uses. We have used



this tool to examine our current and future resource use, and to develop a 'route map' towards a low-footprint, sustainable South East.

What is our Ecological Footprint now?

The South East is an affluent region, and our use of resources reflects this. If everyone used as many of the Earth's resources as we do in the South East, we would need three and a half planets to support the world's consumption¹. The South East's Ecological Footprint in 2003 was about 6 global hectares per person – equivalent to about 5.5 full-size football pitches. This means that, on average for each one of us, 6 hectares of the earth's productive surface (of land and sea) would be needed to grow food and other resources, and to absorb the CO₂ generated by the supply chains which support our lifestyles. This footprint is still growing – we estimate that now, in 2008, the average Ecological Footprint of South East residents is 6.5 global hectares per person. This compares to the world average of only 2.2 per person, and the 'fair earth share' of 1.8 hectares per person (derived by dividing the total bio-productive area of the earth by its current population).

The footprint is calculated at the point of consumption, and includes goods and services consumed in the region even if they were produced elsewhere. The ongoing decline of manufacturing in the South East, which has the side-effect of reducing CO₂ emissions from the region, has little effect on the region's footprint. We simply consume more imported manufactured goods, produced outside the region.

The South East England Development Agency (SEEDA) and the South East England Regional Assembly (the Assembly) are committed to working with other organisations, businesses and individuals in the South East to reduce this footprint. Our analysis suggests that the main elements of our lifestyle contributing to this footprint are: food (19%); personal transport (18%); home energy and housing (15%); public services and capital investment (24%); and other goods and services (25%).

In this study, we have been able to use emerging new information from SEI on past trends in the region's Ecological Footprint. This has helped us to develop predictions for the future. Without significant changes to current policy and trends in the region, we predict that the South East's footprint will continue to increase at about 1.6% per year. Certain elements of the footprint are predicted to grow fast, while others appear to be beginning to stabilise:

- The footprints of personal travel (by road, sea, air and rail), public services, capital investment and other goods and services are all predicted to increase at rates between 2.4% and 3.0% between 2003 and 2016;

¹ WWF (2006) Ecological Budget UK - Counting consumption

- The footprint of home energy is predicted to stabilise (owing to current action on energy efficiency) while the footprint of food consumption is predicted to decrease slightly.

Reducing the region's footprint therefore requires a reversal of current trends in many sectors. The challenge for the route map is to find ways of reducing the region's Ecological Footprint while maintaining, as far as possible, our quality of life. We have started by developing a long-term vision of a low footprint future in 2050, and then worked back to identify the actions we need to be taking now to achieve this vision.

What would a low-footprint future look like?

There is growing consensus that, to avoid high risks of runaway climate change, CO₂ emissions in highly-developed countries need to be reduced to 80% of 1990 levels by the year 2050. At this level, people living in both developed and emerging economies would consume their 'fair share' of the earth's resources, while living within the carrying capacity of the planet.

In this study, we advocate that the South East should aim to become a 'One Planet Region', following the principles set out in the 'One Planet Economy Network'². This would require an 80% reduction in the region's Ecological Footprint and its CO₂ emissions by 2050. Far reaching 'transformation' would be needed: in our values, our society, our government structures, our economy and our lifestyles. In exploring the transformations required to achieve this goal, we have drawn on a number of studies undertaken at national level.³

The types of transformation needed in each sector would be:

- **Built environment:** Transformation of the entire existing housing stock (3.5 million dwellings) and the non-domestic building stock; retrofitting of energy and water efficiency and low/zero-carbon energy measures throughout; investment in high-efficiency housing and construction, supported by public procurement, improvement partnerships and supply-chain development; a major shift towards energy-efficient behaviour by households and business, supported by lobbying for carbon quotas and trading schemes; the development of 'Green Action Zones' for low-footprint living and working;
- **Transport:** Transformation of the entire transport sector, including low/zero carbon vehicles, and a shift to low-impact modes for freight and passenger transport; integrated accessibility and green travel planning, including the development of 'Green Action Zones' and low emission zones; capping of air

² The One Planet Economy Network prospectus is available on www.ecologicalbudget.org.uk.

³ In particular '80% Challenge – delivering a low carbon UK' (Institute for Public Policy Research) and 'Zero Carbon Britain' (Centre for Alternative Technology).

travel impacts at current levels, so that any growth is balanced by efficiency improvements; the eventual development of low carbon air technology;

- **Energy supply:** Transformation of the energy system to meet reduced demand; accelerated investment in renewable sources and micro-generation, aided by forward commitment through public procurement; the development of industrial clusters for low/zero carbon technologies; promotion of Carbon Capture and Storage as an interim measure to reduce the impact of fossil fuels; Combined Heat and Power (CHP) as standard in all large developments.
- **Food:** A commitment to fair trade and ethical procurement; the development of low impact farming; reduction in impacts throughout the food supply chain (e.g. production, packaging, logistics); a major shift towards lower-impact diets (e.g. low meat, organic, local and seasonal food) through behaviour change, public procurement and retailer incentives;
- **Goods and services, public services and capital investment:** A shift from material-based output to dematerialised value-added services; design for low footprint/impact throughout product life cycles; major improvements in the energy and resource efficiency of industry in the region; clusters of innovative businesses supporting the supply of low and zero-carbon technologies; decoupling of economic growth from environmental impacts, leading to improved value added and competitiveness in global markets; a pro-active programme of social enterprise to encourage sustainable consumption; promotion of low-impact services (e.g. sustainable tourism, leisure, retail and so on) with a particular focus on financial services as the key to all other sectors; best possible practice in low-impact health, education and other public services, using the immense power of public procurement as the main mechanism;
- **Waste:** Product design for waste minimisation and eventual recycling; universal application of reuse and recycling technologies, funded by deposit and disposal levies; the development of 'industrial ecology clusters' in which waste from one industry becomes a resource for another.
- **Water:** Water-efficient design in buildings, products and supply chains; active management of business and household demand for water; investment to safeguard water supplies and minimise flood risks in preparation for climate change impacts.

These types of transformation for climate-related issues are currently being widely studied at national and global level (e.g. by the forthcoming Pathways project, sponsored by WWF-UK). The greatest barrier to action for the region, and every other level, is generally seen to be the upfront costs of investment and innovation. Benefits of innovation tend to be recouped later, often by different parties from the original investor.

So, successful transformation will depend not only on technological advances, but also on new business models, such as the 'Energy Services Company' concept⁴, where investment can be linked to returns on efficiency. This will also depend on changes in the way that the public sector, business and communities work together, and on better integration between different levels and departments of government. We envisage a more strategic and pro-active role for government (local, regional and national), using procurement as the spearhead for a wider market transformational approach.

This gives some sense of where we need to get to. But how do we get there? What does this vision mean in terms of actions and policy decisions in the next few years?

What do we need to do now?

We have developed a 'route map' for each sector, setting out the types of actions required both to stabilise and then reduce that sector's Ecological Footprint. We have done the same for a number of cross-cutting issues: behaviour change, lobbying, procurement, planning and 'Diamonds'/growth areas (see below).

These route maps, and a table of priority actions, are set out in the summary report. More detailed action tables are presented in the full report, together with supporting evidence from our modelling work. Many different actors within the region would be involved in delivering the actions below, and some would require action at national level. These responsibilities are explained more fully in the summary and full reports.

Short-term priorities emerging from the route maps for each sector are as follows:

- **Built environment:** Implementation of home energy policies should be continued, including support for rapid achievement of the 'Code for Sustainable Homes' Level 6. More action is needed to encourage retrofitting of energy efficiency and low/carbon technologies to existing homes and buildings. Partnerships should be established for strategic improvement programmes;
- **Transport:** Strong action is needed here, as impacts are increasing despite current efforts to promote alternatives to the car. Active steps should be taken to limit and then reduce car travel, and to promote public transport. Air travel is a special case with huge impacts, local and global: the region should lobby for aviation to be brought into the EU Emissions Trading Scheme, and, ultimately, to constrain growth in air travel to equal growth in technical efficiency;
- **Energy supply:** Strong support for renewable energy projects is required to achieve the current EU and UK target for renewable sources to generate 15% of total energy (equivalent to 40% of grid electricity) by 2020, given current

⁴ For example: Woking Borough Council's Thamesway Ltd was the UK's first Energy and Environmental Services Company (ESCo) – a public/private joint venture company.

barriers to development of these projects. Another priority is the development of infrastructure for Combined Heat and Power schemes;

- **Food:** Procurement should be used as a tool to promote lower impact food consumption within public and private organisations. In the wider community, the emphasis should be on reducing food wastage, and promoting low-impact farming;
- **Goods and services, public services and capital investment:** Business incentives and accreditation/labelling schemes should be developed to encourage energy and resource efficiency within business. Carbon-trading schemes should be piloted. Sustainable procurement should be promoted through public procurement and community-based projects;
- **Waste:** Regional markets should be developed for waste and intermediate products, involving all stakeholders in the supply chain. Innovative waste-reduction schemes should be set up, involving both communities and businesses;
- **Water:** Water metering should be introduced as quickly as possible; water-efficiency measures should be retrofitted to existing houses and other buildings, and fitted as standard on new homes and buildings.

We have identified a number of cross-cutting priorities, which would help to reduce the region's footprint across a number of sectors:

- **Behaviour change:** Develop and implement a regional strategy for behaviour change. Develop behaviour change projects with communities, and support community-led and social enterprise schemes which encourage behaviour change. Promote local incentives for low-footprint behaviours;
- **Lobbying:** Lobby the UK government for national-level incentives for footprint and carbon reduction by all stakeholders;
- **Procurement:** Promote sustainable procurement by all public sector bodies, aiming for Level 3-Level 5 of Defra's Flexible Framework, and identify immediate potential for changing procurement specifications;
- **Planning:** Ensure that funding allocations, strategies and plans reflect Ecological Footprint and carbon reduction priorities. Promote use of Ecological Footprints and carbon metrics (including carbon prices) in decision-making and policy appraisal;
- **'Diamond' local authorities and growth areas:** Pioneer new approaches to footprint stabilisation and reduction, focusing on priority sectors, including

business incentives, skills and supply-chain development, regional innovation clusters, behaviour change and carbon-offsetting.

Using the route map

It is easy to focus on the costs of route map actions, without assessing the cost of doing nothing. The Stern Review of the Economics of Climate Change concluded that the cost of unabated climate change would range from 5-20% of GDP while the costs of mitigation would range from -1% to 5% of GDP. In a recent speech, Lord Stern indicated that evidence suggests that climate change is happening faster than anticipated so faster action is needed. He now suggests that 2% of GDP would need to be spent now to avert the risk of runaway climate change.⁵ But the costs of acting collectively now are outweighed by the potential benefits of avoiding unabated climate change.

The use of the Ecological Footprint takes a wider view than simply counting climate emissions:

- It is a measure of total impacts through the supply chain, both direct and indirect, all the way to final consumption. It encompasses the bio-fuels issue, where conversion of farmland to bio-fuels has been encouraged by climate policy, but at the cost of displacing food production for over 260 million people.⁶
- It includes imports and their embedded impacts, currently estimated at over a third of direct impacts. This avoids the 'green illusion', in which the UK appears to become more sustainable simply by exporting its heavy industry to overseas.

No-one has yet attempted to develop a global costing of unabated Ecological Footprint growth, but it is safe to assume that this would be more than the costs of climate change on its own.

Reducing the region's Ecological Footprint is closely linked to other aspects of the environmental agenda. The 'route map' set out here would help the region to comply with a wide range of environmental targets and legislation, including EU waste targets and carbon reduction objectives.

The current Regional Economic Strategy already stresses the economic opportunities from new environmental technologies. Many of the actions in the 'route map' would also bring positive benefits to our quality of life (e.g. healthy, active lifestyles involving more walking and cycling; stronger communities where people live and work more locally, using ICT to replace some long-distance travel; increased demand for local food and local tourism; shift from the consumption of material goods to leisure services).

⁵ <http://www.guardian.co.uk/environment/2008/jun/26/climatechange.scienceofclimatechange>

⁶ Action Aid, 2008: 'Cereal Offenders'

Starting the journey

Given the challenges presented by the route map, the wide range of stakeholders and the many barriers to progress, the key question is how to mobilise action. In practice, institutional arrangements in the South East will depend on the outcome of the current Sub-National Review. Whatever the detail of regional/sub-regional structures and responsibilities emerging from this review, we recommend that:

- Strategic priorities and action plans from the route map are fed into mainstream strategies and plans, including the Integrated Regional Strategy – led by SEEDA, the Assembly and GOSE, together with the Sustainable Futures Group;
- The short-term priority actions should be mobilised through funding and procurement. Immediate steps should be taken on actions which cost little, use available technology, gain political viability and generate social benefits;
- But more difficult issues (such as constraining growth in car and air travel; and promoting more sustainable consumption of goods and services) should also be tackled as a priority, as these are central to reducing the region's footprint;
- The Diamond Local Authorities should pioneer specific actions from the route map at local level, involving other sub-regional groupings and local authorities where appropriate;
- Consideration should be given to developing a 'Foresight' programme, to explore future trends and opportunities, bring together networks of stakeholders, and develop incentives, strategies and programmes. This could be implemented through existing institutions (e.g. the International Institute for Sustainability; RESOLVE) or could have its own secretariat and resources.

Progress towards the Ecological Footprint, and associated CO₂ emissions targets, should be monitored on an ongoing basis. The REAP⁷ tool used for this study can be used to monitor footprint and emissions for geographical areas (e.g. specific local authorities). But other tools, such as Corporate Stepwise developed by Best Foot Forward⁸ and SEI's Triple Bottom Line, can be used by specific organisations, sectors or businesses. In addition to monitoring progress towards the targets, it will be important to keep the effectiveness of methods and strategies under review. The route map proposed here is a starting point which can be refined and developed as information improves and time progresses.

⁷ Regional Energy Analysis Programme: ([http:// www.sei.se/reap/index.php](http://www.sei.se/reap/index.php))

⁸ www.bestfootforward.com

Conclusion

The proposed route map for the South East calls for a concerted effort to tackle and reverse the upward trends in the region's Ecological Footprint. Meeting long-term reduction goals for both Ecological Footprint and CO₂ emissions will require major transformation of the South East towards a 'One Planet Region'. This transformation will be challenging but will offer far-reaching benefits for the local and global environment, for the region's competitive position, for social cohesion and for quality of life in the region.

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MAIN REPORT

Part I – Overview

1. Introduction

This is the full final report of a study to develop a 'route map' showing how the South East region can meet its medium and long-term targets for stabilising and reducing the region's Ecological Footprint and carbon emissions.

The Regional Economic Strategy and the Regional Spatial Strategy for South East England both make a commitment to reduce the region's 'Ecological Footprint'. The Ecological Footprint measures both the 'real land' required to grow our food, support our buildings and other infrastructure, and the 'energy land' notionally required to absorb the CO₂ generated by our use of fossil fuels. The footprint is measured in land terms and stated in 'global hectares per capita'. It is closely related to our 'carbon footprint', but takes account not only of CO₂ emissions from fossil fuels but also competition between different land uses.

The Ecological Footprint is a measure of our overall use of resources, and helps us to examine whether we are living within sustainable limits. The unsustainability of our current lifestyles is highlighted by growing concern about the future impacts of climate change, recent rises in oil prices and the emerging concept of 'Peak Oil'. Steep rises in world food prices appear to be due not only to rising food demand but also to competition between land use for food and biofuel production. We need to find solutions to environmental problems that do not in themselves cause more problems.

This study has been commissioned by the South East England Regional Assembly (the Assembly), the South East England Regional Development Agency (SEEDA) and WWF-UK, with support from Defra. It has been led by CAG Consultants, in a consortium with the Stockholm Environment Institute (SEI), Cambridge Econometrics (CE) and the Centre for Urban and Regional Ecology at Manchester University (CURE).

The study has involved a review of the region's current footprint and emissions, and projections of future impacts under different policy scenarios. From this analysis, we have developed a 'route map', or recommended action plan, to help guide the region towards achievement of its targets for the Ecological Footprint and carbon emissions. The 'route map' looks not only at potential actions by regional bodies such as SEEDA and the Assembly, but at what needs to be done by other organisations and individuals, at national, regional and local levels.



2

This study builds on the recent work of the Select Committee of the South East England Regional Assembly on 'Reducing the South East's Ecological Footprint'. It applies the 'One Planet Economy Regional Analysis' (OPERA) methodology which was developed for the Assembly, WWF and Defra by CURE. During the study, we have consulted representatives from other Ecological Footprint projects in the South East, including the 'Diamonds' Ecological Footprint working group, Kent County Council, Ashford Futures and Hampshire County Council.

This report is set out in two parts. Part I is a standalone 'overview report', while Part II presents more detail on the analysis of particular sectors and themes. Part I presents:

- Introduction and context;
- Overview of findings and route map;
- Next steps.

2. Why develop a 'route map'?

This chapter discusses the rationale behind the study and some of the issues surrounding it.

2.1. Regional targets

The main impetus for this study comes from the targets set in the South East Plan, in the Regional Sustainability Framework (RSF) and in the Regional Economic Strategy (RES). The RES and South East Plan targets define slightly different timing for stabilisation and reduction of the region's footprint and emissions, but the concepts are similar. Interpretation of these targets is discussed further in Chapter 4.

Ecological Footprint targets:

- ..To seek to stabilise the South East's Ecological Footprint by 2016, and to reduce the Ecological Footprint during the second half of the Plan period (2016-2026) (South East Plan, Policy CC3/RSF);
- To reduce the rate of increase in the region's Ecological Footprint..stabilise it and seek to reduce it by 2016 (RES, headline target 3);

CO₂ emissions targets:

- To reduce CO₂ emissions by 20% below 1990 levels by 2010 and by at least 25% below 1990 levels by 2015 (South East Plan);
- To reduce CO₂ emissions by 20% from the 2003 baseline by 2016 as a step towards the national target of achieving a 60% reduction on 1990 levels by 2050 (RES).

These targets are supported by the Sustainable Futures Group, a high-level panel of experts drawn from stakeholders across the region. They are also supported by the Climate Change Implementation Plan for the South East, which was prepared for the Assembly in 2006.

2.2. Why do these targets matter?

Ecological Footprint

The Ecological Footprint is used to calculate how much productive land and sea is needed to provide the energy, food and materials used by a given population, in this case the residents of the South East. It measures the impacts of our consumption, wherever they occur around the globe. As well as direct land take ('real land'), an Ecological Footprint calculates the carbon dioxide emissions generated from the oil, coal and gas we burn; and determines how much land is required to absorb them ('energy land'). In simple terms, it measures the resources consumed by a population and provides an account of the balance between human demand and nature's supply.

The Ecological Footprint has been chosen as a key indicator by the South East region because of its power to communicate the unsustainability of our current lifestyles: if everyone used as many of the Earth's resources as we do in the South East, it would require three and a half planets to support the world's consumption⁹. The region's high 'Ecological Footprint' is partly due to affluence, with people consuming high levels of resources such as personal appliances and holidays.

Studies of the UK and regional Ecological Footprints have been led by WWF-UK, in association with CURE and the Stockholm Environment Institute. Further information on Ecological Footprints can be found at <http://www.wwflearning.org.uk/ecological-budget/>. Research on Ecological Footprints forms part of wider work towards a 'One Planet Economy'. This concept involves the development of sustainable consumption and production patterns, and fair shares across the globe. The One Planet Economy Network provides a number of relevant reports¹⁰.

Research on organisational and individual Ecological Footprints has been led by Best Foot Forward, through the programmes 'Stepwise' programmes (www.bestfootforward.com).

CO₂ emissions

There is now scientific consensus that the earth's climate is changing and that this is largely due to human activity. Emerging evidence suggests that the climate may be warming faster than scientists had anticipated. Decision makers within government, businesses and households in the UK are now realising that we need to reduce carbon emissions significantly if the worst affects of climate change are to be avoided. Significant action needs to be taken now to avoid the need for more drastic measures in future. This is reflected in a number of national and regional policy initiatives including:

⁹ WWF (2006) Ecological Budget UK - Counting consumption

¹⁰ <http://www.wwflearning.org.uk/ecological-budget/download-centre/one-planet-economy-network,778,AR.html>

- The draft Climate Change Bill, which – amongst other initiatives – advocates the development of 5-year ‘carbon budgets’;
- The Energy White Paper 2007, which sets out a raft of measures to improve energy efficiency and move towards low-carbon energy sources;
- The requirement by Defra for regions and local authorities to develop indicators of territorial CO₂ emissions (i.e. emissions produced within the region) – and for regions to produce future trajectories of these emissions;
- Establishment of Climate South East (formerly the South East Climate Change Partnership) and the South East Sustainable Energy Partnership;
- Development of the Climate Change Implementation Plan for the South East, on behalf of the Assembly, in 2006.

The Government has proposed a long-term target of reducing CO₂ emissions to 60% below 1990 levels by 2050. WWF-UK and the Tyndall Centre strongly advocate that an 80% reduction is required by 2050 to reduce the risk of potentially catastrophic climate change. Long-term targets for this study are discussed further in Chapter 3 of this report.

2.3. Why is a ‘route map’ needed?

To date, there has not been a comprehensive review of the policies and actions needed to meet the regional reduction targets for Ecological Footprint and CO₂ emissions. While a number of studies have been undertaken to assess the current levels of these indicators, less work has been undertaken on the types of policies and actions needed to reduce them:

- The Climate Change Implementation Plan for the South East (2006) proposes a comprehensive set of mitigation and adaptation actions for different actors in the region, but does not model or quantify the impact of these measures on CO₂ emissions;
- Similarly, the ‘Context and Issues Paper’ prepared for the Select Committee of the Assembly in 2007 on ‘Reducing the South East’s Ecological Footprint’ indicates the type of action that should be prioritised but does not attempt to quantify their impact;
- The report by CURE for the Assembly ‘Stabilising the ecological footprint in the South East Plan’ (2005) focuses specifically on the scope for stabilising or reducing the footprint through spatial planning measures, and does not look at the full range of types of policies that could be used within the region.

This study has therefore aimed to both to identify the types of measures required to meet regional targets for stabilisation and reduction of the Ecological Footprint and CO₂ emissions, and to model the impact of these measures in relation to the targets. The outputs from the study will inform policy development by the regional bodies, sub-regional groups and other actors within the region.

2.4. Limitations of the 'route map'

There are considerable uncertainties surrounding development of the 'route map'. Firstly, there is no unique solution. Logically, there are unlimited combinations of different policies that could reach the reduction targets. Using the resources available for this study, it has been possible to develop one plausible route towards the stabilisation and reduction targets, based on our current knowledge and understanding. A more extensive study would be needed to develop and consider alternative approaches to reaching the regional targets, although we have drawn on studies of this type that have been undertaken at national level¹¹.

There are also, inevitably, a large number of uncertainties affecting the region's future path towards the targets. In particular:

- Scientific evidence about the potential impacts of climate change, and the scale of reduction required in CO₂ emissions, is continually evolving;
- Industrialisation around the globe is increasing wealth and improving quality of life in many developing countries, but at the same time contributing to global pressures on food supply, energy supply and emissions;
- Oil and gas resources are depleting, and concern is currently emerging about 'Peak Oil' – a situation in which levels of conventional reserves are declining at the same time as global demand is growing, with consequent upward pressure on prices;
- Considerable effort is going into developing new technologies which could contribute significantly to reducing CO₂ impacts and improving resource efficiencies, including hydrogen fuel cells and 'Carbon Capture and Storage', but it is unclear how soon these will be technically feasible and economically attractive;
- Public awareness of the need to reduce CO₂ emissions and resource use is developing but willingness to take significant action is at present limited;

¹¹ In particular, we have drawn on '80% Challenge – delivering a low carbon UK', led by the Institute for Public Policy Research (IPPR), and 'Zero Carbon Britain' by the Centre for Alternative Technology (CAT).

- International and national policy is continually responding to these factors. While a great deal of new policy has emerged in the last couple of years, it is not yet clear whether the UK Government will introduce bold enough measures (e.g. carbon quotas or taxes) to encourage significant change from 'business as usual' amongst consumers, businesses and other organisations;
- Institutional arrangements in the South East and all English Regions are being reviewed as part of the Government's Sub-National Review: the roles and responsibilities of the regional bodies, sub-regional groupings and local authorities are likely to shift as this review is implemented. In particular there will probably be one single regional body in future, and one Integrated Regional Strategy, rather than SEEDA leading on the Regional Economic Strategy and the Assembly leading on the South East Plan and Regional Sustainability Framework.

By its nature, the remit of the regional bodies is multi-level and multi-lateral. So much of the route map is about influencing other bodies through coordination, enabling and encouragement. This makes assessment of the direct effects of policy more difficult.

Although our study has focused on the South East region, within the UK context, it is clear that there are few boundaries in a globalised economy. Therefore 'transformation' of the South East would require similar actions in the UK and overseas. While these cannot be assumed, it is clear that:

- There are economic advantages for the South East in taking a lead;
- It is (both morally and practically) the right course of action; and
- It will demonstrate leadership for others to follow.

Our approach to these uncertainties, and the principles we have followed in developing the 'route map', are discussed further in the next chapter.

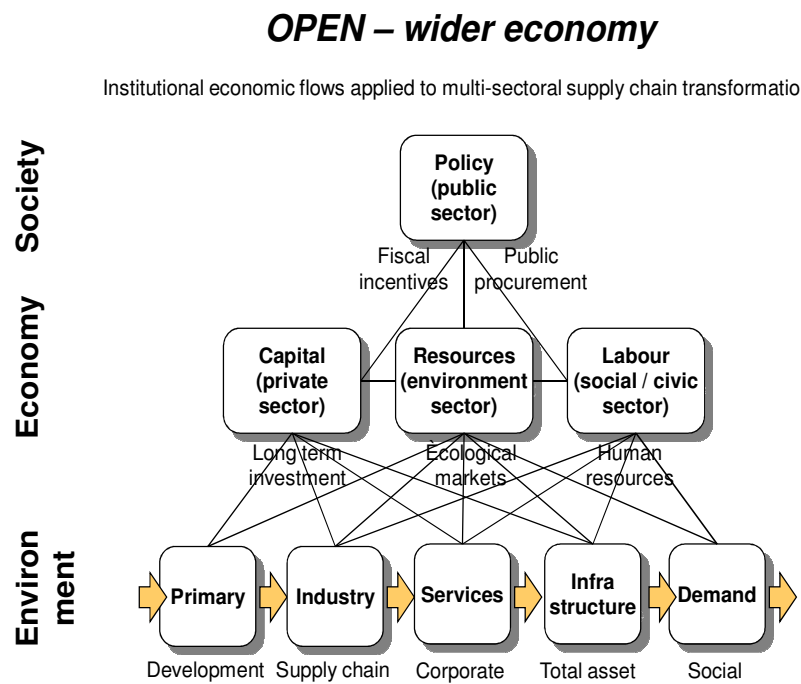
3.Principles underlying the ‘route map’

Our work on the ‘route map’ has been informed by the ‘One Planet Economy Regional Analysis’ (OPERA) methodology, which was developed by Joe Ravetz for the South East region, on behalf of the Assembly, SEEDA and Defra¹².

This chapter outlines what is meant by a ‘One Planet Economy’, and what this would mean for the region’s long-term transformation. It then explores the issues involved in developing a ‘route map’ for the South East.

The broad principles underlying the One Planet Economy are set out in Chart 3.1 below. The implications of these principles for a route map for the South East are explored below and summarised in section 3.2.

Chart 3.1 Principles of a One Planet Economy



¹² ‘One Planet Economy Regional Analysis (OPERA)’ Consultation draft report. (CURE, July 2007).

This chapter draws heavily on generic material which originated with the One Planet Economy Network Prospectus (available on www.ecologicalbudget.org.uk), developed with support from WWF-UK. This in turn was based on an earlier phase of the same work, published in 2006 as 'Counting Consumption'. The material is being continuously adapted and improved in various regions, cities and sectors. Therefore it is offered here as essential and topical background to the research carried out for this study.

The full description of a One Planet Economy at the UK level is due to be launched in autumn 2008 by WWF, based on research by Joe Ravetz at the University of Manchester. It is hoped that the South East regional programme could benefit from this in due course.

3.1. Towards a One Planet region

3.1.1. One Planet themes

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

There are now messages coming from many directions – the Stern Review, the Intergovernmental Panel for Climate Change (IPCC) report on climate change, and the WWF Living Planet Report – to say that the level of consumption in the UK and other affluent nations is pushing the earth's resources to beyond the limits.

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

- The **Ecological Footprint** measure shows that consumption by residents of the South East region (6 global hectares per person in 2003) is using up the earth's limited resources of **bio-productive** land area, at over 3 times their per capita share (and rising);

- As a service-led economy the South East region is now **exporting its environmental impacts**, by importing more goods from overseas, even while the local environment becomes cleaner and greener;
- To reduce the current footprint to the 2050 fair share of bio-productive land area in 2050 would need a **Factor of Four** increase in resource efficiency.

Such resource efficiency improvement can be both cause and effect of economic **development** and **social progress**;

- To achieve this by 2050 would take an efficiency increase of over 3%, year on year, right across the board – transport, housing, industry and so on. This is the fundamental 'One Planet' benchmark, in lifestyle, city, region and economy.

3.1.2. One Planet Thinking

There are major challenges in the One Planet theme. It cuts across the general model of economic growth, and the general assumption that 'more satisfaction = more production = more consumption'. In contrast the One Planet theme highlights the concept of 'decoupling':

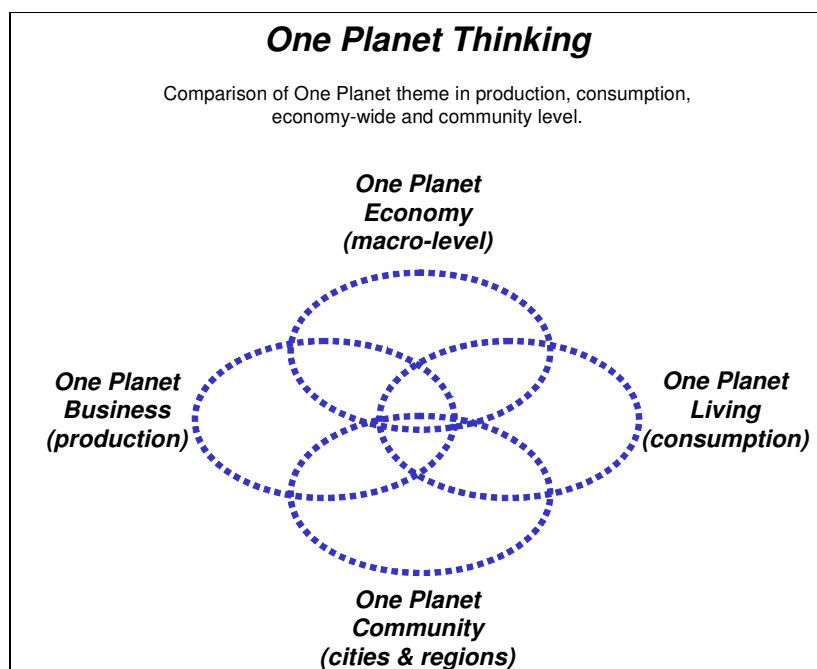
- We can assume a general goal of increasing human satisfaction or welfare – the 'social imperative';
- We can assume a general goal of reducing environmental impact – the 'environmental imperative';
- Putting these together implies the '**de-coupling**' of welfare **growth**, from resource / impact **reduction**;
- Economic growth could be anywhere between these poles, which is consistent with other goals such as employment, investment, equity and so on. There is an agenda for '**re-integration**' of economic goals with social and / or environmental goals.

This theme of decoupling and re-integration can be approached from different angles, as per the overlapping circles shown in Chart 3.2:

- **One Planet Business** – focuses on the producer, industrial and organizational side, and the various incentives and benchmarks suited to this;
- **One Planet Living** – focuses on the consumption, lifestyles and products side, and the behavioural and lifestyle agendas;

- **One Planet Communities** – focuses on the territorial and infrastructure side, at regional, city or neighbourhood levels;
- **One Planet Economy** – focuses on the macro and micro-economy agendas for governments, fiscal policy, markets and market transformation, supply chains, international trade and development, and so on.

Chart 3.2 One Planet Thinking



3.1.3. Trends and targets

There are two main targets which define the One Planet Economy – climate change and Ecological Footprint – and for each, every day brings not only more serious news, but a growing gap between science and policy.

For climate change, the debate hinges on levels of uncertainty, acceptable risk, and new scientific evidence. Estimates of the emissions reductions needed vary from 2.5% per year, to over 6% per year. Even the stronger targets would still carry a significant risk of runaway climate change, with destruction of rainforests, desertification, sea level rise, famine, drought and so on.

One Planet – what is a 'fair share'?

For the resource agenda, current evidence shows that the UK is exploiting the Earth's available resources, as measured in bio-productive land area or 'bio-capacity', at more than three times its 'fair' share, as measured by the Ecological Footprint in global hectares per capita (gha/cap). This footprint is not a universal catch-all measure, but it does draw attention to the totality of global impacts and limits. These of course change over time, so that the One Planet target is very much a moving target:

- By 2050 there is likely to be a 50% increase in world population, to the region of 8-9 billion people;
- There may be some additions to bio-capacity through land reclamation and reforestation, but there may be other damage to eco-systems;
- Therefore a mid-range estimate of change in bio-capacity would be from 1.8 to 1.3 gha/cap in 2050;
- To reduce the current UK footprint of 5.5 gha/cap to the 2050 fair share bio-capacity of 1.3 gha/cap would need a Factor of Four reduction;
- To reduce the future UK footprint (assuming current growth trends of 0.8% per year) of 7.7 gha/cap in 2050, to the 2050 fair share bio-capacity, would need a Factor Six reduction.

This provides the overall horizon for the sustainability of the UK economy i.e. the path towards a Factor Four goal, (named after the book of the same name).¹³ At that point it will take up the challenge of the UK Sustainable Development Strategy, and move towards a real One Planet Economy – *"an economic system of production and consumption which respects environmental limits, local and global, while being financially and socially sustainable"*.

Factor Four reduction

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

- This equates to a year on year reduction in total resource use of 3.5% per year (if starting from 2007), as measured by the Ecological Footprint;
- By 2020, at this rate of change, the reduction in total Footprint would be about 35% and by 2050 about 75%.¹⁴

¹³ 'Factor Four – Doubling Wealth. Halving Resource Use.' Ernst Von Weizsacker (1997)

¹⁴ The calculation depends on which year is set as the baseline year, and whether figures are rounded.

- If we factor in economic growth at an average of 2.5%, then the required rate of 'decoupling' or improvement in the resource efficiency (Footprint per £ of GDP) would be a reduction of more than 6% year on year for the next half century. This is about twice the rate of decoupling in the recent past, which held resource use more or less level while the economy grew.

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

Implications for Ecological Footprint targets

The Ecological Footprint measure is based on the Global Footprint Network method, and shows a very simple target:

- To reduce the regional footprint of 6 gha/cap to the 2050 fair share of 1.3 gha/cap would need a 'Factor Four' reduction;
- This equates to a year on year reduction in total footprint of 3.5% per year. By 2020 the reduction would be 35%, and by 2050 about 75%;
- If we factor in economic growth at an average 2.5%, then the target rate of '**decoupling**' or resource intensity change (Footprint/£GDP) would be a reduction of 6%, year on year – more than twice the rate of decoupling in the recent past.

Clearly such a profound change is not going to happen overnight, and there is not a single way to achieve it. So this report includes for two contrasting angles on the 'One Planet Region' scenario. One is a 'top-down' angle which assumes new technology in a globalized economy, focused on more **sustainable production**. The other is a 'bottom-up' perspective which focuses on demand management and social enterprise, leading towards more **sustainable consumption**.

This section has focused primarily on defining what the 'route map' should be aiming for, in terms of long-term transformation of the South East into a 'One Planet Economy'. The next section discusses how this might be achieved, in terms of the institutional structure and governance of the region.

3.2. Elements of the 'route map' for the South East

3.2.1. Policy and governance issues

The South East region highlights the need for more sustainable development, and sustainable communities/consumption/production, in its RES, RSS, RSF and many other documents. With such good intentions, what could possibly be missing?

For this we should look at the difference between 'surface greening' – a few trees or recycling bins – and real structural change. We can also look at the powers, resources and mandate of local or sub-regional government, in a complex, affluent, globalized economy. In other words, how far can the region really move ahead of the economies of the region, the UK and the EU, and if so then who, when and for what cost? The real questions are about real investment, real technology, and the decisions of 50,000 businesses and 700,000 people. For each of the key sectors above we need to ask:

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

3.2.2. What can the region do?

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

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

For the South East region, the question is how these can be implemented by and with the public sector, at the level of regional and local authorities, and the many agencies and providers in health, education and other sectors.

There is certainly a need for coordination with the regional bodies, UK government, the EU and international bodies. But the South East region and its various initiatives and

partnerships also need to take the lead – to promote, facilitate, innovate, and generally make things **happen** at regional level.

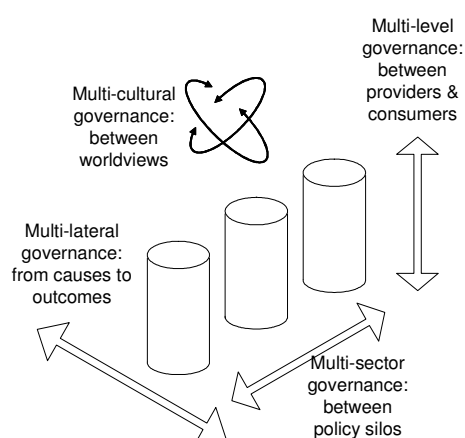
3.2.3. Multi-level and multi-lateral governance

The South East region on its own, in the foreseeable future, is unlikely to move any great distance from the UK economy. So the One Planet region agenda may aim to facilitate the UK/EU policy level, for producers and consumers at the local level. This involves:

- 'Multi-level governance' between national and local;
- 'Multi-sectoral' coordination between policy and public 'silos', and between private and community sectors;
- 'Multi-lateral' governance, linking the supply side and demand side;
- 'Multi-cultural' governance which takes account of different values and worldviews.

Chart 3.3 Joined up policy for sustainable development

Joined up policy for sustainable development



The forthcoming programme for delegated authority at the regional level, as in the Sub-National Review and others, may be one step on a long journey. While clearly more needs to be done, there are open questions for the future:

- **Political** integration or decentralisation, at the national, regional or local level?
- **Economic** integration or decentralisation, at the national, regional or local level?

We cannot pre-judge these issues in this report, but whichever the outcome, we can advocate practical ways forward. Some of these focus on new forms of distributed intelligence, as enabled by information and communications technology (ICT). We see huge potential for 'next generation' web services on the model of eBay, MySpace and so on. These could facilitate a next generation of relationships and governance in a One Planet Economy:

- Trading for re-use and recycling;
- Digital democracy;
- Responsive urban planning and management;
- Consumer needs profiling for public service delivery;
- Social spaces for community networks, and so on.

3.2.4. Fiscal and investment issues

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

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

3.2.5. Affluence and lifestyle issues

This all seems high-minded – but in practice there are deep rooted issues of affluence and individual liberties. One approach to 'decoupling' growth from material consumption is to look at behaviour change incentives, awareness and education, media and fashion, and personal development.

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

This applies to the regeneration agenda in the South East region as elsewhere. The conventional solution is to raise competitiveness, incomes, and material consumption. But more sustainable solutions might look at social enterprise, lifestyle aspirations, skills and careers, and community investment.

3.2.6. One Planet Economy principles for 'route map'

Finally in this section, we apply the One Planet Economy principles to development of a 'route map' for the South East. This looks at the totality of the regional system - from production to consumption, from private to public sector, and from physical to economic to social effects. This can be summarized and represented by 10 principles as in the diagram below - most of which will then combine for application to particular sectors, particular supply chain issues, or policy options. Each principle can be applied through a series of practical benchmarks and indices.

The box shows the general approach to the transformation of the South East regional economy, based on the 10 principles of the One Planet Economy.

General recommendations on the One Planet region economic agenda

Based on One Planet Economy Network Prospectus, available on www.ecologicalbudget.org.uk. These recommendations reflect the '10 principles' of a One Planet Economy:

- a. **Ecological budgeting**, - ensure at least 3.5% per year reduction in climate emissions, ecological footprint and total resource use, across all policies and programmes.
- b. **Fiscal policy and stewardship** – new forms of levies, permits, procurement and re-investment, to promote 'market transformation' in key sectors.
- c. **Investment and partnership** – promote longer term private finance and equity partnerships, to promote 'market transformation' in key sectors.
- d. **Trade and development** – ensure through procurement and investment that all goods and products are from sustainable and ethical sources.
- e. **Integrated supply chain** – promote corporate social responsibility in all business, supply chains and product life cycles.

- f. **Infrastructure and assets** - strategic 'integrated asset management' for all stocks of buildings, vehicles, plant and other fixed assets.
- g. **Consumer and social enterprise**: - promote sustainable consumption on the demand side, enabled by communities, networks, non-profit and other social / community markets.
- h. **Stakeholding and labour**: ensure that the wider community of employees and other stakeholders are engaged and mobilized.
- i. **Stabilisation and equity**: ensure that local and city-region economies are resilient and empowered to realize their own potential.
- j. **Eco-systems integration**: facilitate new forms of market for environmental, social and economic assets.

3.3. The route map – who should do what?

This section applies the general issues of governance to the specific questions of who should do what, how and when. We look first at the 'strategic' level, and then focus more on the immediate 'business planning' level.

3.3.1. One Planet region route map - strategic level

The 'route map' concept is used here to show the general direction of travel, possible milestones, and linkages between different policy levels – see Chart 3.4. This can only be very approximate, as there are many uncertainties even on the present situation, let alone decades from now. However it is important to see even an approximate route-map, as this is the basis for exploring 'policy response' scenarios, building in strategic targets, and dealing with problems and opportunities.

Regional, national and global level:

These are general principles as set out in the One Planet Economy Network research programme:

- Ecological budgeting and strategic transformation: each industry and business sector will need to develop a transformation strategy, in order to maximize added value, minimize environmental impacts and risks, and enhance corporate social responsibility;
- International development and trade policy is a key issue, relating particularly to material intensive imports of commodities;

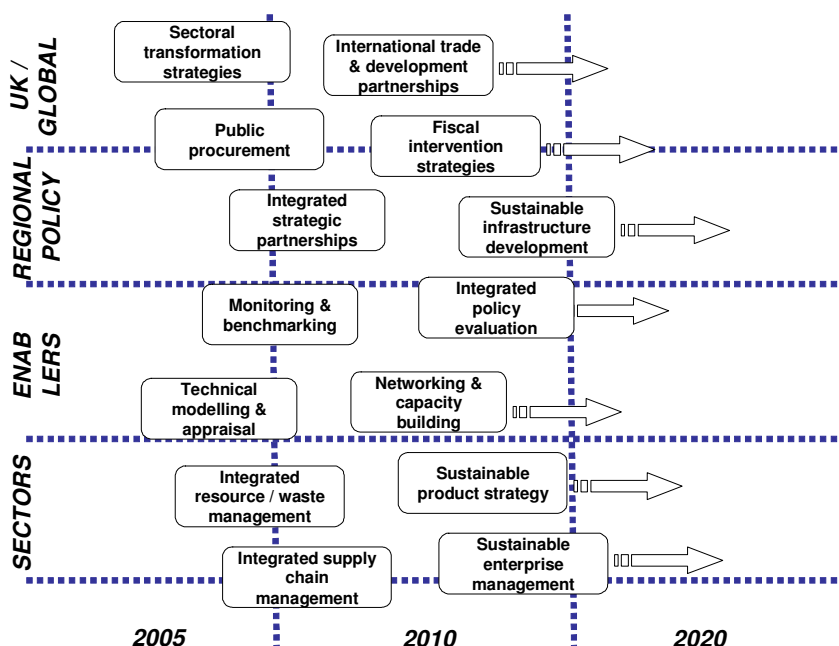
- Fiscal intervention – environmental tax and subsidy is a key principle in shifting market patterns towards environmental responsibility;
- Procurement by the public and quasi public sectors – the first priority where the principles of least-cost planning and integrated asset management can be applied.

Sector, firm and product level:

The business–environment programmes below are not all new, but the incentives and urgency have increased, and the tools and techniques to enable them have also improved:

- Integrated supply chain management – rather than each firm drawing a line at its gate, this looks at the total supply chain for opportunities in new processes, logistics, technologies and business models;
- Integrated resource and waste management;
- Integrated energy and climate emissions strategy;
- Sustainable product strategy – includes the issues of operational impacts, end of life fates and so on;
- Sustainable enterprise management – includes the issues of Corporate Social Responsibility (CSR), employee welfare, shareholder value, risk management and so on.

Chart 3.4 Route map for sustainable regional development



Enablers and Catalysts:

In the centre of this 'route map' are the enablers and catalysts:

- Technical modelling and appraisal tools, including the models used in this report;
- Monitoring and benchmarking techniques, with continuous improvement of audits, databases, case study libraries and so on;
- Integrated policy appraisal and evaluation – applying these tools and techniques to the policy and management cycle;
- Networking and capacity building – training, dissemination and so on.

There is a notional timescale shown from 2007 – 2027, where each of the above factors is an ongoing programme. However where there are clear targets and milestones, for example with EU Directives on waste, then a more specific application of this route map would be useful.

3.4. One Planet Region route map – business planning

So where is the region on the above picture of multi-level governance, and what is its effective competence and mandate? This is a matter for debate and policy innovation. In almost every branch of public policy, the competence and mandate is up for negotiation and consensus building. In many areas which are crucial to the One Planet theme, such as food chains, the local authority has very little competence or mandate at present.

For instance, the proposal to upgrade the entire housing stock of the South East region depends on active partnership between financiers and developers, landlords and agents, designers and builders, utilities and technology suppliers, and so on. Most of these are not defined by the current boundaries. So, the added value of coordination at the region, sub-region, city level, or even inter-regional level, has to be negotiated and debated, with a chain of organisations in a multi-level and multi-lateral situation.

This in reality will be a process rather than a fixed blueprint, where each of the policy options can be researched and negotiated in the short, medium and longer term. A typical strategic programme will contain both 'demand side' and 'supply side' components, both 'physical' actions and 'human' actions, and will need both technical and economic resources. The likely shape of a strategic programme can be charted out on the supply chain basis, showing the likely actions at each stage for now, soon and later (see Chart 3.5).

Chart 3.5 Business planning for sustainability

BUSINESS PLANNING FOR SUSTAINABILITY

General strategic programme or business plan for cradle-grave approach to environmentally sustainable development.

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

In this chapter, we have explored the issues about where the 'route map' should lead to, what principles should underlie it, and what types of policies and actors it should involve. The next chapter, we describe the methodology that we have used to develop the route map, following these principles. Our research findings, and proposals for the route map itself, are presented in Chapters 6-8. Application of the route map is discussed further in Chapters 9-10 of this report. Detailed route maps for each sector are presented in Part II of this report (Chapters 11-20).

4. How have we developed the route map?

4.1. Overview of methodology and models used

In developing the route map, we have been guided by the 'One Planet Economy Regional Analysis' (OPERA) methodology developed for SEEDA, the Assembly and Defra by CURE. Central to the OPERA methodology is the preparation of a series of templates, analysing the structure of different sectors and their scope for change. Examples of these are presented in Appendix 4. Further details about the OPERA methodology can be found in the draft methodology report prepared by CURE in July 2007¹⁵.

The OPERA framework has been used to define future projections by two separate models, using the assumptions set out in the OPERA templates. Neither model gives a complete picture of the region's future performance and impact, but the two are complementary in providing different perspectives on the region's future performance and impacts. Further details of both of these models, and the OPERA framework, are given in Appendix 4:

- **The Resources and Energy Analysis Programme¹⁶ (REAP)** developed by SEI has been used to project the region's future Ecological Footprint on a consumption basis. This model analyses the South East's consumption under a number of headings (e.g. household energy use, personal transport, food, services, consumer goods). Within the REAP analysis, the impacts of business organisations are allocated to the final consumers of goods or services produced by those businesses. So the REAP model highlights the impacts of our lifestyles as consumers. It will soon be possible to use REAP to analyse carbon emissions – as well as Ecological Footprints – on a 'consumption basis'¹⁷ but this capability was not available at the time of this study.
- **The Regional Economy and Environment Input Output¹⁸ (REEIO)** model developed by CE has been used to make projections of the region's Carbon Footprint on a territorial basis. This model analyses production by industries in the South East across a number of sectors (e.g. energy supply, transport, waste management, water supply, manufacturing, services). As well as calculating

¹⁵ 'One Planet Economy Regional Analysis (OPERA)' Consultation draft report. (CURE, July 2007).

¹⁶ <http://www.sei.se/reap/index.php>

¹⁷ See Glossary in Appendix 1 for explanation of technical terms.

¹⁸ http://www.cambridgeeconometrics.com/suite_economic_models/reeio.htm

carbon dioxide emissions, the REEIO model predicts other environmental pressures including waste arisings and water use. So the REEIO model highlights the impacts of the business sector.

Neither of these models provides detailed modelling of the energy supply sector. Both REEIO and REAP are limited in how they can portray energy from the UK electricity grid, and energy from renewable sources. We have developed our projections of this sector with reference to existing national studies, which have been used as inputs to REEIO. In particular, we have drawn on '80% Challenge – delivering a low carbon UK', led by the Institute for Public Policy Research (IPPR), and 'Zero Carbon Britain' by the Centre for Alternative Technology (CAT). Further details are given in Part II, Chapter 16.

Some issues are not amenable to modelling, and many (such as the future direction of national policy) are simply unknowable. On such issues we have reviewed available literature and consulted with appropriate experts. The OPERA framework has been used to structure the analysis, and to provide overall understanding beyond the limits of the models.

Preliminary findings from our modelling work were presented to a workshop of regional stakeholders in February 2008. We are grateful to the contributions of these stakeholders and other consultees, listed in Appendix 2, who commented on early versions of material in this report.

4.2. Scenarios

To undertake this analysis, we have defined three possible scenarios for future Ecological Footprint and CO₂ emissions:

- **'Reference'**: in this scenario, we assume that past trends are broadly continued, except where this would not be technically or economically achievable. The REEIO model also assumes partial implementation of Energy White Paper measures in this scenario.
- **'Current policy'**: in this scenario, we assume that current economic and environmental strategies are successfully implemented, at both national and regional level (e.g. the Regional Economic Strategy, the UK Energy White Paper, the South East Plan). This scenario involves higher economic growth as well as more effective action to promote sustainability.
- **'Transformation'**: this scenario looks at more radical policy changes (at national/regional/local level) required to transform production and consumption within the region, to achieve 80% reduction in both climate emissions, and

Ecological Footprint by 2050. It is clear that for Transformation there are few simple final solutions, rather a continuing debate on ends and means.

Findings from modelling of these scenarios are presented in Chapters 6 and 7: an overview of the Reference and Current policy scenarios is presented in Chapter 6 ('Where are we headed?'), while an overview of findings from the Transformation scenario is presented in Chapter 7 ('How can we reach the targets?'). More detailed findings are presented by theme in Part II of the report.

4.3. Targets

The over-arching goal has been to assess what level of change is needed in the South East region to achieve environmental sustainability, as defined by an 80% cut in CO₂ emissions and ecological footprint, between 1990 and 2050 at the latest. This is consistent with a 'One Planet Economy', as described in Chapter 3, and appears likely to require 'transformation' of policies, markets, technologies, infrastructure and consumer behaviour.

Each of the scenarios is assessed in terms of these two main indicators:

- The Ecological Footprint of consumption in the region;
- CO₂ emissions produced in the region;

Both indicators are assessed against stabilisation and reduction targets.

Stabilisation targets

The short-term targets in the South East Plan and RES focus on stabilisation of the region's Ecological Footprint by 2016 at the latest. We interpret this as meaning a stable level of the footprint with no further growth, albeit at a level higher than historic levels and considerably higher than our 'fair share' of the earth's resources.

As part of our analysis using the REAP model, we have analysed the impact of different policy groups or 'wedges' on each sector's footprint. From this, we can indicate the types or combinations of policies that would be sufficient to stabilise the footprint.

Reduction targets

For each indicator, the Transformation target of 80% cut by 2050 implies the following interim targets (as discussed in Chapter 3). The percentages below assume that new policies will take a year or two to formulate and influence, so the Transformation scenario starts diverging from the Current policy scenario from 2010 onwards:

- Medium-term (1): 33% cut by 2020, relative to 1990;
- Medium-term (2): 54% cut by 2030, relative to 1990;

- Long-term: 80% cut by 2050, relative to 1990.

These targets imply an annual compound reduction of -4% in absolute emissions / footprint between 2010 and 2050. Given that economic growth is projected to be 3% in the Reference case (and 3.5% in the Current policy and Transformation scenarios), this would imply relative decoupling of 7-7.5% from economic growth.

This trajectory would also meet, broadly, the short/medium-term targets in the RES and South East Plan for reducing CO₂ emissions as follows:

- Short-term: 20% below 1990 levels by 2010 (SE Plan);
- Medium-term: 25% below these levels by 2015 (SE Plan, Policy CC2); and
- Medium-term: 20% below 2003 levels by 2016 (RES).

A more detailed assessment of the correspondence between the different short and medium-term targets is not possible at this stage, since the historical data on CO₂ emissions from the region is currently being recalculated using the latest methodology. Early indications from Cambridge Econometrics are that there has been little or no decline in CO₂ emissions from the region between 1990 and 2005, which is the base year for REEIO projections in this report. So reductions from a base year of 2005 are roughly equivalent to reductions from a base year of 1990.

4.4. Themes

We have analysed the region's production and consumption across a number of sectors or themes. We have been able to analyse some of these on both a production and consumption, by REEIO or REAP respectively, giving different perspectives on the themes. But some are amenable to analysis from one perspective only, using the models applied in this study. Part II of this report (Chapters 11-20) presents detailed definitions and findings for each of the following themes:

- The built environment (including home energy use, property and housing construction);
- Transport (passenger and freight transport, including some aspects of aviation and shipping);
- Energy supply (including electricity use from the National Grid);
- Food (including supply, distribution and transport of food);
- Goods and services, public services and capital investment (includes consumer goods, appliances, clothing and so on; also private services (e.g. financial services, private health care), public services (e.g. local government spending on health and education), and capital investment that is not allocated to other sectors);

- Waste and resource use (assessed in terms of waste arisings);
- Water (assessed in terms of water use).

The first five themes are major contributors to both the Ecological Footprint and CO₂ emissions. The last two, as industrial sectors, make a relatively small contribution to the footprint and emissions but are included for different reasons:

- **Waste and resource use** has been included partly because of its potential impact on all aspects of the region's footprint (in terms of resource efficiency), and also because of the importance of waste disposal as a sustainability issue for the region (in terms of the impact of disposal on the local environment);
- **Water** has been included because much of the region is classified as being an area of 'serious water stress'. Not only is water availability a major sustainability issue for the region at present, but the effects of climate change are likely to lead to more frequent and severe droughts.

4.5. Cross-cutting themes

While our detailed modelling and analysis has been structured around the themes outlined above, we are aware that there are a number of cross-cutting themes which can influence many of these themes. We have therefore also reviewed the scope for action on the following cross-cutting themes:

- Procurement
- Spatial planning
- Behaviour change
- Growth areas/'Diamond' local authorities¹⁹

An overview of recommendations on these themes is given in Chapter 8, and more analysis and detail is provided in Chapter 13 of Part II.

¹⁹ The RES identifies 8 'Diamonds for Investment and Growth'. They are a focus for economic growth and innovation in the region.

5. Where are we starting from?

This section presents an overview of the South East's current Ecological Footprint and CO₂ emissions. These two indicators provide different perspectives on the region's impacts:

- The **Ecological Footprint** is presented here from a consumption perspective, measuring the impacts of consumption by South East residents, wherever those impacts may be. This is a good measure of the impacts of our lifestyles. The Ecological Footprint calculates the direct land take ('real land') needed to sustain our lifestyles, and the 'energy land' required to absorb the carbon dioxide emissions from the oil, coal and gas that we burn. Stated in 'global hectares per capita', it measures the resources consumed by our population, and allows comparison with our 'fair share' of the available biologically productive surface area of the planet. The Ecological Footprint calculations take account of imports and exports: the impact of imported goods from (say) China would be attributable to consumers in the South East, rather than to producers in China.
- **CO₂ emissions** are presented here from a production perspective, measuring emissions produced within the region by industry, commerce, transport, power stations and other sources. The emissions indicator, stated in tonnes of carbon, is measured at the point of emission rather than the point consumption. This means that the effects of trade are not included: emissions associated with imported goods are not attributable to the South East, but emissions associated with the South East's exports are still included. International travel, by air or sea, is only partly represented in these figures.²⁰

While it is possible to calculate CO₂ emissions on a consumption basis, equivalent to the energy land component of the Ecological Footprint, the data is unavailable at the time of writing this report. A forthcoming update of the REAP model will present historical data on consumption-based CO₂ emissions for all the UK regions, which can be compared to the production-based CO₂ emissions data presented here.

5.1. Historic Ecological Footprint

The South East has a high, and increasing, Ecological Footprint: the region's Ecological Footprint (EF) has increased from 4.90 global hectares per capita (gha/cap) in 1990 to

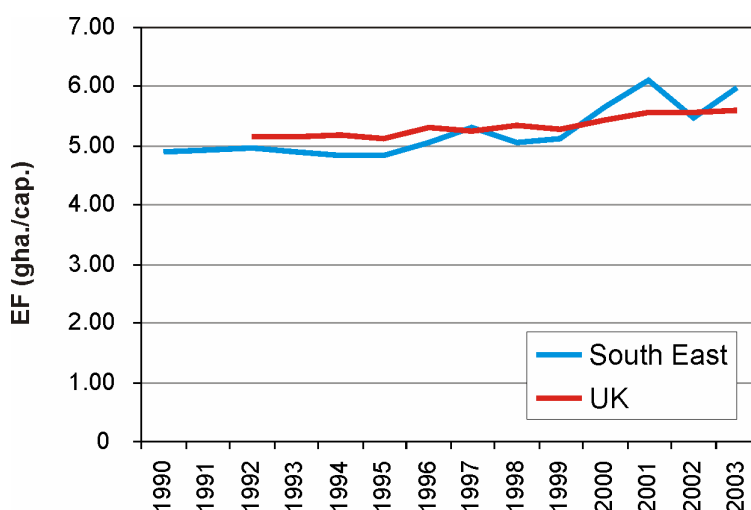
²⁰ The figures for CO₂ emissions include domestic travel to and from airports within the South East (i.e. Gatwick and Southampton, but not Heathrow), but they only include take-offs and landings for international flights (i.e. the cruise element of these flights is excluded). While inland marine transport is included, international marine transport is not.

5.99 gha/cap²¹ in 2003. This South East's footprint is higher than the UK average footprint which was 5.5 gha/cap in 2003. This is because of the region's relative wealth, and the consumption associated with this wealth.

The South East's footprint is more than three times our 'fair share' of the earth's productive land and sea. Dividing the biologically productive surface area of the planet by the current population gives a budget for one component of sustainable living: 1.8 hectares per capita. The world's average Ecological Footprint is already more than this, at 2.2 hectares per capita, indicating that we are consuming resources faster than earth's eco-system can support. As the world's population grows, the 'fair share' will shrink to the point that we would need 'three more planets' if all people on earth were to enjoy the lifestyle of South East England on a sustainable basis.

The chart below shows historical changes in the region's footprint compared to the UK as a whole. The sharp fluctuations in 2001 and 2002 are largely attributable to short-term shifts in exports and imports.

Chart 5.1 Historical trends in the South East and UK (Ecological Footprint per capita)



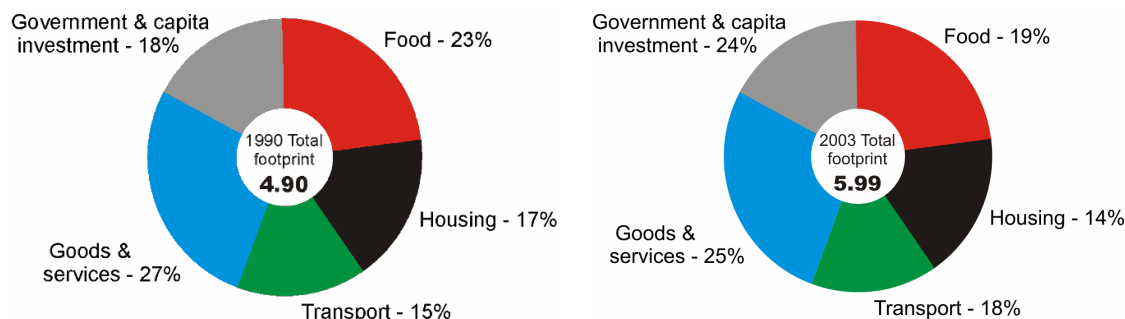
(Source: REAP model, Stockholm Environment Institute)

A sectoral breakdown of the region's Ecological Footprint is given in Chart 5.2 below. Three individual sectors which make a significant contribution to the region's footprint are food (19% in 2003), housing (14%) and transport (18%). The joint category of goods and services outweighs these at 25%, while public services and capital

²¹ There is some variation in estimates of the South East's footprint, arising from different versions of the REAP model. All estimates for 2003 are around 6 global hectares per capita. The overall messages from the study do not depend on the exact figure used.

investment accounts for the remaining 24%.²² The sectors which are growing fastest are transport, goods and services and public services/capital investment. The footprint of the housing and food sectors was stable or declined slightly between 1990 and 2003.

Chart 5.2 Sectoral Breakdown of South East footprint (1990 and 2003)

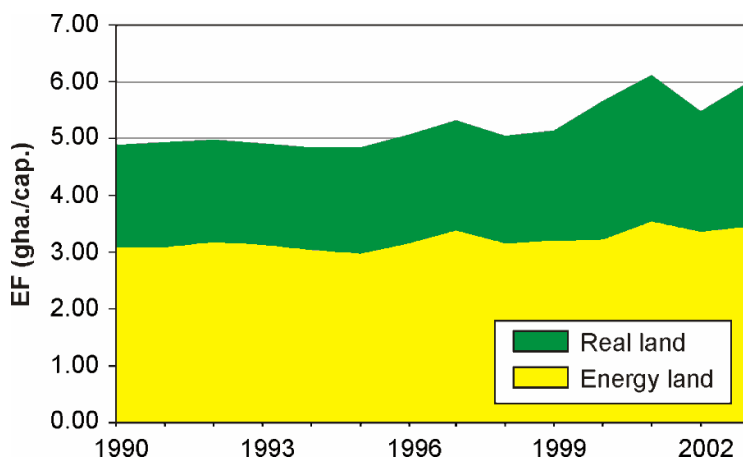


(Source: REAP model, Stockholm Environment Institute)

The Ecological Footprint measures both 'real land' (direct land take for buildings, roads and so on) and 'energy land' (the ecologically-productive land area that would be required to absorb the carbon dioxide we generate by burning fossil fuels). More than half of the region's Ecological Footprint is attributable to 'energy land', rather than 'real land'. Both the 'real land' take and the 'energy land' are increasing, as shown in Chart 5.3, with slightly greater increases in 'real land'. Fluctuations in 'real land' in recent years are largely attributable to short-term shifts in trade.

²² The exact percentages vary according to the allocation of impacts between categories. The figures shown here differ from those shown in the Context and Issues paper on 'Reducing the South East's Ecological Footprint', partly because they present data for 2003 rather than 2001, and partly because capital investment has not been fully allocated by sector.

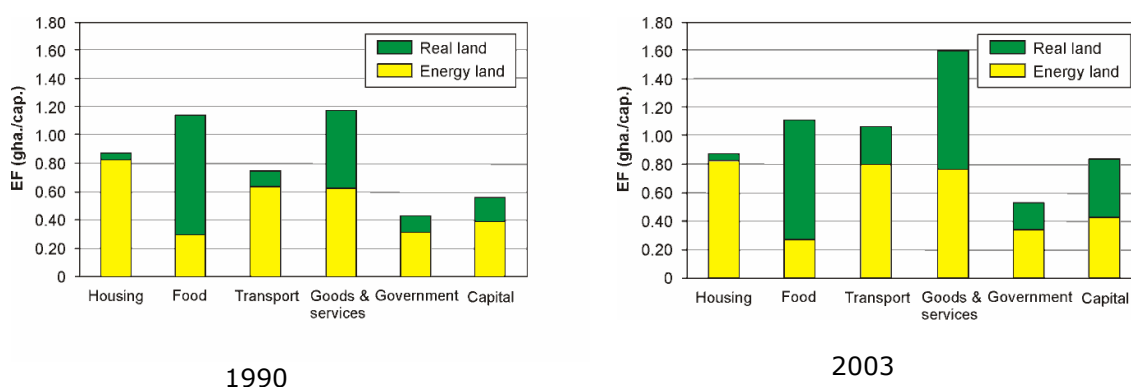
Chart 5.3 Historical trends in the South East – Energy land and real land comparison



(Source: REAP model, Stockholm Environment Institute)

The sectors with the largest 'real land' component are food and 'goods and services'. 'Real land' consists of both built-up land (for roads, housing, factories, towns and so on) and productive land and sea (for farming, fisheries and forestry).

Chart 5.4 Energy land and real land components, by theme: 1990 and 2003



(Source: REAP model, Stockholm Environment Institute)

5.2. Past CO₂ emissions

Historic data series for past CO₂ emissions from South East England are not currently available. The difficulty arises from successive improvements to the methodology for calculating CO₂ emissions, and consequent recalculation of historical figures using revised methodology. The figures below therefore relate to 2005, the earliest year for which reliable emissions data is available.

Data will shortly be available for 1990 emissions, using the latest calculations by AEA-Technology. Early indications from AEA-Technology, as reported by Cambridge Econometrics, are that emissions from the South East region have declined only marginally, if at all, between 1990 and 2005. This is in contrast to a fall of about 5% in UK emissions over this period.

Total emissions in 2005 were 21.8 million tonnes of carbon²³. In 2005, transport was the largest source of CO₂ emissions in the region, accounting for almost a third of all emissions in the region. The power generation sector was the next largest emitter, contributing just under 30%²⁴. Of the other broad sectors, industry accounts for 10% of all direct emissions and services around half that. Households' use of energy accounts directly for about 15% of all emissions in the region, although this does not account for emissions associated with the production of electricity that they consume.²⁵ Other fuel processing activities (e.g. oil refining) are another important source of emissions in the region: these are included in the 'other' category.

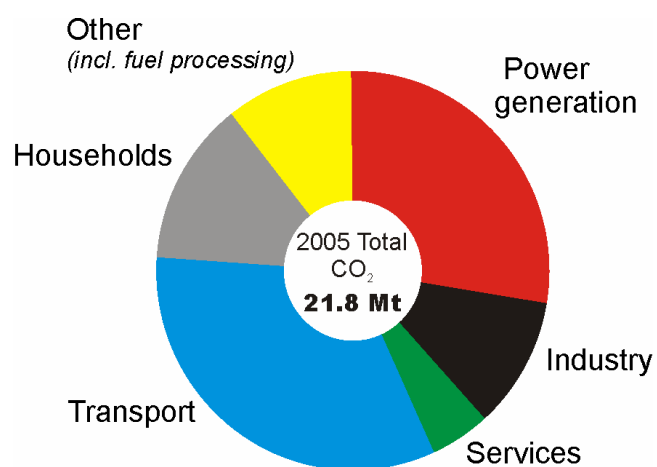
Early indications from Cambridge Econometrics suggest that there have been changes in the sectoral mix of emissions between 1990 and 2005. While emissions from power generation in the region appear to have declined, those from transport (and particularly aviation and road transport) appear to have increased.

²³ We have used 'tonnes of carbon' as the main unit for carbon emissions in this report. Applying the conversion factor of 3.666, these emissions are equivalent to 79.9 million tonnes of CO₂. This is higher than Defra's estimate of 67.0 mt of Greenhouse Gas emissions from the region owing to differences of definition (e.g. inclusion of domestic aviation; exclusion of non-CO₂ greenhouse gases).

²⁴ The emissions from electricity generation are attributed to the region where the generation activity is located, even though the region will not consume all the electricity that is generated by the stations located there.

²⁵ Estimates of indirect greenhouse gas emissions from electricity consumed in the region, but supplied by the National Grid, are presented in Chapter 16.

Chart 5.5 Sectoral breakdown of CO₂ emissions in 2005



(Source: REEIO model, Cambridge Econometrics)

6. Where are we headed?

6.1. Introduction

This chapter analyses whether the region is currently heading in the right direction, and whether reduction is happening fast enough to meet the Ecological Footprint and CO₂ stabilisation and reduction targets.

To undertake this analysis, we have defined two likely scenarios for future Ecological Footprint and CO₂ emissions:

- **Reference:** this scenario assumes that past trends are broadly continued, except where this would not be technically or economically achievable;
- **Current policy:** this scenario assumes that current economic and environmental strategies are successfully implemented, at both national and regional level (e.g. the Regional Economic Strategy, the UK Energy White Paper, South East Plan).

Analysis of these two scenarios will help to identify the scale of change required to meet the regional stabilisation and reduction targets, and the sectors which need most attention. This chapter sets out:

- A brief outline of the policy context at national and regional level;
- Predictions for the region's future Ecological Footprint, and the assumptions underlying them;
- Predictions for the region's future CO₂ emissions, and the assumptions underlying them.

6.2. Policy context

6.2.1. National and international policy

Growing concern about the potential impacts of climate change have led to an array of policy initiatives at national and EU level, aimed at mitigating the causes of climate change and dealing with its consequences. These will set the context within which the South East works to meet its Ecological Footprint and CO₂ reduction targets.

In particular, the UK **Energy White Paper (2007)** summarises and proposes a number of initiatives to improve energy efficiency and encourage low carbon technologies. Some of these are new initiatives and others are pre-existing:

- Stronger obligations on energy supply companies to invest in the energy efficiency of domestic consumers' homes, under proposed Carbon Emission Reduction Targets (CERT);
- A requirement that all new housing should meet Level 6 of the 'Code for Sustainable Homes' (CSH) by 2016, which involves excellent energy and water efficiency and investment in renewable energy;
- Introduction of a mandatory 'cap and trade' scheme for carbon emissions, the 'Carbon Reduction Commitment', for large commercial and public sector organisations;
- Stronger implementation of the EU Emissions Trading Scheme (ETS), including incentives for investment in Combined Heat and Power (CHP), and extension of this scheme to domestic aviation;
- Support for cleaner coal technologies, including Carbon Capture and Storage (CCS), to meet the EU ambition for new plants to be fitted with this technology;
- Stronger support for renewable energy through changes to the Renewables Obligation, in support of the latest EU target for 15% of the UK's total energy to be met from renewable sources by 2020;
- Progress towards the EU target for 10% of energy for transport to be from biofuels by 2020, through establishment of a Renewable Transport Fuel Obligation;
- Commitment to review the potential to apply pricing mechanisms to all modes of transport;
- Support for 'Smarter Choices' initiatives, which promote soft measures to encourage people to travel by more sustainable modes, including walking and cycling.

Another key policy document at national level is the draft **Climate Change Bill** which, when it becomes law, is expected to:

- Require the Government to define mandatory carbon budgets for five yearly periods;
- Set up a target for national carbon emissions in 2050 to be 60% lower than 1990 levels;

- Give the government greater powers to set up carbon trading schemes, the renewable transport fuel obligation scheme and waste reduction schemes.

In June 2008, the Renewables Advisory Board (RAB) published '2020 Vision – How the UK can meet its target of 15% renewable energy' (www.renewables-advisory-board.org.uk). This sets out the policies required to meet the target assigned to the UK by the EU earlier this year for 15% of the UK's total energy to be supplied from renewable sources, which is equivalent to about 40% of the UK's electricity.

This study is more conservative about the speed of developing renewable energy sources, owing to the slow development of supplies in recent years. In modelling Current policy, we have assumed achievement of the RES 'aspirational' target: that 20% of the region's electricity production should be generated from renewable sources by 2020. Given that renewable energy represents only 3.5% of the region's generating capacity at present, both the RES and EU targets are highly demanding.

Further details on policies on specific issues, including transport, waste, procurement and food are referenced in the relevant chapter of Part II.

6.2.2. Regional policy

This section gives highlights of three key regional documents:

- The South East Plan;
- The Climate Change Mitigation and Adaptation Implementation Plan;
- The Regional Economic Strategy (RES).

Targets for footprint and emissions reduction are included in both the South East Plan and the RES, as outlined in Chapter 2 above. These targets also form part of the Regional Sustainability Framework.

South East Plan

In addition to these targets on footprint reduction, relevant policies in the South East Plan include:

- Targets for renewable energy to reach 8% of generating capacity in the region by 2016, and 16% of generating capacity by 2026;
- A range of policies to encourage energy efficient/low carbon design in new developments, and to promote renewable energy, Combined Heat and Power (CHP) and bio-mass schemes;

- A Regional Transport Strategy that promotes 'management and investment' in existing transport infrastructure, combined with measures to encourage modal shift away from cars and reduce the need to travel;
- The Regional Transport Strategy also promotes 'mobility management' to rebalance the transport system in favour of non-car modes, and requires that all major travel-generating developments must agree a travel plan to manage/reduce transport impacts;
- Targets for waste minimisation, diversion of waste from landfill, and recycling/composting of all waste;
- An aspiration that annual consumption of primary aggregates will be stabilised by 2016;
- Policies to promote water demand management and water resource development and the incorporation of challenging water-efficiency standards into new developments;
- Economic policies which include the promotion of ICT to support flexible working and home-based businesses, to reduce commuting;
- Support for the role of, and regeneration of, town centres, as an alternative to car-dependent 'out of centre' developments.

Climate Change Mitigation and Adaptation Implementation Plan

The Climate Change Mitigation and Adaptation Implementation Plan (2006) has been developed to support the South East Plan. It is a strong document which includes many actions that would reduce the region's ecological footprint and CO₂ emissions. It focuses on the following mitigation principles:

- Improving energy efficiency performance of new and existing buildings and influencing behaviour of occupants;
- Reducing the need to travel and ensuring good accessibility to public and other sustainable modes of transport;
- Promoting land use that acts as carbon sinks;
- Encouraging the development and use of renewable energy;
- Reducing the amount of bio-degradable waste that is landfilled.

Further details are available at http://www.southeast-ra.gov.uk/southeastplan/plan/supporting_information.html#climate_change.

Regional Economic Strategy

The Regional Economic Strategy (2006-2016) sets out a vision that: *"by 2016 the South East will be a world class region achieving sustainable prosperity"*. The RES has three main themes: Global Competitiveness, Smart Growth and Sustainable Prosperity. While sustainability is threaded throughout the strategy, there are some inherent tensions between these themes. In addition to the Ecological Footprint and CO₂ emissions target, some highlights of the RES with regard to Ecological Footprint reduction are:

- **Housing:** maximising opportunities for South East businesses arising from sustainable energy; high energy efficiency standards in SEEDA-funded developments; demonstration projects on sustainable energy; 20% of electricity demand to be met from renewable sources by 2020;
- **Transport:** supporting development of home-based businesses and tele-substitution; Sustainability Checklist for new developments; sustainable solutions for road/rail schemes;
- **Food/other:** developing a South East Plan for Sustainable Public Procurement, with partners; promoting sustainable consumption and production amongst South East businesses; demonstration projects such as 'Resource Recovery Parks'.

Relevant RES policies on other topics are referenced in the appropriate chapter of Part II of this report.

6.3. Predictions – Ecological Footprint

We have used the REAP model to predict the region's Ecological Footprint under the two scenarios. In both cases, the Ecological Footprint of the South East continues to rise.

Summary of REAP assumptions

The REAP **Reference scenario** assumes that past trends in Ecological Footprint (1990-2003) are continued. This means that past trends in policy implementation (such as progress towards energy efficiency) will be continued, and that growth in consumption will also continue.

The REAP **Current policy scenario** introduces changes to the Reference scenario where there are clear indications of effective policies at regional or national level. Key aspects of current policy that are modelled by REAP include:

- **Housing:** Significant reductions to home energy use, through the introduction of the Code for Sustainable Homes (level 6), and retrofitting of a significant proportion of the existing housing stock with smart meters, loft insulation and condensing boilers;
- **Transport:** Modest reductions in distance travelled by car, through wider implementation of the 'Smarter Choices' agenda, but continued growth in air travel.
- **Food:** Significant reductions in food wastage, through the WRAP campaign, leading to a 15% reduction in consumption in some categories of consumption over a 10 year period.

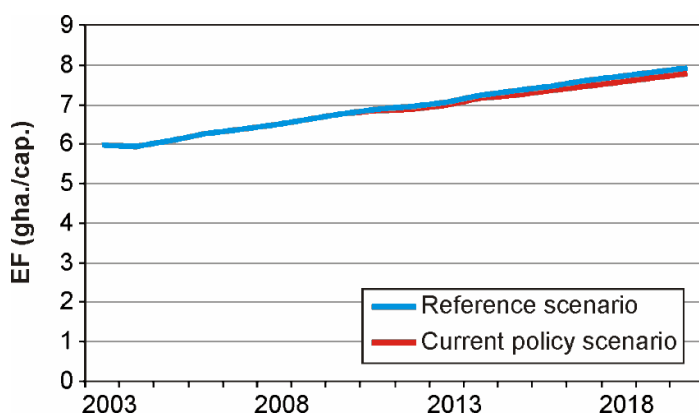
In this scenario, no reductions are assumed in the consumption of 'goods and services', 'public services' or 'capital investment', because there is not yet evidence of clear policies to reduce the impacts of these consumption categories.

Further details on the assumptions for each sector are presented in the relevant chapter in Part II.

In the **Reference scenario**, the Ecological Footprint for the region would nearly double between 2003 and 2050, rising at about 1.4% per year to reach 11.5 gha/capita by 2050. The region's Ecological Footprint has probably already risen to around 6.5 gha/capita in 2008, and would rise further to nearly 8 gha/capita by 2020. This is equivalent to the current footprint of the United States.

The **Current policy scenario**, based on the assumptions outlined above, is only marginally below the Reference scenario. The Ecological Footprint would still rise at a rate of 1.3% per annum, reaching about 11 gha/capital by 2050. This represents an increase of nearly 85% above 2003 levels. By 2020, the Ecological Footprint would have risen by nearly 30% above 2003 levels, to just under 8 gha/cap.

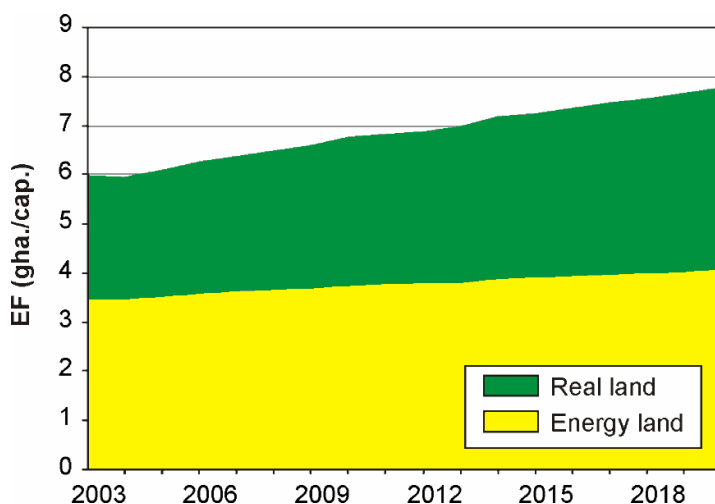
Chart 6.1 Projections of Ecological Footprint (2003-2020)



(Source: REAP model, Stockholm Environment Institute)

Looking at the Current policy projections in more detail, the 'real land' component of the footprint is predicted to grow faster than the 'energy land' component. This is similar to past trends for the period 1990-2003, which saw a significant increase in the 'real land' component of the footprint, particularly for 'goods and services' (see Chart 5.4).

Chart 6.2 Energy and real land breakdown for Ecological Footprint – Current policy

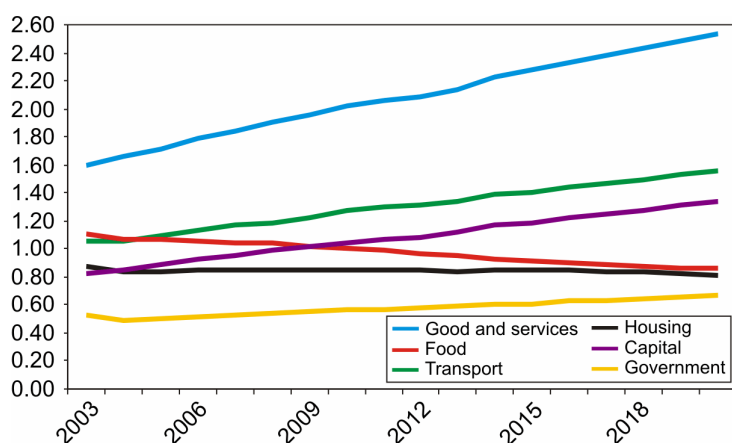


(Source: REAP model, Stockholm Environment Institute)

Although the overall Ecological Footprint is predicted to increase, some sectors are relatively stable. Under the Current policy scenario, the footprint associated with food consumption is predicted to decline slightly, while the footprint of housing is predicted

to stabilise. In contrast, the footprints of transport, public services, capital investment and other goods and services are predicted to increase strongly.

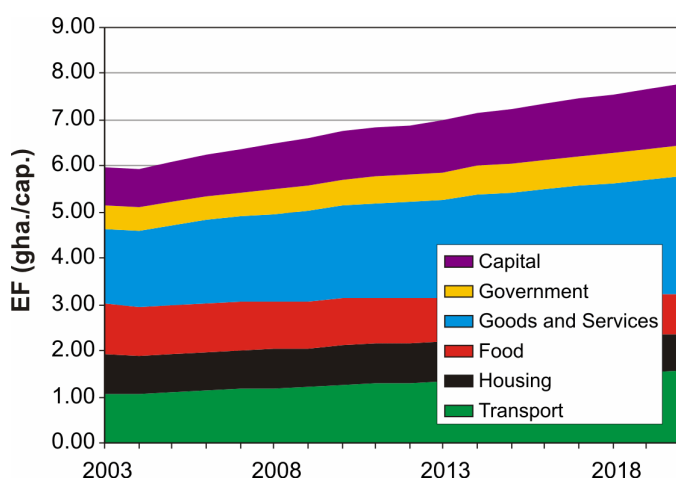
Chart 6.3 Projected Ecological Footprint by sector – Current policy



(Source: REAP model, Stockholm Environment Institute)

The cumulative effect of these sectoral projections is shown in Chart 6.4. These projections are dominated by the growing footprints of consumption of transport, public services, capital and other goods and services. Further detail on each sector can be found in Part II of this report.

Chart 6.4 Cumulative Ecological Footprint by sector – Current policy



(Source: REAP model, Stockholm Environment Institute)

The key message from analysis of the Current policy scenario is that only two components of the region's Ecological Footprint appear to be stabilised by 2016:

housing and food. The footprint of other sectors, and of the region as a whole, is predicted to continue increasing under Current policy.

6.4. Predictions – CO₂ emissions

We have used the REEIO model to predict CO₂ emissions under the Reference and Current policy scenarios.

Summary of REEIO assumptions

The **Reference scenario** is Cambridge Econometric's central case for the REEIO model: their 'best guess' as to what is likely to happen. In contrast to the equivalent REAP scenario, it includes many measures from the Energy White Paper 2007. For example, the Reference scenario already assumes that just under 20% of UK electricity generation will be from renewable sources by 2020. Estimates for regional economic growth in this scenario are based on Cambridge Econometric's own economic forecasts (see Chapter 12 for details).

The **Current policy scenario** for REEIO includes successful implementation of certain key economic and sustainability policies, as put forward in the Regional Economic Strategy, the Regional Spatial Strategy, the UK Energy White Paper and the Climate Change Supplement to Planning Policy Statement 1 (PPS1). Stronger GVA growth will tend to increase the footprint, while other factors will decrease it:

- Slightly stronger GVA growth, to meet the targets set in the RES;
- Stronger trends in energy efficiency in commerce and domestic sectors;
- Slower growth in transport, including air transport;
- Modal shift from road to rail, for both passengers and freight
- Electricity generation from renewable sources rises to be 20% of total generation in the region by 2020;
- The introduction of Combined Heat and Power schemes (CHP) is increased by a further 33% relative to the Reference Scenario;
- Increased energy extraction from waste, increased recycling of household waste and reduction in proportion of Commercial/Industrial and Construction/Demolition Waste going to landfill;
- Stronger policies to introduce water meters to households.

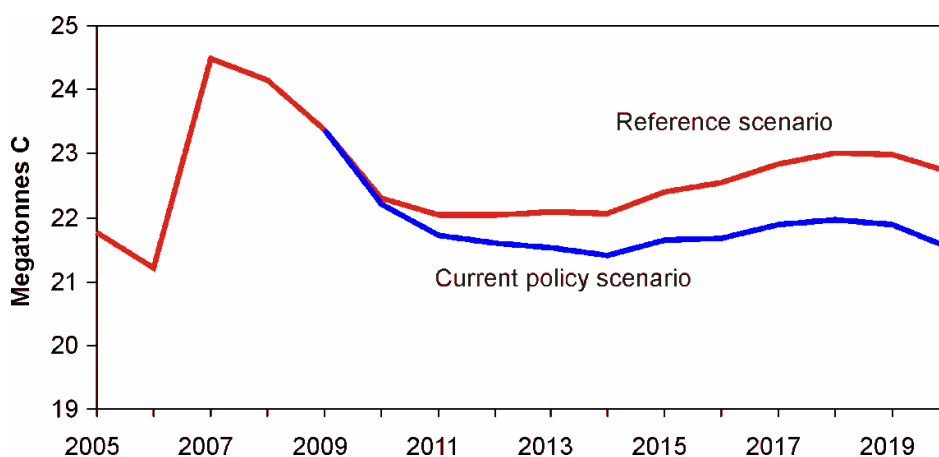
Further details of the assumptions made for each scenario are presented in the detailed chapters, by theme, in Part II of this report.

Chart 6.5 shows the projections for total CO₂ emissions in the South East under the Reference and Current policy scenarios. Neither of the scenarios results in a significant reduction in emissions from current levels, but both succeed in stabilising emissions. The Current policy scenario results in some reduction from current levels (2007/8), but

emissions in 2020 are similar to those in 2005 (and implicitly also 1990). So the medium-term reduction targets for CO₂ emissions within the RES and SE Plan would not be met.

The results indicate that, if the significant improvements in energy efficiencies are achieved, as are reductions in the transport intensity of economic growth, then the aspirations for growth set out in the RES could be achieved with a reduction in CO₂ emissions relative to the Reference scenario. However, the scale of reduction would be far below the scale needed to achieve the medium and long-term ambitions of the region in terms of sustainability.

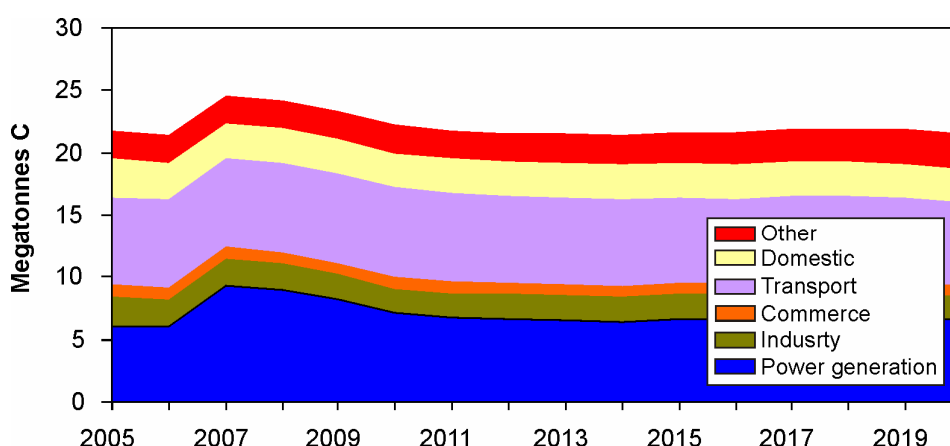
Chart 6.5 Projections of CO₂ emissions – Reference and Current policy



(Source: REEIO model, Cambridge Econometrics)

As Chart 6.6 indicates, power generation in the region is a significant source of direct emissions in the region, and it is this sector that is behind much of the volatility of emissions.

Chart 6.6 Sectoral breakdown of CO₂ emissions – Current policy

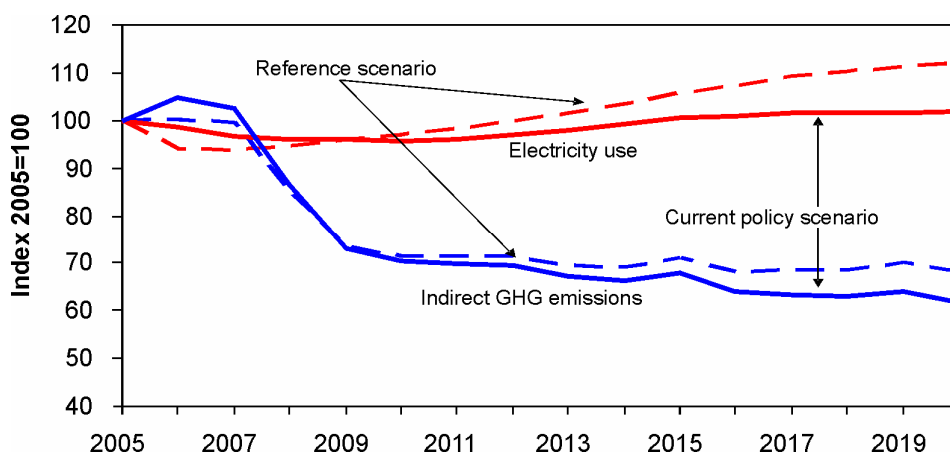


(Source: REEIO model, Cambridge Econometrics)

As well as the CO₂ emissions resulting directly from activity in the region, it is also important to consider emissions associated with producing the electricity consumed in the region. The scale of these 'indirect' emissions will be determined by the nature of UK electricity generation, the overall level of electricity demand in the region and the extent to which this may be met by more localised schemes such as CHP and locally-distributed generation from renewable sources.

As Chart 6.7 indicates, even in the Reference scenario the emissions associated with the region's electricity needs are expected to fall sharply, despite an overall increase in the consumption of electricity. This results from an expectation that the carbon-intensity of UK electricity generation will fall to 2020. Further details are provided in Chapter 16, within Part II of this report.

Chart 6.7 Electricity use and associated indirect GHG emissions



(Source: REEIO model, Cambridge Econometrics)

6.5. Conclusions: 'Where are we heading?'

Our findings suggest that the Ecological Footprint of the region is likely to continue growing under current policy. Stabilisation and reduction targets are unlikely to be met without significant changes to policy. However, territorial CO₂ emissions are likely to stabilise or slightly reduce, depending on growth levels and energy efficiency performance:

- In the **Reference scenario**, the Ecological Footprint could increase by over 30% from 2003 to 2020, while direct CO₂ emissions would stabilise at around current levels; but
- Under the **Current policy scenario**, assuming stronger economic growth combined with stronger policies on energy efficiency, the Ecological Footprint would still increase by nearly 30% from 2003 to 2020, but direct CO₂ emissions would fall slightly from current levels.

For both of these scenarios, the **consumption-based Ecological Footprint** is predicted to continue increasing. This is largely because the consumption-based approach is only affected by what is consumed in the region, not what is produced in the region. Consumption is predicted to continue increasing, provided that wealth and GVA increase. Declining manufacturing within the region has little or no impact on the footprint: locally manufactured goods are simply substituted by imported goods from overseas, which still have an impact on global land-use and CO₂ emissions. The Ecological Footprint will not decline significantly until either our consumption patterns change dramatically, or efficiency gains and low carbon technology are applied on a global scale – or both.

The impact of UK and regional energy efficiency measures are relatively weak in the Ecological Footprint projections, except in relation to Housing which is primarily supplied within the region. It is difficult to influence technology choice in the production of goods and services, when a significant proportion (as yet unknown²⁶) is produced in other regions or countries. The consumption-based approach also means that air transport growth registers more strongly, since flights by residents of the South East are included, no matter where they fly around the globe.

Production-based CO₂ emissions, as presented here, are predicted to stabilise and decline slightly, albeit not to the levels required by medium-term targets in the RES and South East Plan. This is because the predicted effects of economic growth are balanced by a long-term shift away from manufacturing, and by fairly strong implementation of energy efficiency technologies across many sectors in the South East.

²⁶ See Chapter 18 on 'Other goods and services' for discussion on this point.

In both cases, significantly stronger policies will be needed to meet medium and long-term targets for reducing Ecological Footprint and CO₂ emissions. As discussed in Chapter 3, this would require roughly 33% reduction between 2010 and 2020; 54% reduction between 2010 and 2030; and an 80% reduction from 1990 levels by 2050.

In Chapter 3, we discussed the principles inherent in a 'One Planet Economy', and the types of transformation that would be needed to achieve reductions on this scale. In the next chapter, we examine the type and scale of 'transformational' policy change that would be needed to meet the targets for both Ecological Footprint and CO₂ emissions.

7. How can we reach the targets?

7.1. Introduction

This chapter analyses the types and scale of 'transformational' policy change required to meet the stabilisation and reduction targets for Ecological Footprint and CO₂ emissions.

To undertake this analysis, we have defined a further scenario for future Ecological Footprint and CO₂ emissions, in addition to the **Reference scenario** and **Current policy scenario** analysed in Chapter 6:

- **Transformation scenario:** this looks at more radical policy changes (at national/regional/local level) required to transform production and consumption within the region, to achieve 80% reduction in both climate emissions, and carbon/Ecological Footprint by 2050. It is clear that for Transformation there are few simple final solutions, rather a continuing debate on ends and means.

Analysis of the Transformation scenario will help to identify the scale of change required to meet the regional reduction targets, and the sectors which need most attention. This chapter sets out:

- Predictions for the region's future Ecological Footprint in the Transformation scenario, and the assumptions underlying them;
- Predictions for the region's future CO₂ emissions in the Transformation scenario, and the assumptions underlying them.

The next two sections describe our predictions for the Ecological Footprint and CO₂ emissions in the Transformation scenario, and the policy/technical/economic assumptions underlying these predictions.

7.2. Predictions for Ecological Footprint

Stabilisation target

In Chapter 6 we analysed the likely impact of Current policy on the region's Ecological Footprint and concluded that the region's footprint was unlikely to be stabilised by 2016 under current policy. As shown in Table 7.1, increases are predicted for transport, for goods and services, and for public services and capital investment. The footprint of the housing sector is predicted to stabilise by 2016, and the footprint of food consumption is predicted to decline slightly.

Table 7.1: Predicted Ecological Footprint to 2016 under Current Policy (global hectares per capita)

Key: Green shading for decrease; red shading for increase 2008-2016.

Consumption category	Actual		Predicted		Change (%)	Predicted change (gha/cap)
	1990	2003	2008	2016	2008-2016	2008-2016
Housing	0.87	0.88	0.84	0.85	0%	+0.00
Transport	0.74	1.06	1.19	1.44	+21%	+0.25
Food	1.14	1.11	1.04	0.90	-13%	-0.14
Goods and services	1.17	1.59	1.90	2.33	+22%	+0.43
Public services and capital	0.98	1.35	1.53	1.84	+21%	+0.32
Total	4.90	5.99	6.49	7.36	+13%	+0.87

(Source: REAP model, Stockholm Environment Institute)

Energy supply, waste and water impacts are not explicitly included in this table because the REAP methodology already includes them in one of the consumption categories set out above.

Table 7.1 highlights the predicted level of increase in the footprint of transport, public services, capital investment and other goods and services. If the region's Ecological Footprint is to be stabilised, let alone reduced, it is essential that action is taken on these sectors.

The predictions for the energy and food sectors, which have a stable or declining footprint, are dependent on effective implementation of current policy. For example, the Current policy scenario assumes that under current policy 40% of new homes built between 2008 and 2020 meet Level 6 of the Code for Sustainable Homes. It also assumes that 20% of the region's electricity is generated from renewable sources by 2020. Both of these are demanding targets. Further detail of assumptions for each sector can be found in Part II of this report.

Priority actions to achieve stabilisation of the footprint at 2008 levels are presented in Table 8.1 in Chapter 8 of this report, together with a few of the short-term actions for Transformation. A fuller set of recommended actions for each sector is presented in Part II.

Reduction targets

REAP assumptions – Transformation scenario

There are many different ways in which the Ecological Footprint reduction targets could be met: many combinations of policies that would reach the same endpoint. Given the resources available for this study, we have been able to define one plausible combination of policies and changes that appears to achieve the Ecological Footprint reduction objectives, for both the medium-term (2020) and the long-term (2050).

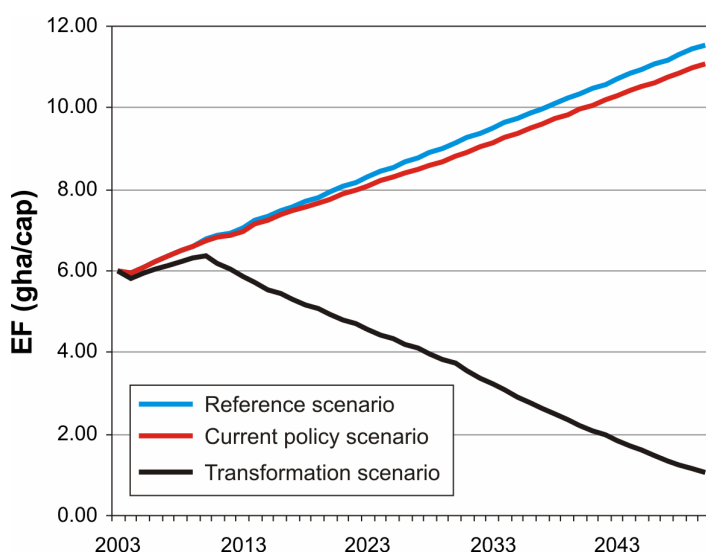
We have focused much of our attention on housing, transport and food, as these are the three main categories which (a) are major impacts from household consumption; and (b) are amenable to influence within the region. We have also considered potential changes in consumption of public services, capital investment and other goods and services. The Transformation scenario would require radical changes to current policy:

- **Housing:** All new homes built to Code 6 (Code for Sustainable Homes) by 2016; retrofit programme for all houses by 2025; carbon intensity of electricity reduces by 20% by 2020 and reduction trend continues thereafter; behaviour change programme significantly affecting energy use in every single home;
- **Transport:** Infrastructure changes to stabilise car growth by 2016; every individual targeted through 'Smarter Choices' measures by 2016; 50% of journeys by walking and cycling by 2030; 1% per year efficiency improvement in all vehicle types; occupancy/infrastructure efficiency improvement of 1% per year;
- **Food:** Renewable energy accounts for 80% of the agricultural energy mix by 2050; food/drink/catering sectors increase efficiency by 2% per year from 2010 onwards; consumers adopt a low carbon diet in which meat consumption is halved and dairy product consumption reduced by a third; reduction in food waste cuts food consumption by 15-25%;
- **Goods and services:** A 5% reduction per year in the impact of household consumption of goods and services from 2010 onwards(or equivalently a 5% per year efficiency gain in the global economy);
- **Public services and capital investment:** A 4% reduction per year in the impact of public services and capital investment, through a combination of service efficiency improvements, low impact procurement and efficiency gains in the wider economy.

Further detail on these assumptions is given in the relevant theme chapters in Part II. These impact reductions would be difficult to achieve without supporting incentives at national level (e.g. carbon quotas or taxes).

The combined effect of translating these radical assumptions into practice would be to reduce the Household consumption element of the region's Ecological Footprint by 20% below 2003 levels by 2020. By 2030, the reduction below 2003 levels would be 40%, and by 2050 it would be 80%. The region's Ecological Footprint would then be just less than 1 gha/cap, which is predicted to be roughly the 'fair share' for 2050.

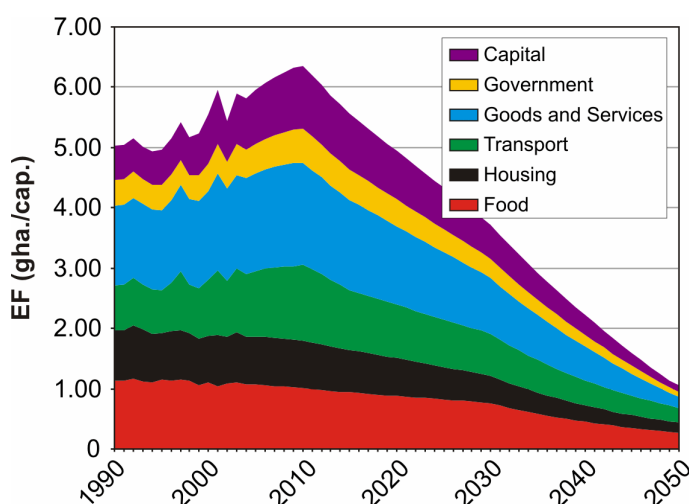
Chart 7.1 Projections of Ecological Footprint – all sectors



(Source: REAP model, Stockholm Environment Institute)

A breakdown of the Transformation scenario projection by sector is shown below, for the period 1990-2050. This chart emphasises the challenge involved in stabilising and then reversing current upward trends in the footprint. The greatest reduction is seen in the footprint of goods and services (nearly 90% reduction), with around 80% reductions in the other sectors.

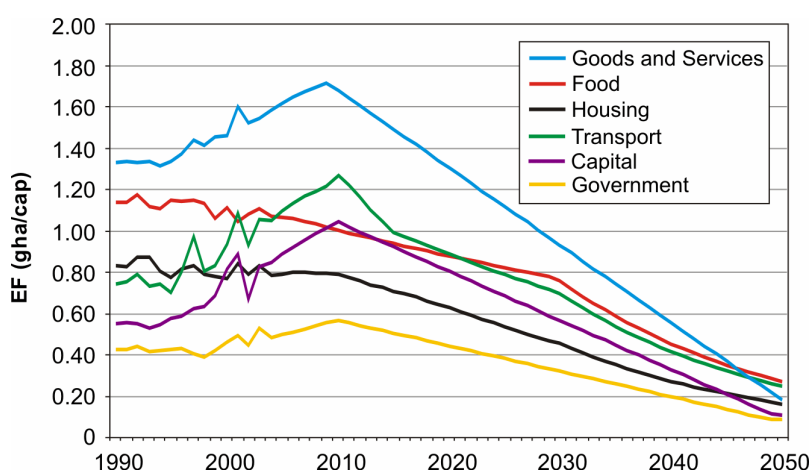
Chart 7.2 Sectoral breakdown of Ecological Footprint – Transformation



(Source: REAP model, Stockholm Environment Institute)

The dramatic reduction assumed for the footprint of goods and services can be seen more clearly in Chart 7.3, which presents the footprint of each consumption sector separately.

Chart 7.3 Profile of Ecological Footprint sectors – Transformation



(Source: REAP model, Stockholm Environment Institute)

We now examine the relative impact of different types of policy (or 'policy wedges') for the three consumption categories which are most open to regional influence:

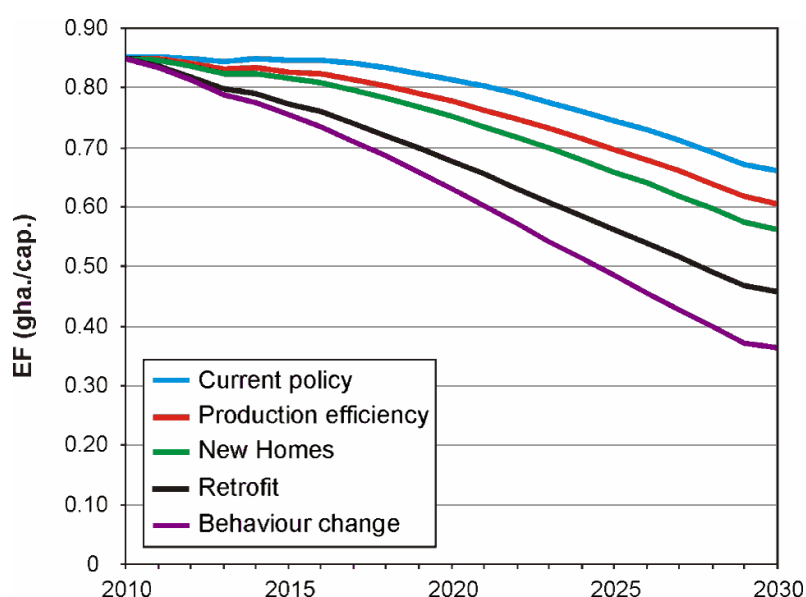
- Housing;

- Transport; and
- Food.

Policy wedges - housing

Chart 7.4 shows the predicted effectiveness of the 'policy wedges' in reducing the Housing footprint, compared to the Current policy scenario up to 2030. The greatest savings are attributable to the major retrofit programme (a further 15% saving compared to current policy) and to widespread behaviour change (a further 17% saving). These would potentially reach a greater proportion of the housing stock than policies affecting new housing. But major savings would also result from the policy on new housing (a further 7%) and reducing the carbon-intensity of energy supply (a further 8%).

Chart 7.4 Effectiveness of policy wedges in reducing the housing footprint – Transformation scenario



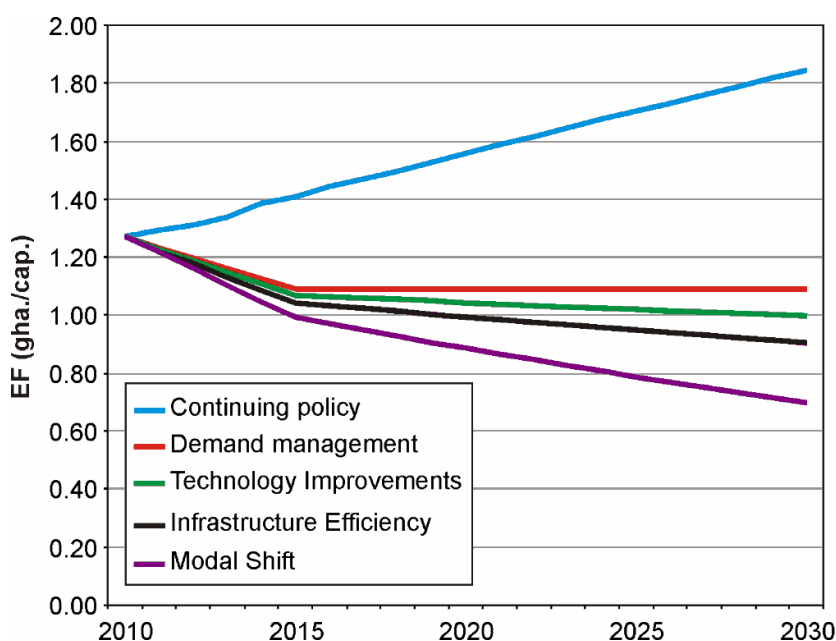
Policy wedges - transport

Chart 7.5 below shows the predicted effectiveness of 'policy wedges' in reducing the transport footprint under the Transformation scenario, relative to the Current policy scenario. Our findings are that:

- If the policy to 'constrain growth' was implemented with no further measures, we estimate stabilisation of the transport footprint by 2016;
- We estimate that demand management would reduce the footprint by a further 15% over a five-year period;

- The major modal shift we have assumed would reduce the transport footprint by 22% between 2010 and 2030;
- Technological improvement in vehicle efficiency could bring about a 20% reduction between 2010 and 2030, and new technologies (e.g. hydrogen) might be able to bring further efficiencies thereafter;
- Improving infrastructure efficiency is predicted to bring a 10% reduction between 2010 and 2030.

Chart 7.5 Effectiveness of policy wedges in reducing the transport footprint – Transformation scenario



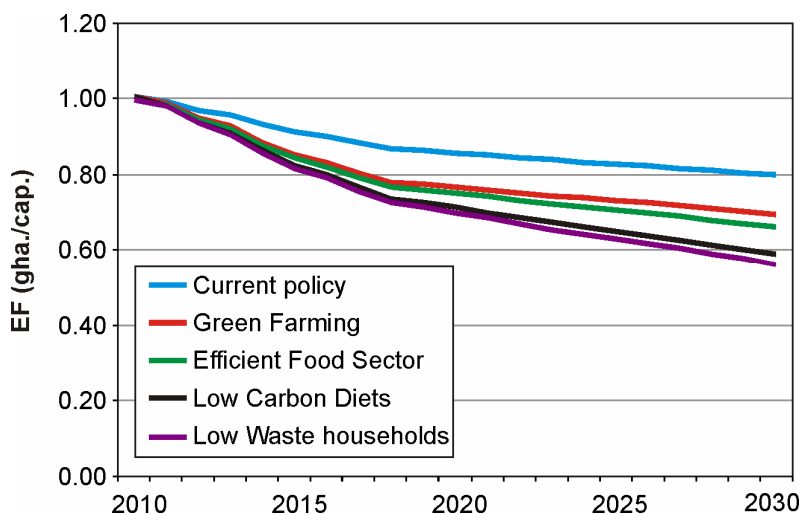
(Source: REAP model, Stockholm Environment Institute)

Note: In this graph, 'constraining growth' in transport is included within 'demand management'.

Policy wedges - food

Chart 7.6 below shows the predicted effectiveness of 'policy wedges' in reducing the food footprint under the Transformation scenario, relative to the Current policy scenario. The greatest savings are predicted to be generated by initiatives on green farming (e.g. renewable energy use by farms) and low carbon diets (e.g. lower meat and dairy consumption).

Chart 7.6 Effectiveness of policy wedges in reducing the food footprint – Transformation scenario



(Source: REAP model, Stockholm Environment Institute)

7.3. Predictions of CO₂ emissions

Stabilisation targets

Stabilisation of territorial CO₂ emissions is predicted to be achieved by current policy. This will, in itself, require significant improvements in energy efficiency across all sectors and effective implementation of measures proposed by the RES and by the Energy White Paper 2007.

Reduction targets

Under current policy, the region is not predicted to meet the RES/South East Plan medium-term reduction targets for CO₂ emissions. Stronger policies will be required both to meet these targets and to meet longer-term targets for transformation of the region into a 'One Planet Economy'.

Using the REEIO model, we have developed a Transformation scenario which would meet the medium-term targets and be on track to meet long-term targets. The assumptions underlying this scenario are set out in the box below.

REEIO assumptions – Transformation scenario:

There are many different ways in which the CO₂ emissions targets could be met: many combinations of policies that would reach the same endpoint. Given the resources available for this study, we have been able to define one plausible combination of policies and changes that appears to achieve the CO₂ emissions reduction objectives. We have forecast CO₂ emissions up to 2020, as this is the limit for predictions by the REEIO model. Estimates for CO₂ trajectories beyond 2020 could be made by reference to the forthcoming OPEN study for the UK as a whole.

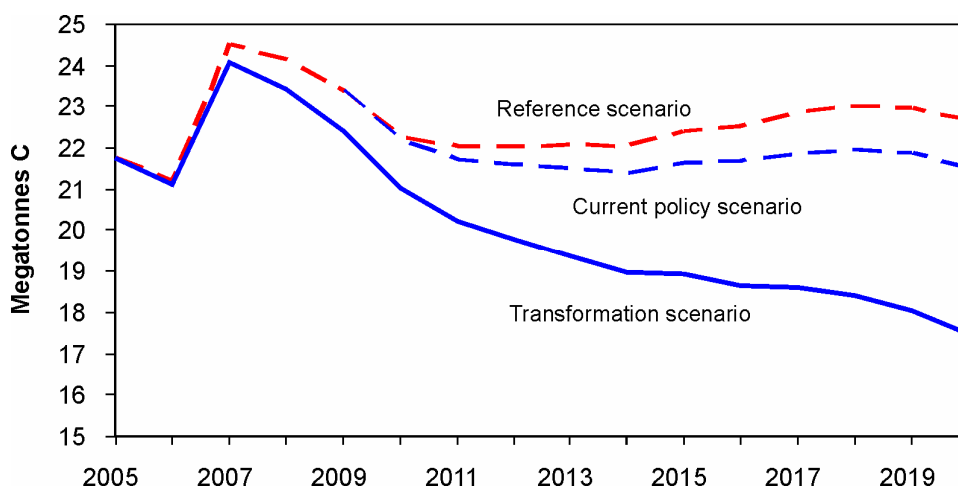
Key assumptions in the Transformation scenario are that:

- **Economic growth** is unchanged from the 'Current policy scenario' (i.e. RES targets for GVA growth are achieved);
- **Housing:** energy efficiency rates are again higher, averaging 4.5% pa over the period 2010-2015 and 5.5% pa thereafter; there is a stronger move away from gas and towards electricity, so that 35% of domestic energy needs are met by electricity by 2020 (compared to 25% in other scenarios);
- **Transport:** the link between economic growth and demand for transport is weakened from 2010 onwards; the energy efficiency of road vehicles improves by 2% pa; there is a shift from conventional fuels to carbon-neutral biofuels equivalent to a further reduction in conventional fuels of 2% pa;
- **Energy supply:** the carbon intensity of generation from the UK electricity grid is further reduced through faster take-up of renewable sources; rates of energy efficiency improve, as outlined above; the overall take-up of CHP increases so that by 2020 there is 1.3 MWe of capacity installed across all sectors; there are stronger trends towards the use of electricity (increasingly low-carbon);
- **Production of goods and services:** energy efficiency rates reach 3.5% pa for industry and services over the period 2010-2015, and 5% pa thereafter; there is a stronger move towards electricity and away from gas, with 30% of industry's needs met by electricity by 2020; CHP take-up is greater, with 1.2 MWe of capacity installed in industry and services by 2020;
- **Waste:** industries reduce the waste-intensity of their inputs by up to 5% pa, with the strongest improvements being in pharmaceuticals, chemicals, electronics and professional services. Construction is assumed to improve the waste intensity of its operations by 0.5% pa.

Further details on specific sectors can be found in Part II of this report.

Chart 7.7 shows the projections of CO₂ emissions from the South East under the Transformation scenario. It is clear that a sustained downward trend in CO₂ emissions is achieved. The result is that by 2020 total CO₂ emissions are 20% (4m tonnes) lower than in the Current policy scenario, and similarly about 20% below the level of 2005/1990 emissions.

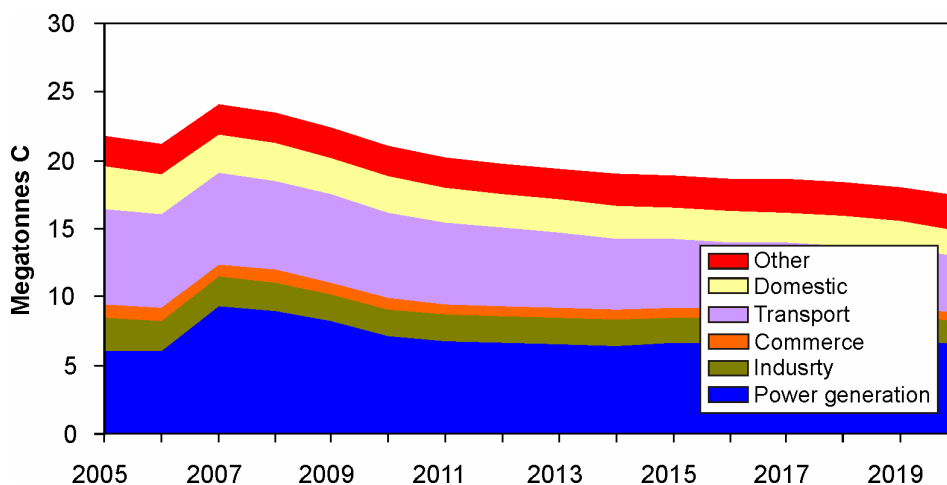
Chart 7.7 Projected CO₂ emissions for all sectors – Transformation scenario



(Source: REEIO model, Cambridge Econometrics)

As Chart 7.8 illustrates, the greatest impact under the scenario is in the reduction of emissions from transport, which are 40% lower in 2020 than in the Current policy scenario. If we consider the impact of the Transformation scenario on emissions other than power generation then the impact is even greater. By 2020 emissions are almost 30% lower than in the Current policy scenario.

Chart 7.8 Sectoral breakdown of CO₂ emissions for all sectors – Transformation scenario



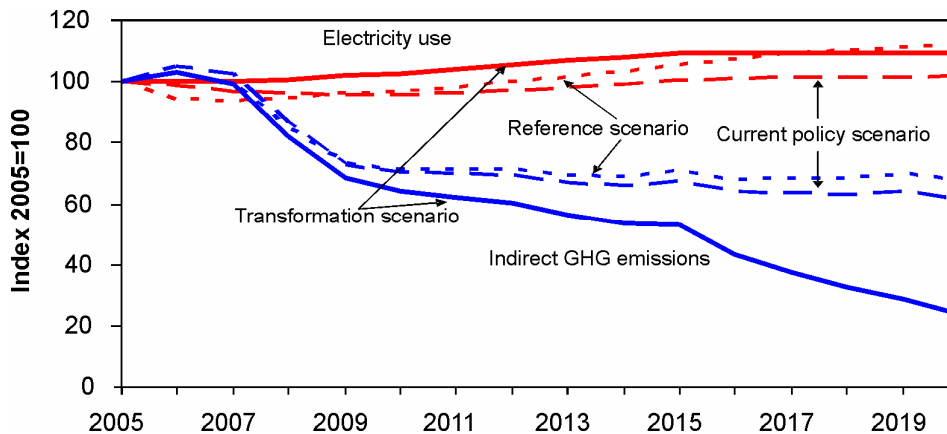
(Source: REEIO model, Cambridge Econometrics)

Two important assumptions underlying the Transformation scenario are:

- Strong decarbonisation of the UK electricity generation sector, based on greater use of renewable and phasing out of nuclear power; and
- A stronger trend by firms and households to use electricity over other fuels.

Chart 7.9 shows the projections for electricity consumed in the region and sourced from the National Grid, and the indirect Greenhouse Gas (GHG) emissions associated with its production. The Transformation scenario assumes that by 2020 the carbon-intensity of UK electricity generation falls to just 36% of its 2005 level, and that further decarbonisation occurs thereafter. As a result of this, the GHG emissions associated with electricity consumption in the scenario are 40% below those in the current strategies scenario despite the higher demand for electricity.

Chart 7.9 Electricity demand from the grid, and indirect GHG emissions – Transformation scenario



(Source: REEIO model, Cambridge Econometrics)

7.4. Conclusions: 'Reaching the targets'

Meeting the stabilisation target for the region's Ecological Footprint will require strengthening of current policy. Without stronger policies, the footprint of personal transport, public services, capital investment and other goods and services are likely to continue to increase with economic growth. Production efficiencies for goods and services are difficult to influence because much of this consumption involves goods and services produced outside the region. Appropriate policies to influence consumption are discussed further in the next chapter.

Stabilisation of territorial CO₂ emissions is more easily achievable, because the efficiency of the economy within the South East is more easily influenced. Stabilisation should be achieved - even with significant economic growth as per RES targets - provided that current policy on sustainable energy is effectively implemented.

Meeting reduction targets for both the Ecological Footprint and CO₂ is much more demanding. We have modelled plausible policy combinations that could enable the region to meet its medium and long-term targets for reduction of both Ecological Footprint and CO₂ emissions. But some of these policies are very challenging - particularly those relating to the transport and to the consumption of goods and services within the region. These policies require transformation of the South East into a 'One Planet region'. This is only likely to be possible if supported by appropriate incentives and fiscal measures at national level. The nature of transformation required is discussed in the next Chapter.

8. What needs to be done?

8.1. Priority short-term actions

Key actions to stabilise the region's Ecological Footprint at 2008 levels are summarised in Table 8.1 below. These focus not only on the sectors which have an increasing footprint (e.g. transport; other goods and services) but on sectors where stabilisation is dependent on effective implementation of current policy (e.g. housing/built environment and food). Many of the actions have already been started, but need to be implemented more widely and fully.

The table also includes actions on a number of cross-cutting issues, and actions on waste issues, which will affect the footprint indirectly. Actions on water issues have been included in Table 8.1, for completeness, but these are driven by water security issues rather than footprint stabilisation. Full action tables for each of these issues and sectors are presented in Part II of this report.

Most of the actions in this table are required to stabilise the region's footprint in the short-term. Actions which could be started in the short-term, but would particularly contribute to longer term Transformation, are marked with an asterisk. Effective implementation of these actions would also stabilise, and begin to reduce, the region's territorial CO₂ emissions.

The challenges of longer term Transformation are discussed further in this chapter.

Table 8.1: Priorities for short-term action

Most of these actions are required to stabilise the region's footprint in the short term. Actions which could be started in the short-term but would particularly contribute to longer term Transformation are marked with an asterisk.

Theme	Priority actions for the route map	Action by:
Behaviour change (cross-cutting)	• Develop and implement a regional strategy for behaviour change, targeted at individuals, communities, businesses, government and other organisations, and taking account of the range of approaches needed for different groups at different stages; • Support the development of behaviour change projects working with communities, in communities and supporting community-led schemes/social enterprise; • Promote local fiscal incentives for behaviour change in the sectors below (e.g. smart metering; council tax banding);	Local authorities, the Assembly, with utilities, private, civic and community organisations Local authorities, communities Local authorities, utilities
Lobbying	• Lobby UK government for national-level incentives for footprint and carbon reduction by all stakeholders (e.g. carbon quotas, fiscal schemes and extension of the Carbon Reduction Commitment);*	SEEDA, the Assembly
Procurement (cross-cutting)	• Support all public sector bodies and 'quasi' government bodies to reach Level 3-Level 5 of Defra's Flexible Framework, taking forward the South East Plan for Sustainable Procurement;	SEEDA, the Assembly, NHS, LGA, local authorities

Theme	Priority actions for the route map	Action by:
	Identify immediate potential for changing procurement specifications and practices to low carbon/footprint options;	SEEDA, the Assembly, NHS, LGA, local authorities
Planning (cross-cutting)	- Examine current and forthcoming LDFs and area policies, for strategic potential to reduce footprints by integrating built environment/land use/ transport; - Ensure that policies and priorities are fully incorporated into Integrated Regional Strategy and relevant spatial plans, including LDFs; - Ensure that regional funding allocations are in line with climate and Ecological Footprint objectives; - Promote use of Ecological Footprints and carbon metrics, and alternative measures of economic welfare, in public and private sector planning and decision-making; - Include the social price of carbon emissions in policy appraisal and impact assessment;	SEEDA, the Assembly, local authorities SEEDA, the Assembly, local authorities Regional funding boards SEEDA, the Assembly, local authorities, businesses, Business Link, Carbon Trust, Envirowise SEEDA, the Assembly, local authorities
Diamonds and Growth areas (cross-cutting)	Pioneer new approaches to footprint stabilisation and reduction across priority sectors, including business incentives, skills and supply-chain development, regional innovation clusters, urban infrastructure, behaviour change and carbon off-setting;	SEEDA, Diamond local authorities, businesses, Business Link, Carbon Trust, Envirowise

Theme	Priority actions for the route map	Action by:
Built environment	• Support implementation of the new Code for Sustainable Homes, including demonstration projects for Code 6 zero-carbon housing and higher than minimum standards in publicly-funded developments; • Form local partnerships for the strategic improvement of housing and commercial buildings;* • Pilot and support demonstration of major retrofit programmes (e.g. smart meters, switching, whole house insulation, condensing boilers, micro-generation and so on);	SEEDA, SECBE, local authorities, developers Local authorities, developers, housing associations, regeneration bodies Local authorities, EST, utilities
Transport	• Constrain growth in car use (e.g. through spatial planning, travel assessment of new development, reductions in road space/car parking, low emission zones, reallocation of road building funds to more sustainable modes and access improvements); • Commit to constraining growth in air travel by South East residents to levels which are equalled by efficiency improvements, to oppose further expansion of London airports and to lobby for air to be included in the EU Emissions Trading Scheme; • Promote eco-tourism within the region, linked to capping air travel impacts;	The Assembly, local authorities, SEEDA, Regional Transport Board SEEDA, the Assembly, local authorities SEEDA, Tourism South East, businesses
Energy supply	• Ensure that electricity generation from renewable sources rises to 40% of total generation in the region	SEEDA, the Assembly, Sustainable Energy Partnership, businesses, local

Theme	Priority actions for the route map	Action by:
	by 2020 (e.g. planning policies; partnership investment; grid strengthening; supply chain development); • Support an additional 310MW of Combined Heat and Power Capacity by 2020 (e.g. through Community Infrastructure Levy);	authorities Local authorities, with SEEDA and energy supply companies
Food	• Promote low impact food in all public institutions and major businesses (subject to further research, 'low impact' is likely to mean locally-sourced, seasonal, organic and low-meat); • Support and extend the WRAP campaign to reduce food waste; • Demonstrate low impact farming (including use of sustainable energy on farms);*	SEEDA, NHS, local authorities, Carbon Trust, Business Link, Envirowise WRAP, local authorities, SEEDA, Carbon Trust, Business Link SEEDA, Defra, Rural Development Partnership, Sustainable Energy Partnership
Goods and services, public services and capital investment	• Develop region-wide procurement standards and labelling/accreditation schemes for low impact and fair-trade products and services; • Encourage low-impact production (e.g. reduce business rates for accredited resource efficient businesses); • Demonstrate – and develop incentives for – low impact consumption patterns – in combination with behaviour change initiatives (e.g. regional eco-tourism; ethical	SEEDA, retailers, producers, consumer bodies, Carbon Trust, Business Link Local authorities, SEEDA, Carbon Trust, Business Link Local authorities, consumer bodies, businesses, communities

Theme	Priority actions for the route map	Action by:
	finance; free-cycle hubs); • Pilot internal carbon trading schemes under the Carbon Reduction Commitment; (see also procurement)	SEEDA, the Assembly, NHS, LGA, local authorities
Waste	• Develop regional markets for waste and intermediate products; • Engage all key stakeholders in the supply chain in waste reduction (e.g. Pathways to Zero Waste); • Set up innovative waste-reduction schemes, working with communities and local businesses (e.g. 'bag free' areas; deposit systems; free-cycle hubs).	SEEDA, businesses SEEDA, businesses Local authorities, communities, businesses
Water	• Introduce water metering as quickly as possible; • Promote low water-use behaviours in houses and gardens;* • Meet 'Code for Sustainable Homes' Level 6 requirements for water efficiency in new housing, and retrofit water efficiency measures to existing buildings.	Water companies, local authorities, communities Water companies, communities Water companies, local authorities, housing partnerships, developers

8.2. The challenge of transformation

The target for reducing the Ecological Footprint and CO₂ emissions to 80% below 1990 levels by 2050 requires a compound decrease of -4% per year, assuming that major action starts in 2010. Similar rates of decrease are required to meet the region's medium-term targets for 2016 and 2025.

If this is set against the RES target rate of economic growth of +3% per year, it means a 'de-coupling' between economic growth and environmental impact of -7% per year. This is over twice any decoupling seen in recent years in the UK.

This suggests that major transformation, rather than marginal changes, is needed in supply chains and markets. The types of transformation required in each sector would include:

- **Built environment:** Transformation of the entire existing housing stock (3.5 million dwellings) and the non-domestic building stock; retrofitting of energy and water efficiency and low/zero-carbon energy measures throughout; investment in high-efficiency housing and construction, supported by public procurement, improvement partnerships and supply-chain development; a major shift towards energy-efficient behaviour by households and business, supported by lobbying for carbon quotas and trading schemes; the development of 'Green Action Zones' for low-footprint living and working;
- **Transport:** Transformation of the entire transport sector, including low/zero carbon vehicles, and a shift to low-impact modes for freight and passenger transport; integrated accessibility and green travel planning, including the development of 'Green Action Zones' and low emission zones; capping of air travel impacts at current levels, so that any growth is balanced by efficiency improvements; the eventual development of low carbon air technology;
- **Energy supply:** Transformation of the energy system to meet reduced demand; accelerated investment in renewable sources and micro-generation, aided by forward commitment through public procurement; the development of industrial clusters for low/zero carbon technologies; promotion of Carbon Capture and Storage as an interim measure to reduce the impact of fossil fuels; Combined Heat and Power (CHP) as standard in all large developments.
- **Food:** A commitment to fair trade and ethical procurement; the development of low impact farming; reduction in impacts throughout the food supply chain (e.g. production, packaging, logistics); a major shift towards lower-impact diets (e.g. low meat, organic, local and seasonal food) through behaviour change, public procurement and retailer incentives;

- **Goods and services, public services and capital investment:** A shift from material-based output to dematerialised value-added services; design for low footprint/impact throughout product life cycles; major improvements in the energy and resource efficiency of industry in the region; clusters of innovative businesses supporting the supply of low and zero-carbon technologies; decoupling of economic growth from environmental impacts, leading to improved value added and competitiveness in global markets; a pro-active programme of social enterprise to encourage sustainable consumption; promotion of low-impact services (e.g. sustainable tourism, leisure, retail and so on) with a particular focus on financial services as the key to all other sectors; best possible practice in low-impact health, education and other public services, using the immense power of public procurement as the main mechanism;
- **Waste:** Product design for waste minimisation and eventual recycling; universal application of reuse and recycling technologies, funded by deposit and disposal levies; the development of 'industrial ecology clusters' in which waste from one industry becomes a resource for another.
- **Water:** Water-efficient design in buildings, products and supply chains; active management of business and household demand for water; investment to safeguard water supplies and minimise flood risks in preparation for climate change impacts.

Such transformations for climate-related issues are now being studied at national and global levels, by the Office of Climate Change, the CBI, McKinsey, the EC, OECD, World Bank and many others. The greatest barrier to action for the region, and every other level, is seen as the upfront costs of investment and innovation. Benefits tend to be recouped later, often by different parties from the original investor.

8.3. Enabling innovation and investment

The One Planet Economy Network project of WWF-UK is launching a report on 'Pathways' later in 2008. This contains very positive proposals for ways to bridge the gap between upfront costs and ultimate benefits. This advocates a practical approach to investment in each sector:

- Increase the number of years allowed for payback on efficiency investment (i.e. reduce the effective discount rate);
- Look for economies of scale and critical mass in application;
- Design a framework for targeted public procurement, with forward commitment for market transformation;

- Use appropriate fiscal instruments, mainly targeted at the point of capital investment;
- Apply these instruments right across the wider supply chain, in particular the services and demand side;
- Build up a portfolio of public partnership shared-equity funds to facilitate partnership investment for supply chain innovation.

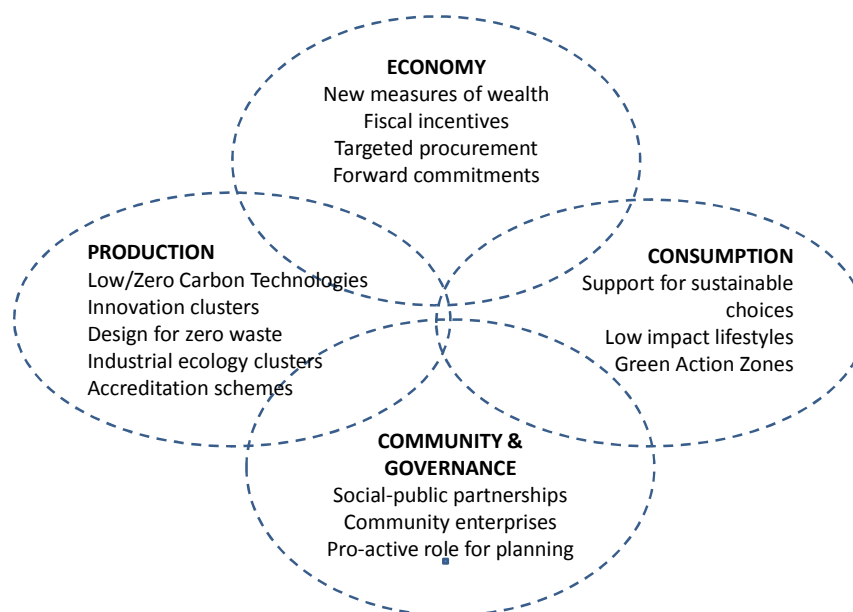
These proposals are designed to be built into current schemes for carbon pricing and trading such as the EU Emissions Trading Scheme Phase 2, the Carbon Reduction Commitment and other micro-economic measures. They involve a more strategic and pro-active role for government (local, regional and national), using procurement as the spearhead for a wider market transformational approach.

We recommend that the regional bodies keep a watching brief on the progress of the Pathways project as it emerges in 2008.

8.4. What would 'transformation' involve?

Transformation would require far-reaching changes to governance within the region, to the way our economy works, to the technologies we use and the lifestyles we live. This section highlights some of the types of change required to transform the South East into a 'One Planet Region', as illustrated in Chart 8.1.

Chart 8.1 Transformation into a One Planet Region



Transformation of the economy will involve:

- New measures of wealth, well-being and impacts, as a basis for investment and decision making;
- Fiscal incentives to support sustainable consumption and production decisions, at a national – and where possible local – level;
- Integration of efficiency investment costs into production supply chains, through more comprehensive versions of the Emissions Trading Scheme/ Carbon Reduction Commitment, and so on;
- Targeting procurement and subsidies, coordinated at local, regional and sub-regional level, at supplies of low-footprint and low-carbon goods and services;
- Pro-active procurement, through forward commitments, to stimulate 'integrated supply chains', innovation clusters and technological development in key sectors.

Transformation of production will involve:

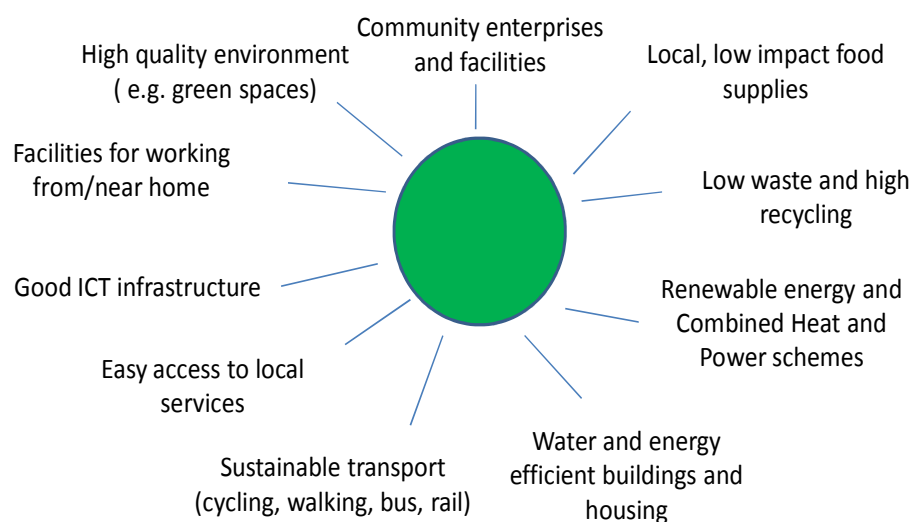
- Low carbon and low footprint materials, processes, manufacturing and distribution systems throughout the producer and consumer economy;

- Design for zero waste, throughout the supply chain and lifecycle of products and services;
- Support for the development of these technologies through pro-active procurement and the development of clusters of innovative businesses;
- 'Industrial ecology clusters' involving reuse of waste from one industry as a resource for another, as part of 'closed-loop' systems at regional or wider levels;
- Management of the indirect impacts of services through pro-active and transparent accreditation and Corporate Social Responsibility schemes.

Transformation of consumption will involve:

- Incentives, infrastructure and information to make sustainable consumption choices more attractive and convenient;
- Demand side management through the pro-active promotion of low-impact lifestyles, working through communities, the social economy and community enterprise;
- Integrated asset management and the re-engineering of the entire domestic and commercial building stock;
- Area-based transformation schemes (possibly called 'Green Action Zones' or 'One Planet communities') using integrated planning and high-quality infrastructure to support low-footprint and low-carbon living and working (see Chart 8.2 below).

Chart 8.2 Vision for a 'Green Action Zone'



Transformation of communities and governance will involve:

- The development of closer partnerships between public bodies, businesses and social networks or community enterprises;
- Pro-active investment by these partnerships in products and services related to the built environment and infrastructure;
- Full benefit-cost management of public services as the basis for overhauling the environmental performance of health, education and other services;
- Targeted use of public sector funding as procurer, investor, steward and fiscal mediator;
- A pro-active role for planning: to encourage integrated solutions in urban development, social economy and local enterprise, based on new measures of prosperity.

The region's role:

At the regional level, aspirations and potential are often higher than direct powers and resources. So much of the regional agenda is about softer measures of coordination, facilitation, enabling and so on, rather than about direct spending, legislation or control. Important roles for regional and sub-regional bodies in making transformation happen include:

- Pro-active enabling and implementation of relevant sectors in national / EU policy, markets and so on;
- Focusing of spending and services by local government and other public bodies;
- Coordinating infrastructure and urban development partnerships;
- Leading partnerships for behaviour and organisational change programmes.

Part II of this report presents a set of route maps which the region could use to make transformation happen. Chapter 13 sets out a way forward for four cross-cutting issues which affect a number of sectors, while Chapters 14-20 present analysis and route-maps for specific sectors.

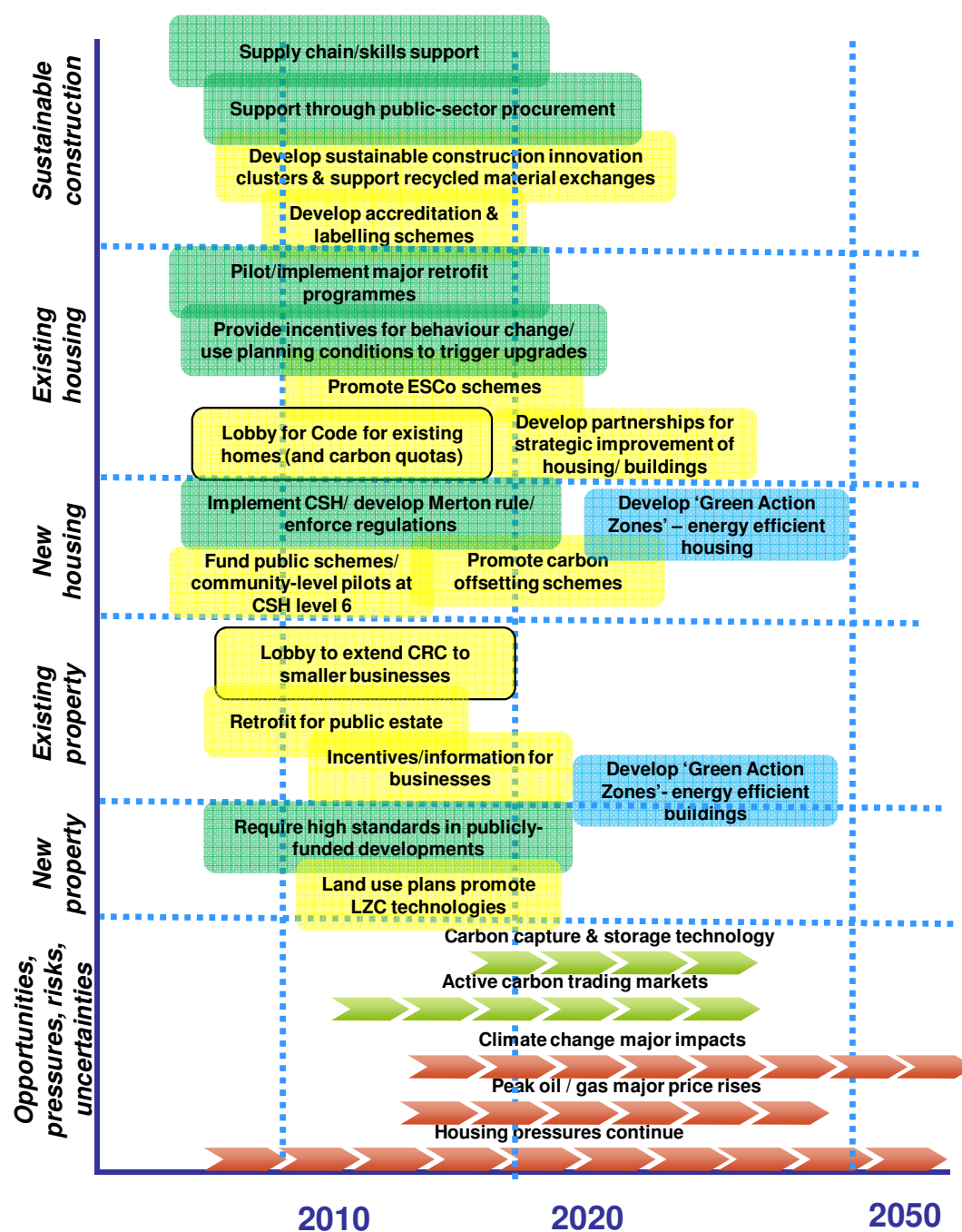
8.5. Example of 'route map' chart

For each of the themes analysed in Part II, we have developed a 'route map' table and chart. This sets out the main policy groupings, and the programmes/policies required to achieve them, together with identification of the uncertainties surrounding development of the route map over time.

An example of one of these route map charts is given below, for the Built Environment sector. Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions). A black border indicates that an action involves lobbying for change at national level or above.

Charts and accompanying tables for each theme are presented in the relevant chapter of Part II.

Chart 8.3 Example of route map chart – for the Built Environment



9. Using the route map

Chapters 5 to 8 have summarised the proposed 'route map' for key sectors and cross-cutting issues. Our modelling work, supported by the REAP and REEIO models, suggests that effective implementation of the route map would enable the South East to stabilise and reduce its Ecological Footprint and CO₂ emissions, becoming a 'One Planet Region' by about 2050. Further detail of recommended actions in each sector are given in Part II of this report. But the route map is challenging and following it will require significant investment of time, money and effort.

9.1. What happens if we don't take this path?

Findings of the Stern Review

It is easy to focus on the costs of route map actions, without assessing the cost of doing nothing. The Stern Review of the Economics of Climate²⁷ concluded that the cost of unabated climate change would reach 5% of GDP and, if the effects were severe, could reach 20% of GDP. The Review predicted that the costs would fall most heavily on poorer countries.

Compared to this, the Stern Review estimated that the cost of mitigating climate change, aimed at keeping temperature rises below 2-3°C, would reach about 1% of annual GDP by 2050. The Review estimates a range for mitigation costs from -1% (i.e. a net benefit to GDP) up to 5% of GDP.

In a recent speech, Lord Stern indicated that evidence suggests that climate change is happening faster than anticipated so faster action is needed. He now suggests that 2% of GDP would need to be spent to avert the risk of runaway climate change.²⁸ But, provided that strong collective action is taken around the globe, the costs of acting now to avert the worst effects of climate change would be significantly outweighed by the potential benefits of avoiding unabated climate change. If significant action is not taken now, it is likely that more drastic measures will be needed in future.

Potential impacts of climate change on the South East

The types of impacts that are already predicted for the South East region, as outlined in the Climate Change Mitigation and Adaptation Implementation Plan, include:

²⁷ http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

²⁸ <http://www.guardian.co.uk/environment/2008/jun/26/climatechange.scienceofclimatechange>

- Hotter drier summers;
- Milder wetter winters;
- A significant decrease in soil moisture content;
- More frequent extreme high temperatures;
- More frequent extreme winter precipitation;
- Increased storminess and wind speeds in winter;
- Net sea level rise and increase in sea storm surge height.

Many adaptation responses are already in hand, supported by the work of Climate South East (formerly the South East Climate Change Partnership), including:

- Water supply and storage measures to deal with the potential increased frequency of droughts and water shortages;
- Increases in food storage capacity;
- Improved flood and sea defences;
- Development of sustainable urban drainage systems;
- Limits to new development on flood plains;
- Designs for low-carbon houses and properties that are resilient to climate change (e.g. low-carbon cooling systems; rainwater and greywater systems).

Risks of unabated climate change

There is an important issue here about collective responsibility. The risks of moderate climate change for the South East are significant, but not as significant as for many poorer countries in lower latitudes.

But the risk of unabated climate change – involving temperature increases of 5-6°C or more – are potentially serious for the earth's ecosystems as a whole. No-one yet knows how the melting of major ice-caps would affect sea levels around the globe. Nor whether land and sea habitats would continue to provide our food and act as the 'lungs' of our planet. Scientists have identified a number of ways in which significant temperature rises could limit the earth's ability to absorb and store greenhouse gases (e.g. within the oceans or permafrost), raising the possibility of 'runaway' climate change.

The issue is not therefore solely whether it is in the South East's interests to take action on the Ecological Footprint and CO₂ emissions targets, but whether the region has a moral responsibility to do so – as part of collective action around the globe.

During this study, several contributors have suggested that a 'war footing' is required to mobilise action, likening the potential impact of climate change to the impact of war.

Not just climate change

Furthermore, the use of the Ecological Footprint takes a wider view than simply counting climate emissions:

- It is a measure of total impacts through the supply chain, both direct and indirect, all the way to final consumption. It encompasses the biofuels issue, where conversion of farmland to biofuels has been encouraged by climate policy, but at the cost of displacing food production for over 260 million people.²⁹
- It includes imports and their embedded impacts, currently estimated at over a third of direct impacts. This avoids the 'green illusion', in which the UK appears to become more sustainable simply by exporting its heavy industry to overseas.

No-one has yet attempted to develop a global costing of unabated Ecological Footprint growth, but it is safe to assume that this would be more than the costs of climate change on its own.

9.2. Opportunities arising from the 'route map'

Reducing the region's Ecological Footprint is closely linked to other aspects of the environmental agenda. The 'route map' set out here would help the region to comply with a wide range of environmental targets and legislation, including EU waste targets and carbon reduction objectives.

The current RES already stresses the economic opportunities arising from new environmental technologies. The stronger pursuit of these policies advocated in the route map would offer potential to companies within the region to be market leaders in their fields and – through the exports of goods and services – to influence the sustainability of production and consumption outside both the South East and the UK.

There are also many opportunities for improving people's quality of life through actions which have synergies with other goals. For example:

- Higher levels of walking and cycling will have potential health and lifestyle benefits, as will better access to fresh, seasonal local food;
- More emphasis on local communities where people live and work, using ICT to replace a significant proportion of long-distance travel, will have positive benefits for social networks and community resources;
- Increased demand for local food production, and local tourism, will benefit suppliers within the region;

²⁹ Action Aid, 2008: 'Cereal Offenders'

- The de-materialisation of the economy may offer greater scope for leisure time, leisure services and quality of life.

This is backed up by current research on quality of life which shows that, beyond a certain basic income level, happiness comes not from material consumption but from families, communities and fulfilling occupations.³⁰

³⁰ 'Happiness: Lessons from a New Science': Layard, 2005; Penguin Books.

10. Starting the journey

10.1. Mobilising action on the route map

Given the challenges presented by the route map, the wide range of stakeholders and the many barriers to progress, the key question is how to mobilise action to stabilise and reduce the region's Ecological Footprint and CO₂ emissions.

Mainstream policies and plans

It is clearly important that strategic priorities and action plans deriving from the route map are fed into mainstream strategy formulation and planning, at regional, sub-regional and local level. This process should initially be taken forward by SEEDA, the Assembly and GOSE, together with the Sustainable Futures Group. The Diamonds Local Authorities offer opportunities to pioneer many elements of the route map, but wider involvement of other sub-regional groupings and local authorities will also be needed.

In practice, institutional arrangements in the South East will depend on the outcome of the current Sub-National Review (SNR). Whatever the detail of regional/sub-regional structures and responsibilities emerging from this review, we recommend that the process should focus on:

- Immediate priorities for short-term action, aimed primarily at stabilising the region's footprint (see Table 8.1 above);
- Short and longer-term actions for transformation of the region (see fuller route map tables and charts in Part II);
- Developing a framework for taking forward the route map.

Given the level of technological and policy innovation inherent in the route map, one approach would be to develop a regional 'Foresight' process.

Foresight programme

The Foresight principle is to explore future trends and opportunities, bring together networks of stakeholders, and develop strategies and programmes. This approach is much used in regional development and technology innovation, in the UK, EU and other OECD countries. This would aim to accelerate positive thinking and 'joined up' policy, through catalytic actions. This could work in parallel strands to:



- Develop a strategic framework for long term transformation – build the evidence, analysis, motivation, leadership;
- Build partnerships and action learning networks for key sectors and supply chains, across public, private and civic sectors;
- Identify demonstration projects and area-based initiatives to show examples and leadership (e.g. supply chain networks using information and communications technology);
- Identify all possible incentives in spatial planning system, with all possible extensions (building regulations, environmental regulation, business rating system, highway planning, public transport finance and so on);
- Mobilise the fiscal and procurement agenda, in particular with the Assembly's local authority members, other public agencies (NHS, Higher Education and Further Education Colleges), and regionalised government expenditure.

There would be various options for the institutional basis of a Foresight programme. It could be integrated into an existing institution, such as the post-SNR single regional body, and could draw on the resources of existing centres of excellence in the region (e.g. the International Institute of Sustainability; RESOLVE; and the Sustainable Construction Academy at Ebbsfleet). Or, alternatively, it could have its own secretariat and resources, possibly hosted by one of the regional bodies.

The resource implications of a Foresight programme depend on the number of sectors covered, the depth of stakeholder engagement, the degree of technical resources provided, the in-kind contributions of partners, the length of programme, and other factors to be discussed. From previous experience of regional foresight, it is possible to run an effective programme which makes significant contributions, with an annual budget range between £100-500k, which can be spread among a range of partners. It is also important that such funding requirements are set in the context of a 'triple bottom line' cost-benefit balance, which includes social, environmental and economic factors on the route map presented above.

Examples of potential outcomes of a 5-year regional Foresight programme could include:

- New forms of local investment (e.g. business improvement taxes);
- Potential for local carbon trading and incentives schemes;
- Partnerships with utility companies for large-scale energy and water retrofit programmes;
- Accelerating the use of ICT as a catalyst for trading and decision making.

10.2. Next steps – short term actions

Mobilisation of funding and procurement is the key to mobilising short term actions. The immediate 'next steps' will generally be actions which cost little, use available technology, gain political viability and generate social benefits. There are other immediate priorities (such as 'constraining car use' and 'capping aviation emissions') which are more controversial and difficult to implement, but are central to achieving stabilisation of the region's footprint. A series of immediate next steps are suggested in Table 8.1 above and are summarised here:

Short-term priorities emerging from the route maps for each sector are as follows:

- **Built environment:** Implementation of home energy policies should be continued, including support for rapid achievement of the 'Code for Sustainable Homes' Level 6. More action is needed to encourage retrofitting of energy efficiency and low/carbon technologies to existing homes and buildings. Partnerships should be established for strategic improvement programmes;
- **Transport:** Strong action is needed here, as impacts are increasing despite current efforts to promote alternatives to the car. Active steps should be taken to limit and then reduce car travel, and to promote public transport. Air travel is a special case with huge impacts, local and global: the region should lobby for aviation to be brought into the EU Emissions Trading Scheme, and, ultimately, to constrain growth in air travel to equal growth in technical efficiency;
- **Energy supply:** Strong support for renewable energy projects is required to achieve the current EU and UK target for renewable sources to generate 15% of total energy (equivalent to 40% of grid electricity) by 2020, given current barriers to development of these projects. Another priority is the development of infrastructure for Combined Heat and Power schemes;
- **Food:** Procurement should be used as a tool to promote lower impact food consumption within public and private organisations. In the wider community, the emphasis should be on reducing food wastage, and promoting low-impact farming;
- **Goods and services, public services and capital investment:** Business incentives and accreditation/labelling schemes should be developed to encourage energy and resource efficiency within business. Carbon-trading schemes should be piloted. Sustainable procurement should be promoted through public procurement and community-based projects;
- **Waste:** Regional markets should be developed for waste and intermediate products, involving all stakeholders in the supply chain. Innovative waste-

reduction schemes should be set up, involving both communities and businesses;

- **Water:** Water metering should be introduced as quickly as possible; water-efficiency measures should be retrofitted to existing houses and other buildings, and fitted as standard on new homes and buildings.

We have identified a number of cross-cutting priorities, which would help to reduce the region's footprint across a number of sectors:

- **Behaviour change:** Develop and implement a regional strategy for behaviour change. Develop behaviour change projects with communities, and support community-led and social enterprise schemes which encourage behaviour change. Promote local incentives for low-footprint behaviours;
- **Lobbying:** Lobby the UK government for national-level incentives for footprint and carbon reduction by all stakeholders;
- **Procurement:** Promote sustainable procurement by all public sector bodies, aiming for Level 3-Level 5 of Defra's Flexible Framework, and identify immediate potential for changing procurement specifications;
- **Planning:** Ensure that funding allocations, strategies and plans reflect Ecological Footprint priorities. Promote use of Ecological Footprints and carbon metrics (including carbon prices) in decision-making and policy appraisal;
- **'Diamond' local authorities and growth areas:** Pioneer new approaches to footprint stabilisation and reduction, focusing on priority sectors, including business incentives, skills and supply-chain development, regional innovation clusters, behaviour change and carbon-offsetting.

These short-term priorities will require horizontal measures:

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

These horizontal measures link back to the 'Foresight' programme, or an equivalent initiative, to build capacity and drive innovation within the region. Sub-regional groupings, such as the Diamond clusters, Growth areas and regeneration areas, would provide ideal test-beds for many of the short-term actions summarised in this Chapter.

10.3. Milestones

It is important that progress towards the Ecological Footprint and CO₂ emissions targets is monitored on an ongoing basis. CO₂ emissions are already monitored within the Regional Monitoring Report, and are updated annually. The region should consider whether to incorporate estimates of CO₂ emissions on a consumption, as well as production, basis when these become available through the REAP model.

Monitoring progress towards Ecological Footprint targets has been difficult in the past, as REAP provided only a 'snapshot' of Ecological Footprint data. The revised version of REAP, which will be available shortly, will provide more scope for maintaining a time series of regional and sub-regional Ecological Footprinting. REAP Petite can also provide assessments of Ecological Footprints at community level. Other tools, such as 'Corporate Stepwise' (been developed by Best Foot Forward) and 'Triple Bottom Line' (developed by SEI), may be useful for specific organisations or sectors which want to monitor their progress on footprint reduction.

In addition to measuring progress towards the targets, it will be important to keep the effectiveness of methods and strategies under review. The 'pilot schemes' suggested above will need to be evaluated and reviewed, so that lessons can be extended into roll-out schemes. This is particularly the case for initiatives involving new approaches (e.g. to behaviour change) or new technologies.

10.4. Conclusion

A concerted effort is needed to tackle the upwards trends in the region's Ecological Footprint, even if the goal is simply stabilisation. CO₂ emissions are less problematic - if measured on a 'territorial' basis - as it appears that effective implementation of current policy will be able to stabilise them. On a consumption basis it is likely that CO₂ emissions too are still rising steadily.

Meeting longer term reduction goals for both the Ecological Footprint and CO₂ emissions will require major transformation towards a One Planet Region. This transformation will be challenging but will offer far-reaching benefits for the local and global environment, for the region's competitive position, for social cohesion and for quality of life in the region.

The proposed route map towards transformation of the South East is challenging and beset with uncertainties. This report offers a first sketch of a route map at regional level, which can be taken forward and refined by local knowledge, by sector-specific expertise and by emerging research as time proceeds.

This chapter completes Part I of the report. Part II sets out detailed findings and recommendations for each theme, as well as analysis of cross-cutting issues.

Part II – The route map in detail

11. Introduction to Part II

This part of the report presents more detail on the route map. The analysis in Part II underlies the results and recommendations presented in Part I. The structure of Part II is as follows:

- Chapter 12 sets out our assumptions on economic growth and population for each of the three scenarios used in the study;
- Chapter 13 highlights a number of 'cross-cutting' themes that span a number of sectors, and are particularly relevant to the remit of SEEDA, the Assembly and their partners;
- Chapters 14-20 analyse potential change and make recommendations for the following sectors in turn:
 - The built environment (i.e. housing and property);
 - Transport;
 - Energy supply;
 - Food;
 - Other goods and services;
 - Waste and resource use; and
 - Water.
- Supporting technical information is given in Appendices.

The remainder of Part II assumes the reader's familiarity with the methodology used for the study, which is explained in Chapter 4 of Part I.

12. Economic growth and population

12.1. Assumptions on population

The population forecast used in this study are those published by Cambridge Econometrics in 'Regional Economic Prospects', July 2007. They take account of the assumptions for the natural change in the population (birth/death rates) published by Office for National Statistics, while the migration of the working age population is modelled, taking account of the strength of the region's relative economic performance.

Importantly, it should be noted that the population assumptions are the same for each of the economic scenarios. This has been done partly for pragmatic reasons: population projections continue to be revised. For example, the latest national projections from the Office for National Statistics (ONS) have a much stronger rate of growth than previous vintages of forecasts. By maintaining similar population projections between the scenarios we focus our analysis on differences in patterns of production in each scenario. We recognise that if the population differed in each scenario then this would also be a source of variation in the different scenario outcomes.

12.2. Assumptions on Gross Value Added

Reference scenario

The Reference scenario takes the view of the future prospects for the South East and UK economies published by Cambridge Econometrics in Regional Economic Prospects, July 2007³¹.

In this scenario the South East economy is forecast to grow by just under 3% per annum (pa) over the period 2005-20. This is a faster rate of growth than is forecast for the UK as a whole and stronger than the 2.25% pa growth that was achieved in the South East economy over 2000-05 (but slower than the rates seen over the 1980s and 1990s). With the region's population forecast to rise by 0.5% pa over 2005-20, the growth in Gross Value Added (GVA) per capita over this period will be restricted to just under 2.5% pa.

Key drivers of growth are expected to include transport and communications, health and education and financial and business services. Manufacturing, because of its high-

³¹ This will be the economic scenario provided in the forthcoming 2007/08 update of the REEIO model.

technology orientation in the region, and construction, because of house-building and transport infrastructure projects, are also expected to perform well over the next decade. Growth in these sectors is expected to average 2% pa over the period, stronger than is expected in the UK as a whole.

This predicted strong economic growth will continue to provide new job opportunities. Over the period 2005-20 employment in the region is forecast to rise by 0.75% pa, with the strongest growth in financial and business services and construction. In contrast manufacturing employment is expected to continue to fall. However, the expected rate of decline, at 1.25-1.5% pa is much slower than has been seen over the last twenty years or more.

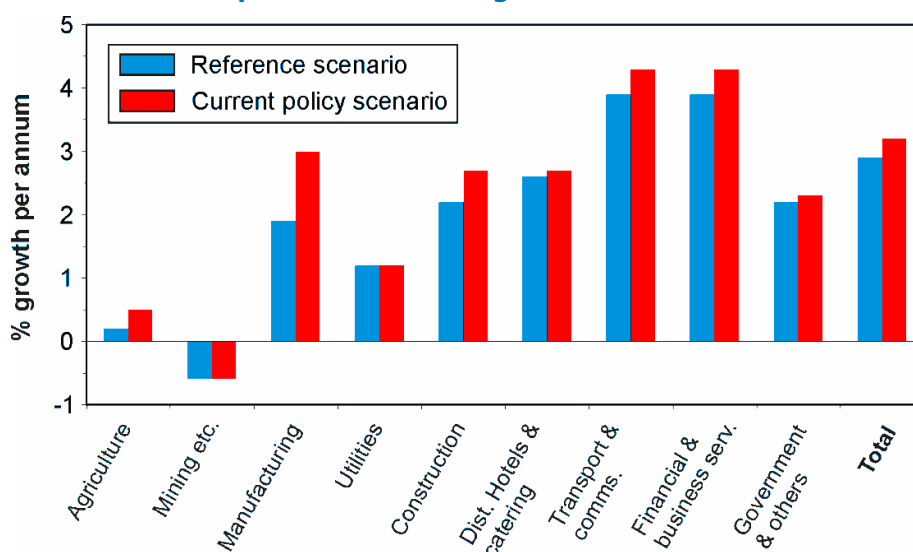
Current policy scenario

In the Current policy scenario, we assume that SEEDA's target of achieving growth in GVA per capita of 3% pa in the long term is achieved.

This is equivalent to overall growth of about 3.5% per year. In the scenario the improvement in economic performance mainly occurs over the period 2010-20 (and so growth in GVA per capita over 2005-20 is therefore below the 3% pa target).

Chart 12.1 compares the pattern of economic growth by broad sector in the two scenarios. The most significant change compared to the reference scenario is an increase in the growth rate for manufacturing. The fastest growing sectors are again transport and communications and financial/business services.

Chart 12.1 Comparison of annual growth in GVA between scenarios



(Source: REEIO model, Cambridge Econometrics)

Transformation scenario

The economic scenario for the Transformation scenario was the same as in the Current policy scenario (i.e. 'Regional Economic Strategy (RES) success'). In that way the scenario focused more on the implications from changes in 'behaviour' rather than the economic consequences from those changes.

One reason for this is that part of the story for the 'RES success' is exploiting the opportunities of environmental technologies, which will clearly be stimulated in the transformation scenario.

12.3. Alternative measures - ISEW

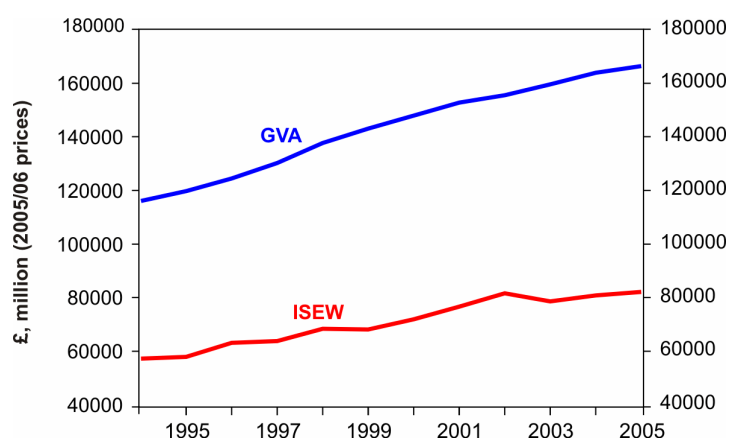
Conventional indicators of economic growth, such as Gross Value Added (GVA) and Consumer Expenditure, are sometimes criticised for providing an inaccurate picture of the sustainability of the economy, or people's quality of life. While growth has increased fairly steadily since World War II, people's perceptions of their quality of life have not increased so fast. Some researchers believe this is due to negative impacts of a high-growth, high-consumption economy on our quality of life – including stress, traffic congestion, pollution and so on.

The 'Index of Sustainable Economic Welfare' (ISEW), developed by the New Economics Foundation with support from SEEDA and other organisations, applies various adjustments to Consumer Expenditure. These are designed to remove 'defensive' expenditure (e.g. spending to deal with the negative impacts of growth, such as pollution) and those elements of expenditure associated with negative aspects of 'quality of life' (e.g. family breakdown, crime, car accidents and so on).

SEEDA and the Assembly have looked carefully at using ISEW as one of the region's indicators. At the moment, the indicator is not included in the Assembly's 'Regional Monitoring Report' owing to various changes in methodology which have required recalculation of historic values of the ISEW. This has made it difficult to develop consistent trend data for the indicator.

However, there are strong arguments for using ISEW, despite its imperfections, as a more meaningful indicator of 'progress' than conventional measures of economic growth. The charts below compare trends in ISEW to GVA in recent years, showing that ISEW is lower than GVA but has grown at similar rates for the past 10 years.

Chart 12.2 GVA and ISEW (1994-2004) – South East England



Source: New Economics Foundation

Further information on the regional ISEW can be found in 'Measuring Regional Progress: Developing a Regional Index of Sustainable Economic Well-being for the English Regions', prepared by T. Jackson, N.McBride, N.Marks and S.Abdallah for the new economics foundation, London, 2006-7. (www.neweconomics.org)

13. Cross-cutting issues

Before we embark on a sector by sector analysis, it is useful to pull out common themes which cut across several sectors. In this chapter, we focus on cross-cutting issues that are particularly relevant to the remit of SEEDA, the Assembly and their partners. There are opportunities to make significant reductions to the region's Ecological Footprint and CO₂ emissions by strengthening action on these cross-cutting issues.

Public sector bodies such as SEEDA, the Assembly, local authorities and sub-regional groups can influence activity within the region in a number of ways. Particularly important roles are:

- Coordinating, facilitating and enabling;
- Spatial planning;
- Policy making;
- Providing funding;
- Buying goods and services;
- Undertaking research;
- Developing and sharing information; and
- Providing leadership.

Some of these roles offer the regional bodies significant levels of influence, but over a limited proportion of regional activity (e.g. buying goods and services; providing funding). But others, such 'coordinating, facilitating and enabling', offer weaker influence that could potentially reach a wider audience.

The cross-cutting issues that we examine here cover a range of these roles. They are:

- Behaviour change (indirect influence – but major scope for change);
- Procurement (direct influence – and part of leadership role);

- Planning and building regulations (direct influence); and
- Diamonds/growth areas (both direct and indirect influence – e.g. through planning and investment/funding).

The following sections set out the route map for each of these four cross-cutting issues.

13.1. Behaviour change

13.1.1. Role and scope of behaviour change

Change by individuals

By 'behaviour change' we mean changes in people's behaviour, both at home and at work, which reduce their impact on the region's Ecological Footprint and CO₂ emissions. In theory, the scope for reducing impacts through behaviour change is very high: committed individuals and groups across the country are already demonstrating that it is possible to choose lifestyles which have a very low footprint, close to our 'fair share' in global terms.³² This can be done using existing technology, if we have the will to do it. But in practice, there are barriers to change and widespread adoption of sustainable behaviours and choices has been slow.

Change is slow even when it involves changes that have direct benefits for the individuals concerned (e.g. energy efficiency measures with a quick payback; reducing food waste through better planning of food purchases; increased walking and cycling with health and lifestyle benefits). It is even slower when the required change involves a cost to the consumer in terms of money or time. Concern for the local or global environment may appear low priority compared to more immediate issues and concerns in people's lives (such as employment, health and education). But change can happen, provided it is made easy enough: many more people now recycle their rubbish, compared to 10 years ago, partly because national performance targets have encouraged local authorities to provide kerbside recycling facilities.

Change by organisations

In addition to behaviour change at an individual level, the region needs to consider how to change the values and behaviour of organisations: public sector bodies, businesses and community/voluntary groups. Organisational change is a science in itself. Tools which may be useful include partnership working, business advice schemes, accreditation schemes and Corporate Social Responsibility. Again, incentives play an important role in supporting change.

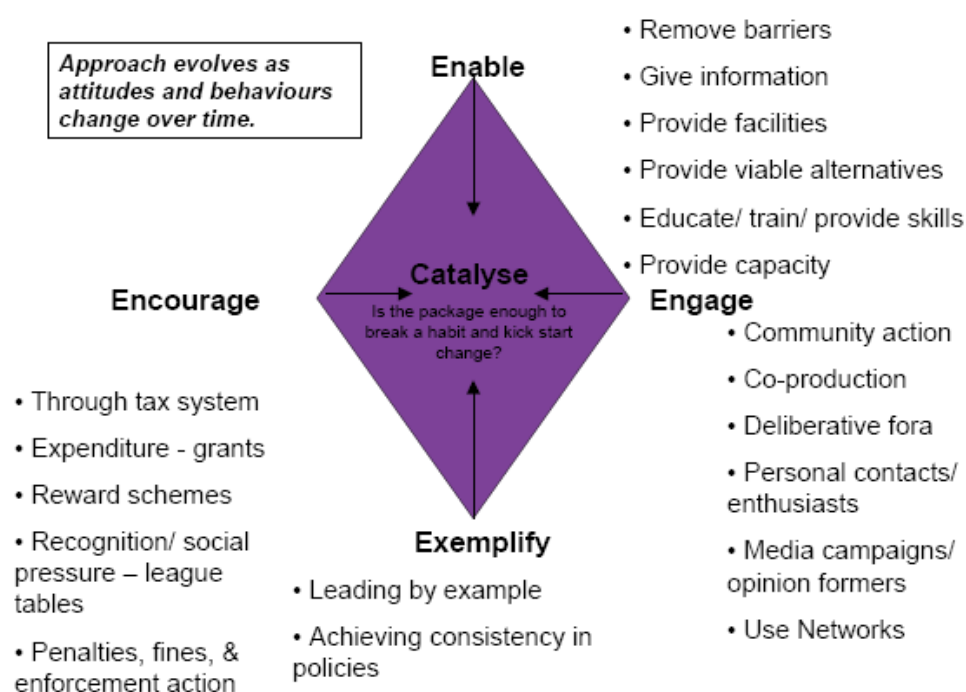
³² 'Towards a low footprint Scotland – Living well, within our ecological limits.' (SEI, March 2007).

4 'E's model of behaviour change

The Government has adopted the four 'E's model of behaviour change: Enable; Exemplify; Encourage; Engage. This is set out in Chart 13.1 below. The model suggests that action is required on all four aspects to provide a sufficient catalyst for a person to make a change in their behaviour. Raising awareness is not enough in itself – it may trigger behaviour change in some individuals, but there will be many others who need more incentive to change.

It could be argued that all of the actions in the route map as a whole fit into one of these categories. Similarly, all four 'E's need to be addressed by the route map if Transformation is to happen in a given sector.

Chart 13.1 Defra model of behaviour change – the 4 E's



(Source: 'Securing the Future – the UK Government Sustainable Development Strategy'; Defra, 2005)

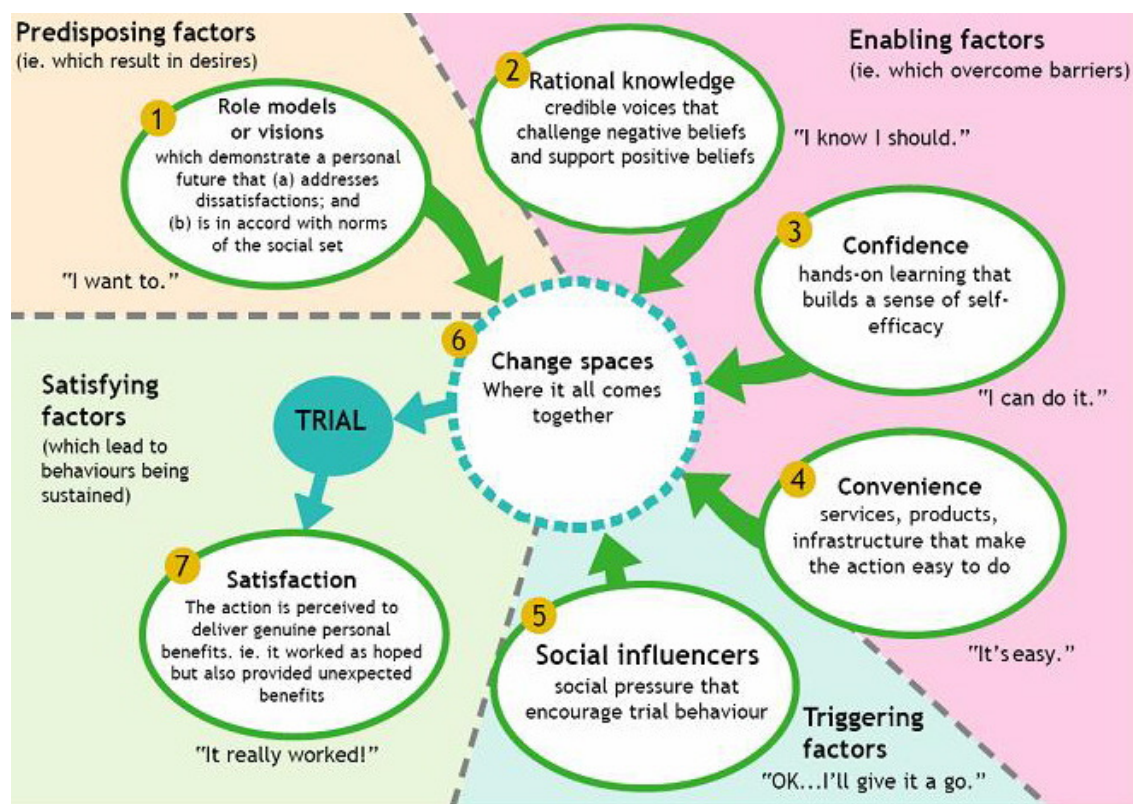
The 'Exemplify' aspect of this model emphasises that people are far more likely to make changes if they see that Government bodies are taking the lead themselves, not just pushing responsibility onto consumers. This issue is explored in the report: 'I will if you will' (Sustainable Development Roundtable, 2006). This has important implications for the regional bodies' own behaviour (e.g. procurement) and the consistency of regional policies.

The Seven Doors model for behaviour change programmes

Research by CAG Consultants for WWF-UK suggests that behaviour change is a journey rather than an event.³³ People make successive small changes to their behaviour as their awareness grows and their constraints change. Sustainable choices need to be made easy and convenient, and information about these choices needs to be communicated in clear, simple ways. Feedback helps, so that people can see the benefits of their new behaviour.

This is expressed well by the 'Seven Doors' model developed by Social Change Media.³⁴ This shows a series of steps that people need to go through before they actually make a lasting change in their behaviour. It is a cycle in the sense that satisfaction with one level of change can predispose an individual to make further changes. Social Change Media have used this model to help design and evaluate behaviour change programmes.

Chart 13.2 The 'Seven Doors' model for designing and evaluating behaviour change programmes



(Source: Social Change Media)

³³ See <http://www.wwflearning.org.uk/community-engagement/>

³⁴ http://media.socialchange.net.au/strategy/7_Doors_Model.html

Work by Global Action Plan, CAG Consultants and WWF-UK supports the importance of the 'social influencers' element of the Seven Doors model. Social networks and community engagement can play an important role in helping people to increase their awareness and change their behaviour. People are more likely to make a change if they know that their peers are doing, or have done, the same.

While awareness campaigns still have their role, work done with communities – or where relevant organisations – is likely to be more cost-effective in creating far-reaching change.

13.1.2. Current situation

National policy

Behaviour change is increasingly seen as a key part of government policy on sustainable development and climate change. While the Government and private sector are responsible for many aspects of the structure within which we – as consumers – make choices, we also have responsibility for our choices.

Given the importance of improving understanding of behaviour change, the Government has established a cross-government 'Behaviour Change Forum' which has sponsored and published research on barriers to, and potential for, behaviour change³⁵.

Recent government initiatives include the 'Act on Carbon Calculator' which encourages people to find out and reduce their own impacts on climate change. Defra also funds the 'Every Action Counts' programme, which works through voluntary and community groups to encourage individuals to make successive small changes to their lives.

Defra's report on 'A Framework for Pro-Environment Behaviours' (January 2008 – www.defra.gov.uk) uses a social marketing approach to analyse the willingness of different segments of the population to change specific aspects of their behaviour. There is a close match between the 'pro-environment' behaviours analysed in that report and the types of behaviour that would contribute to Ecological Footprint and CO₂ emissions reduction. A key point from this report is that different approaches will be needed to influence different sections of the population.

Regional policy and action

Behaviour change has been identified as a priority in the Implementation Plan for the South East Plan and RES. Attention has so far been focused on investment to enable or facilitate behaviour change (e.g. possible allocation of funds by the Regional Transport Board to facilitate more sustainable transport choices). But so far, the regional approach to behaviour change is in its early stages.

³⁵ Their reports can be found at: <http://www.sustainable-development.gov.uk/what/priority/behaviourChangeResearchAndGuidance.htm>

There are examples of good practice within the region. These include Global Action Plan's 'Small Change Programme' which has run pilot projects in Hastings, Lewes, Thanet and Tonbridge and Malling. Participants in the programme have, on average, decreased the amount of waste they produce by 19% and increased the amount they recycle by 22%. Some have started to save energy by installing energy-efficient lightbulbs and switching off appliances³⁶. The 'Low Carbon Households' programme, supported by Lewes District Council, is also working with local households to encourage low-carbon choices.

There are also a growing number of 'bottom-up' community initiatives, such as the Transition Towns movement. These are run, on a voluntary basis, by individuals and groups who want to mobilise their communities to respond to the twin threats of Climate Change and 'Peak Oil'. There are about 50 Transition Towns in the UK to date, several of which are in the South East, including: Lewes, Brighton and Hove, Canterbury, Mayfield, Forest Row and the Isle of Wight. Examples of activities by Transition Town Lewes include the development of an 'Energy Descent Action Plan' for the town, holding events and training courses, and using a 'wiki'-style website to share ideas and information on 'transition' to low-carbon living³⁷.

13.1.3. What needs to change - stabilisation?

Behaviour change could potentially have a very significant role to play in stabilising the region's footprint. It is relevant to almost all themes:

- **Built environment** – we have estimated that energy saving behaviour (such as buying low-energy appliances; switching off appliances and lights; turning down thermostats and so on) has the potential to reduce the Ecological Footprint of home energy use by up to 17% between 2003 and 2030 (see Chapter 14). Individual choices will also influence the rate of retrofitting of energy efficiency measures to existing houses and other buildings. Both these measures would help to reduce the footprint below current levels;
- **Transport** – the 'Smarter Choices' report³⁸ estimated that 'soft' measures aimed at influencing travel behaviour could – if accompanied by appropriate 'hard' infrastructure measures – reduce car use by 10-11%. This would not, in itself, be enough to stabilise the footprint of transport, but it would reduce the rate of growth;
- **Energy supply** – investment choices by households and businesses will determine the rate of retrofitting of Combined Heat and Power (CHP) and micro-generation to existing houses and other buildings;

³⁶ Small Change South East Evaluation Report, March 2007. Produced by the New Economics Foundation on behalf of Global Action Plan.

³⁷ See <http://transitiontowns.org/Lewes/Lewes>

³⁸ 'Making Smarter Choices Work' (DoT, 2004)

- **Food** – the footprint of this sector appears to be fairly stable, but dietary choices and food purchasing choices could have a significant impact on the Ecological Footprint of this sector, leading to future reductions in the footprint; and
- **Goods and services** – the Ecological Footprint of this sector has increased at about 2.4% per annum between 1990 and 2003, and is predicted to continue rising under current policy. Influencing consumer behaviour towards lower-impact goods and services, and longer lasting products, could have a significant impact on this aspect of the footprint.

At a very rough guess, behaviour change – without major structural changes – could potentially reduce the Ecological Footprint by 5-10% - mainly through energy efficiency and transport behaviour, and changing consumption patterns for food and other goods and services. The impact on an individual's consumption could be much greater than this, but many individuals will not be willing to make far-reaching changes without accompanying incentives. The potential for behaviour change would be much greater if accompanied by incentives such as carbon quotas or taxes, and road pricing schemes.

Our recommendations for strengthening of current policy to support stabilisation are summarised in Table 13.1 below. A key recommendation is that the regional bodies should, with partners, develop and then implement a strategy for behaviour change. This strategy should cover all aspects of the 4'E's model: Enable, Exemplify, Encourage and Engage. It should also consider behaviour change by organisations (e.g. businesses, government bodies, community and voluntary groups) as well as individuals.

We also recommend that the region should support the development of behaviour change projects, working with communities. Whether this approach is community-based or community-led, it is likely to be more cost-effective than large-scale awareness raising work.

The next section discusses the changes needed to achieve 'transformation' of behaviour towards low-footprint lifestyles.

13.1.4. What needs to change – transformation?

Transformation will require more than adjustment to people's behaviour patterns. It will require a major shift in the values and expectations of our society, in response to the revised reality of a world in which climate change and 'Peak Oil' are major threats. These changes will happen more readily when the effects of climate change are more strongly felt, but by then many opportunities for change will already have been lost. There is an urgency to communicate the need to act now.

In addition to the 'stabilisation' actions outlined below, the types of measures required to generate more far-reaching change are:

- Promoting, lobbying for, and where possible piloting, those structures, regulations and fiscal measures that will provide strong incentives for Ecological Footprint and emissions reductions;
- Work with communities to develop and implement local route maps towards a 'One Planet Region' or its equivalent (e.g. Transition Towns Movement - Energy Descent Action Plans; Green Action Zones); and
- Developing information-sharing networks, to share research findings and good practice examples, which use the web to full advantage and help people/organisations to make informed choices.

Our recommendations for action on behaviour change are summarised in Chart 13.3 below, and presented in more detail in Table 13.1. Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions). In Chart 13.3, a black border indicates that an action involves lobbying for change at national level or above.

Recommendations for short-term priority actions are listed in Table 8.1.

Chart 13.3 Behaviour change – route map chart

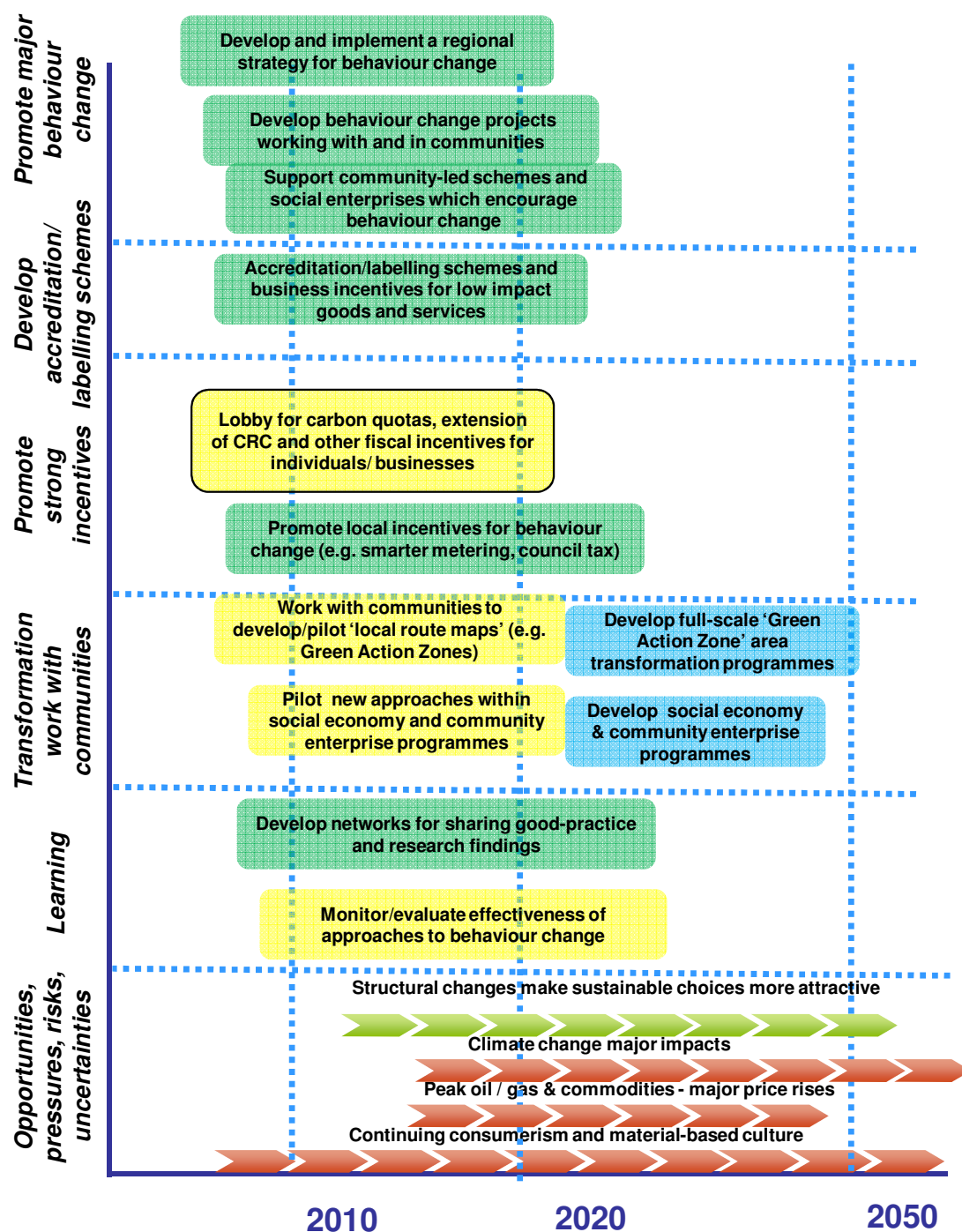


Table 13.1 Behaviour change route map (cross-cutting)

Key: **Stabilisation actions;** **short-term transformation actions;** **longer term transformation actions**

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Promote major behaviour change across households, businesses and other organisations	Develop a regional strategy for behaviour change to stabilise, and then reduce, the region's footprint – targeted at individuals, communities, businesses, government and other organisations.	Local authorities/ the Assembly/ with utilities, private, civic and community organisations	Minimal cost	We estimate that behaviour change could reduce the Ecological Footprint by 5-10% without major structural change.
	Implement behaviour change strategy (using the 4 E's) aimed at the following behaviours: • Buying less (or buying lower impact) goods and services; • Retrofitting energy efficiency measures and LDC to existing housing; • Encouraging energy and water-saving behaviour at home and at work; • Reducing car and air travel; • Buying less air-freighted produce; • Reducing food waste; • Eating healthy low-impact food; • Minimising waste and increasing recycling.		Significant cost	Its impact could be much greater than this if accompanied by fiscal incentives or carbon quotas.
	Support the development of behaviour change projects working with communities (both community-based and community-led approaches, including support for relevant social enterprises)	Local authorities/ communities	Moderate cost	Implement more effective behaviour change, through community engagement, and reflective practice.
	Monitor and evaluate the effectiveness of different approaches to behaviour change, and adapt programmes accordingly.	SEEDA/ the Assembly/ local authorities/ other partners	Minimal cost	

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Promote/ develop/ adopt appropriate labelling and accreditation schemes	Develop and extend labelling programmes for low impact products and services, including: • Sustainable construction; • Low/zero carbon technologies; • Food; • Fair trade products.	SEEDA/ retailers/ producers/ consumer bodies	Moderate cost	Encourage more informed choices by consumers and businesses.
Promote strong incentives for behaviour change	Lobby national government re incentives for households/business (e.g. carbon quotas; fiscal incentives). Promote local incentives for behaviour change through CERT, council tax banding and new technology (e.g. smart metering; thermal imaging and so on).	SEERA/ the Assembly Local authorities, utilities	Minimal Self-financing	Very high – would make behaviour change work more effective. As above.
Work with communities to achieve far-reaching transformation of values and behaviour	Work with communities to develop and pilot local route maps towards a 'One Planet' region (e.g. pilot 'Green Action Zones'; Transition Towns). Pilot approaches to personal carbon allowances and related incentives through social economy and community enterprise programmes. Develop wider social economy and community enterprise programmes to promote sustainable consumption and value added. Develop full-scale 'Green Action Zone' or 'One Planet' area transformation programmes for low footprint living and working.	Local authorities/ community organisations/ regional bodies	Significant costs.	Implement more effective behaviour change, through community engagement. Scope for integration with other aspects of low-footprint living.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Develop and share information on sustainable choices	Develop information-sharing networks, using the web to full advantage, to share research findings and good practice examples with organisations, communities, businesses and individuals.	SEEDA/ the Assembly/ local authorities/ businesses/ research institutions	Low cost.	Improve the effectiveness of behaviour change work across the region.

13.2. Procurement

Total expenditure on public procurement in the region is estimated to be £22 billion per year (13% of GDP). Procurement should be one of the principal means of achieving sustainability policy objectives. In practice it is often constrained by institutional barriers, professional conventions, consortium contracts, EU State Aid rules, and particularly 'value for money' short term accounting and budgeting standards.

13.2.1. What is 'public' procurement?

The procurement agenda itself can be identified in layers:

- Direct procurement of goods and services by regional and local bodies;
- Contracting by regional and local bodies, involving procurement of goods and services by the contractor; and
- Indirect procurement, through a range of influences including grant / subsidy conditions, spatial policies, and other fiscal incentives.

Also, the public procurement agenda raises the question of definition of the public sector. This can be seen in the layers of multi-level and multi-lateral governance, relating to the various roles of regional bodies (i.e. SEEDA and SEERA until redefined by the Sub National Review). The regional bodies act as:

- Direct spending and grant giving bodies;
- Influencers or facilitators of local government expenditure;
- Influencers of national government expenditure; and
- Coordinators or facilitators of other public and quasi-public executives, agencies, partnerships, consortiums and so on.

This scope for broadening the influence of procurement to meet the challenge of the Transformation agenda is explored further in section 13.2.4 below.

13.2.2. Current situation

National level

At the UK level, procurement has become part of the BERR (formerly DTI) innovation strategy. A number of policy developments have highlighted the importance of procurement to achieve not only greater efficiency in public sector spending, but also as a vehicle for innovation and local economic development.

The Government has also established a Sustainable Procurement Taskforce, which published a report 'Procuring the Future' (2007). In 2007, HM Treasury and Defra published the 'UK Government Sustainable Procurement Action Plan'.³⁹ This sets out a Flexible Framework to guide public sector procurement, which defines 5 different levels of progress towards sustainable procurement processes. There is a national target for all public sector organisations to reach Level 3 (or above) of the Defra Flexible Framework with leadership (Level 5) in at least one area. 'The local government sustainable procurement strategy' was produced in November 2007 by IdeA, LGA and the Centre of Excellence North East. It sets out the sector's response to these reports.

Sub-national levels

In the UK, the local government sector as a whole spends some £40 billion per year on goods and services from third parties, which represents about half of local government's overall expenditure. Around 70-80% of procurement by government is for services rather than goods or capital investment.

In the UK each local authority is responsible for its own procurement. This makes local government a significant customer and a potential key actor in promoting economic growth and innovation. The scale of local and regional procurement, albeit important, is lower than in other EU countries with greater degrees of decentralisation. The way procurement is conducted varies from one local authority to another. In some cases a corporate procurement unit develops the council's strategy and provides expertise and advice. In other cases there is merely a contracts compliance unit ensuring that contracts meet the council's specifications, but without a strategy.

Research commissioned by the Sustainable Procurement Task Force found that 42% of local authorities have in place a procurement strategy that takes account of sustainability when assessing needs (UK Government Sustainable Procurement Action Plan – 2007).

South East region

Total expenditure on public procurement in the region is estimated to be £22 billion per year (13% of GDP). Conventional procurement is mainly cost driven and has few linkages to environmental policy, although progress is being made to incorporating sustainability into procurement decisions.

SEEDA is committed, through the RES, to develop a South East Plan for Sustainable Public Procurement. Work has started on a Regional Action Plan for public-sector procurement, which would cover local authorities, the health sector and other regional players.

³⁹ See <http://www.sustainable-development.gov.uk/publications/pdf/SustainableProcurementActionPlan.pdf>

All public sector organisations are committed to reach Level 3 (or above) of Defra's Flexible Framework by 2009, with leadership (Level 5) in at least one area. This framework can be found in Annex C of the UK Sustainable Procurement Action Plan.

In the next section, we consider how procurement could become a more effective lever to make stabilisation and transformation of the Ecological Footprint happen across the region.

13.2.3. What needs to change – stabilisation?

In the period 1990-2003, the Ecological Footprint of government spending and capital investment grew at around 2.5% per year, and these trends are broadly expected to continue if past policy and economic growth levels continue. So a reduction of around 2.5% per year in the impact of public sector procurement is required to stabilise this element of the footprint.

This would require, and go beyond, strong implementation of current policy. It would require prioritisation of the proposed South East Plan for Sustainable Procurement, and support work to ensure that public sector organisations reach beyond Level 3 of the Flexible Framework by 2009. It also requires ongoing and increased support for labelling/product information schemes, such as the Leaf Marque programme, and moves to improve the evidence base and sustainable procurement skills within the region.

To achieve stabilisation, action should also be taken to involve large private sector players in the development of a region-wide procurement strategy, and associated labelling schemes, in order to move towards development of consistent standards across the region as a whole.

Our recommendations for stabilisation of the region's footprint through procurement are summarised in Table 13.2 below.

13.2.4. What needs to change - transformation?

To reach the long-term targets for transformation, involving a decrease of around 4% per annum in government spending and capital investment, a more pro-active approach to procurement needs to be developed:

Pro-active public procurement partnerships

In section 13.2.1, we outlined the potential role for regional bodies to influence procurement through their role as coordinators/facilitators of other public and quasi-public executives, agencies, partnerships, consortiums and so on. This last point shows some key concepts on new forms of policy and investment to meet the challenge of the Transformation agenda.

This amounts to a new kind of institutional platform, or compact between society, resource providers and consumers (see Chapter 3 of Part I). The concept of public sector as **steward or stake-holder** of common resources underpins, both politically and ethically, our recommendations for a range of market and technical measures. This concept has many implications for the practical details of fiscal policy, economic development policy and so on. For example the public sector's roles could include:

- A pro-active role as **investor and manager** of common resources. This may be at the national level, through active intervention with taxation or trading systems. It has also great potential at the regional or local level, as with area housing partnerships (see example below);
- A pro-active role as **standard setter**, so that firms and other organizations will be required to be transparent and responsible at all times, as would the public sector;
- A direct economic role through **procurement and contract specifications** – the prime interface between the public and private sectors;
- This can then leverage up its effects by forming public-private partnerships for innovative and sustainable supply chains and consumer markets.

An example of how this could work is shown in the box below.

Worked example: pro-active procurement in the housing sector

- The public sector leads an area housing partnership, and brings regeneration funding with clear conditions and standards attached under the 'procurement' heading;
- The social housing sector implements an affordable housing programme, also procuring design and construction services;
- Private house builders are also in the partnership, gaining from reduced uncertainty and uplift in values, and with economies of scale can improve the performance and lower the cost of new Low and Zero Carbon (LZC) technologies;
- Private utilities are brought on side with larger-scale low impact infrastructure plans, again reducing uncertainties;
- The demand side and consumer purchasing market is already coordinated through the Registered Social Landlords (RSLs) and others, acting in coordination with mortgage lenders and public housing agencies.

Potential changes – by sector

Here we show some of the main applications of public procurement in each of the key sectors, in relation to the Transformation scenario:

- **Food and farming:** using the direct purchasing power of health and education providers (i.e. National Health Service (NHS) trusts, Local Education Authorities (LEAs) and related bodies) to encourage a rapid shift towards more low-impact, local and organic food supply chains. This could build on initiatives such as the 'Strategy for public procurement of food from the South East Region' (2006)⁴⁰;
- **Built environment:** as with the example above, procurement can greatly increase its leverage through partnership and supply chain consortiums with private and third sector providers. This could build on current policy (RES action 12.8): *"ensure that all SEEDA-funded developments achieve Ecohomes/BREEAM 'excellent' standard as a minimum, aspiring to higher standards of sustainability, including zero carbon development, where possible."*;
- **Transport:** this would focus on direct procurement of transport services, vehicles and infrastructure by the public sector. It would also cover added leverage through indirect funding for private infrastructure, area regeneration, economic development and so on. In each of these areas there would be positive support for investment in high-efficiency low-impact vehicles, fuel and travel modes;
- **Products and manufacturing:** public procurement in these sectors divides into supply and demand sides. Economic development on the supply side should use procurement as a main lever for environmental best practice, through supply chain innovation partnerships in selected clusters and sectors. On the demand side, procurement should stipulate a coordinated framework of incentives for low-impact trade and logistics, eco-labelling, overseas development and waste management;
- **Commercial services:** there should be strong financial and market incentives for sustainable tourism and leisure operators, with the first criterion being low impact transport and buildings. There should also be a particular focus on financial services as the key to all other sectors. This includes the criteria for investment of public sector pension funds, which are some of the largest in the country;
- **Energy, water and waste:** transformation requires rapidly accelerated 'Forward Commitment Procurement' investment in low impact services and infrastructure, with 'stretch' levels of performance targets and benchmarks. This would cover renewable energy sources, waste reuse and recycling technologies, low impact demand side management water technologies and so on.

⁴⁰ See <http://www.sussexenterprise.co.uk/data/5728471.pdf>

Our recommendations for action on procurement are summarised in Chart 13.4 below, and presented in more detail in Table 13.2. Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions).

Recommendations for short-term priority actions are listed in Table 8.1.

Chart 13.4 Procurement – route map chart

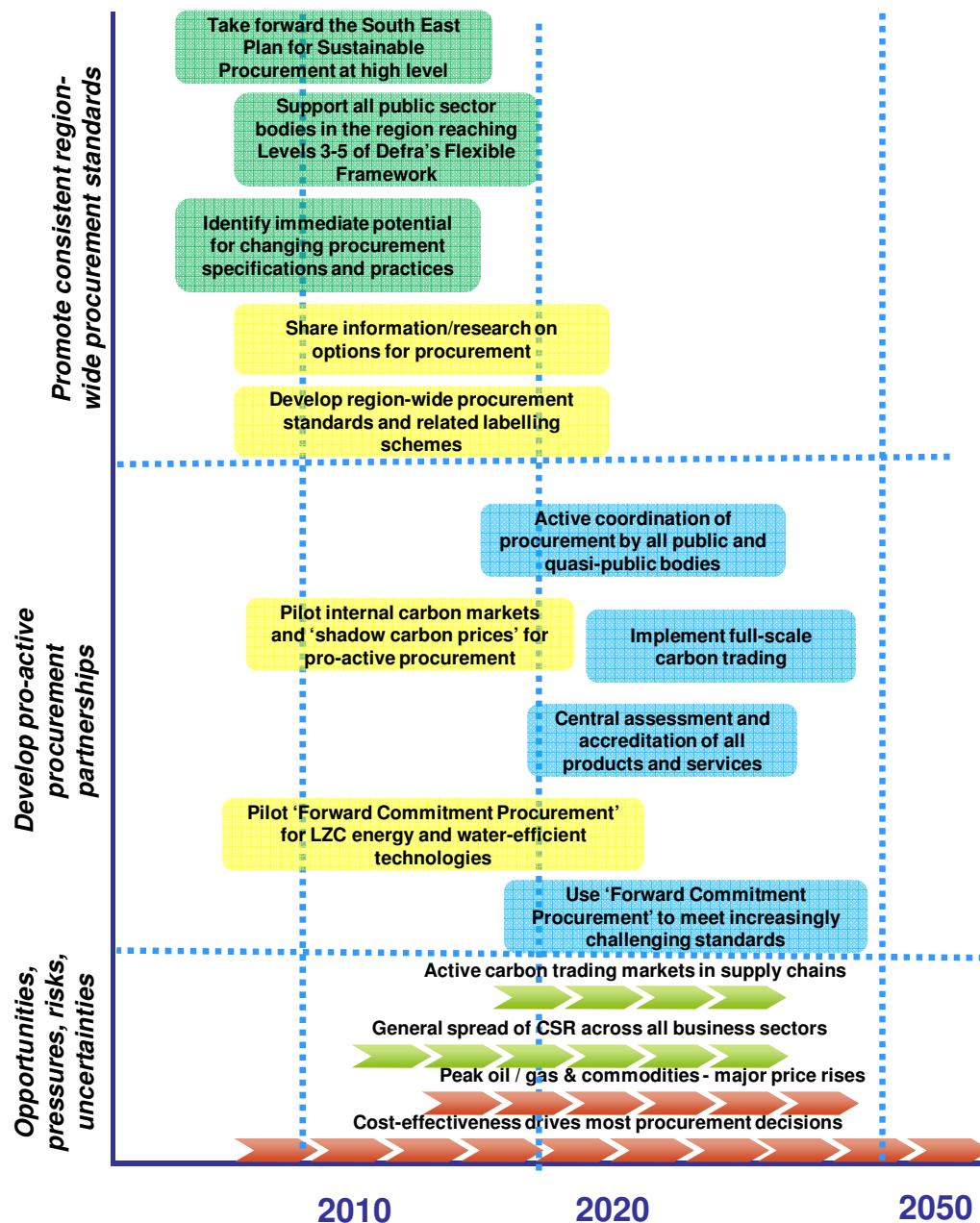


Table 13.2 Procurement route map (cross-cutting)

Key: Stabilisation actions; short-term transformation actions; longer term transformation actions

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Promote consistent region-wide procurement standards	Ensure that the South East Plan for Sustainable Procurement is taken forward by a high-level procurement group. Support all public sector bodies in the region to reach Level 3, and where possible Level 5, by 2009. Share information, and where necessary undertake research, on environmental impacts and technical options for procurement. Involve major private sector companies in the development of region-wide procurement standards and related labelling schemes.	SEEDA, with the Assembly, Health, LGA, local authorities SEEDA/ major companies in the region	Higher unit costs for some goods/services Moderate costs of running a support/information service	Sustainable procurement could significantly reduce the footprint of public services. Higher unit costs should be offset by reduced wastage in these or other areas. Extend the impact of procurement work to the private sector.
Develop pro-active procurement partnerships	Active coordination of procurement by all public and quasi-public bodies. Pilot internal carbon markets and 'shadow carbon prices' to enable pro-active approach to procurement. Implement full-scale carbon trading. Establish central assessment and accreditation of all products and services.	SEEDA, with the Assembly, Health, LGA, local authorities SEEDA/ private companies in the	Higher unit costs for some goods/services should be offset by reduced wastage in these or other areas	Potential high impact in both the public and private sectors through partnership working and establishment of incentives for low-carbon procurement.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	Pilot 'Forward Commitment Procurement' on LZC energy and water-efficient technologies. Use 'Forward Commitment Procurement' to meet increasingly challenging efficiency standards.	region SEEDA/public bodies	Share risks posed by emerging technologies.	Provide support for emerging technology markets.

13.3. Planning and building regulations

13.3.1. Role and scope of planning

Spatial planning is a 'horizontal' theme which cross-cuts each of the key sectors for footprint reduction. Within the current legislative structure, spatial planning has direct but often limited influence on the following:

- Construction and the built environment – planning can influence spatial forms and location, but has limited influence on demand, supply, efficiency of building uses and occupancies;
- Transport - planning can influence transport demand through spatial forms, but has limited influence on transport supply and efficiency; and
- Energy, water and waste services – planning has limited influence in the privatised market for infrastructure location and provision, but has some influence on the demand side.

Within these constraints, planning has an essential role to play in the South East Footprint agenda:

Regulatory and economic policies:

- Area use class designations; minimum standards;
- Protection policies, as for landscape value and so on;
- Planning gain supplement/infrastructure charges.

Spatial allocation/coordination of sites, corridors, infrastructure and so on:

- Transport and ancillary provision;
- Water, waste, energy, communications;
- Civil engineering (e.g. flood defences).

Area initiatives – including:

- Urban regeneration and renewal;
- Rural programmes;
- Large scale developments (e.g. Thames Gateway);
- 'Regional hubs' as centres of economic activity and transport services.

13.3.2. Current situation

National policy

The framework for planning at a regional level will be strongly influenced by the outcome of the current Sub-National Review (SNR). The Government is currently consulting on proposals which would create a single regional body, to replace RDAs and Regional Assemblies. This body would have responsibility for an Integrated Regional Strategy, which would bring together the formerly separate Regional Economic Strategy and Regional Spatial Strategy. The scrutiny role of Regional Assemblies would be replaced, in some form, by scrutiny of the new regional bodies by local authorities.

SNR should improve the integration of spatial planning policies with wider economic policies. But it is not yet clear how far the objectives of the new single regional body will focus broadly on promoting sustainable development, which is the current framework for Regional Spatial Strategies, or more narrowly on promoting economic development.

Other national policy initiatives which are relevant to spatial planning policy in the South East include:

- The Sustainable Communities Plan which promotes development in major growth areas including the Thames Gateway and Milton Keynes/South Midlands;
- The Planning White Paper (Planning for a Sustainable Future, 2007) which proposed a new system for deciding major infrastructure projects, and proposed a bigger role for the planning system in tackling climate change and supporting the role of town centres; and
- The Climate Change supplement to Planning Policy Statement 1 (PPS 1, 2007) which sets out guidelines on how spatial plans should support climate change mitigation and adaptation, particularly in relation to future built development.

Regional policy

The South East Plan is generally targeted at supporting sustainable development and responding to/mitigating the effects of climate change. There are areas of potential tension, such as policies on major road or air transport infrastructure. And there are, of course, broader questions about the sustainability of regional housing allocations which target more development at the already densely-populated South East.

In spatial terms, the South East Plan proposes that development should be focused in 18 'Regional hubs'. The aim of this policy is to create sustainable communities, reduce the need to travel, and encourage re-use of brownfield land for new development.

This spatial strategy has been taken forward in the RES through the definition of 'Diamonds for Investment and Growth'. These are discussed further in section 13.4 below.

Regional issues

The South East region has a very particular profile and role in the spatial geography of the UK. It is:

- Generally poly-centric and dispersed, without one single core conurbation;
- Generally the peri-urban area, and in many senses the 'back-yard', of Greater London; and it has
- Diverse landscapes and a long coastline;
- High pressures from urban growth, and also from landscape amenity value;
- High vulnerability to climate change impacts;
- Large areas of fragmentation, decline and regeneration in the Thames Gateway.

There are implications for spatial planning, both as currently practiced, and as extended under the transformation agenda:

- Conventional guidance on 'sustainable urban development' is not necessarily applicable to the South East region;
- Conventional linear public transport solutions may struggle to equal the performance of the private car at a regional level;
- The sub-regional agenda with localised 'hubs' may be more significant as a practical policy level;
- The Assembly or its future equivalent is likely to achieve more by facilitation and coordination of sub-regions and local authorities, than by direct regulation and investment.

13.3.3. What needs to change – stabilisation?

In terms of the Ecological Footprint, planning and building regulations potentially have most impact on:

- Energy use in the built environment, particularly in new housing and properties;
- Transport and accessibility;

- Waste and water management.

At a very rough guess, current policy could potentially reduce the Ecological Footprint by around 5% - mainly through energy efficient/low carbon development and through urban design for accessibility. This would support efforts to decrease the footprint of the built environment and halt the increase in the footprint of transport.

Overarching recommendations for stabilisation of the region's footprint are summarised in Table 13.3 below. Further sector-specific actions are included under the relevant theme or sector in Chapters 14-20.

13.3.4. What needs to change – transformation?

Planning as pro-active policy integration

Land-use and development planning is a key point of reference in sustainable development: land is effectively the ultimate 'finite' resource on which all else depends. While much store is placed on development planning to 'achieve' or 'deliver' sustainability, as if this was a fixed product, there are obvious constraints:

- Planning has little power to counter underlying trends and pressures (e.g. 'reducing the need to travel' policies, might easily 'increase the desire to travel' for many consumers);
- Planning, as a non-spending function whose main power is that of veto, depends on the resources of others beyond its control;
- Planning only controls direct physical change, with little influence on subliminal trends or pressures – for all its policies on reducing travel, traffic continues to grow.

In response there is a challenging and exciting agenda for integrated planning, which this report aims to demonstrate. 'Integrated planning for sustainable development' (Ravetz, 2000) applies the principle of integration in each dimension of the regional system:

- **Horizontal or sectoral integration:** coordinate land-use and spatial development with sectors such as housing, education or transport;
- **Environmental integration:** coordinate policies and programmes within an integrated regional environment framework;
- **Vertical integration:** coordinate EU, national, regional, local and neighbourhood level policies and programmes;

- **Policy integration:** coordinate policies and programmes with environmental, economic, social and technology impact assessment;
- **Supply-demand integration:** coordinate supply-side and demand-side policies and programmes in each sector;
- **Time integration:** consider long term dynamic trends, pressures, goals and targets, with a strategic horizon of at least 25 years.

To achieve this agenda involves more than the text-book 'survey-analysis-plan' approach. It needs further layers of integration in human, technical and organizational resources:

- **Technical integration:** using ICT with GIS, systems modelling, and interactive decision support tools to support the above;
- **Political integration:** for participation from many interests and communities, with democratic and collaborative mediation;
- **Resource integration:** coordinate with funding resources, programmes and projects to fulfil planning objectives;
- **Institutional integration:** establish partnerships and agencies with capacity for implementation;
- **Communications and network integration:** action-centred networks with learning management style, rather than monolithic organizations.

Applications of pro-active spatial planning

This 'joined up' and 'pro-active' approach to integrated spatial planning can then be applied in many areas of the key sectors addressed in this report:

- **Food and farming:** focused use of spatial planning, combined with public subsidy/fiscal schemes under Entry/Higher Level Stewardship schemes (ELS/HLS), to encourage and coordinate farm diversification, niche products, local supply chains, landscape stewardship and waste/environmental management;
- **Built environment:** as with the housing example in section 13.2 above, spatial planning is one dimension whereby a pro-active public sector can increase its leverage through area-based partnerships and consortiums with private, civic and community sectors. This approach should focus on practical targets (e.g. RES Action 12.8: '*ensure that all SEEDA-funded developments achieve Ecohomes/ BREEAM 'excellent' standard as a minimum, aspiring to higher standards of sustainability, including zero carbon development, where possible*').

The spatial planning system at regional, local and site levels is essential to mobilising the potential of each development site in terms of climate mitigation and adaptation potential;

- **Transport:** as above, spatial planning is an essential approach to an integrated approach to urban and rural settlement patterns and infrastructure. The common problems in funding public transport should in principle be forward funded through anticipated uplift in property values. This in turn follows from a clear and practical synergy between landuse allocations in the Local Development Framework (LDF), and public transport infrastructure programmes. The spatial planning system then becomes a means whereby collective value is created and maintained;
- **Products and manufacturing:** in this sector spatial planning is more directly concerned with the location and infrastructure needs of businesses. However as stewards of the regional environment, there is also an agenda for spatial planning to lead on the economic incentives for low-impact trade and logistics, eco-labelling, overseas development and waste management;
- **Commercial services:** spatial planning is an obvious starting point for incentives for sustainable tourism and leisure operators, with the first targets being low impact transport and buildings. For retail and consumer services, spatial planning is (at present) the principal means of ensuring that external impacts are controlled and wider public interests maintained, over market-based private interests. For instance, most parking is currently quite costly in town centres, while free in supermarkets and out-of-town locations: these locations not only put pressure on road infrastructure but cause major secondary impacts on local economies. Internalising such cost displacements and indirect impacts should be one of the key priorities for spatial planning.
- **Energy, water and waste:** as above, spatial planning should work in close coordination with procurement, economic development and other regulation to achieve the most sustainable forms of utility provision. This would cover renewable energy sources, waste reuse and recycling technologies, low impact demand-side management water technologies and so on.

Integrated spatial planning for transformation

As outlined in Chapter 3 of this report, we raise an agenda here which goes much further and deeper than planning agreements on new development. This agenda sees spatial planning as the main instrument for the physical restructuring and re-engineering of the physical region and sub-regions, in the Transformation scenario. We can summarise this briefly as follows:

- There is a need to consider restructuring of the whole physical metabolism of the region and its sub-regions, not only the small fraction which is new development in any one year;
- New forms of fiscal stakeholding and investment partnership are needed, in order to enable this wider restructuring;
- Many environmental aspects of this depend on national/international schemes for carbon trading or other forms of eco-system services markets;
- These are likely to be coordinated and facilitated at the regional level, and implemented at the local government and public services level, and possibly at the citizen/household level;
- The basic principle is that of re-investment for innovation and market transformation – that funds should be drawn from polluting or damaging activity, to be reinvested in clean technology and low-impact infrastructure;
- Spatial planning is then a key instrument for this re-investment, and creation or maintenance of added value;
- We would also see new forms of stakeholding and equity, particularly in public services and public realm provisions. For instance the Community Land Trust concept is a likely possible solution for affordable housing, community open space, local centre management and so on;
- The above environmental and social initiatives are likely to take time to emerge, and there is a need for shorter term interim solutions;
- These would be constructed around 'triple-bottom line' accounting (taking account of social, environmental and financial outcomes), shadow markets for social and environmental values, and use of every kind of 'soft' leverage available to the public sector.

Our recommendations for planning actions are summarised in Chart 13.5 below, and presented in more detail in Table 13.3. Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions). In Chart 13.5, a black border indicates that an action involves lobbying for change at national level or above.

Recommendations for short-term priority actions are listed in Table 8.1.

Chart 13.5 Planning – route map chart

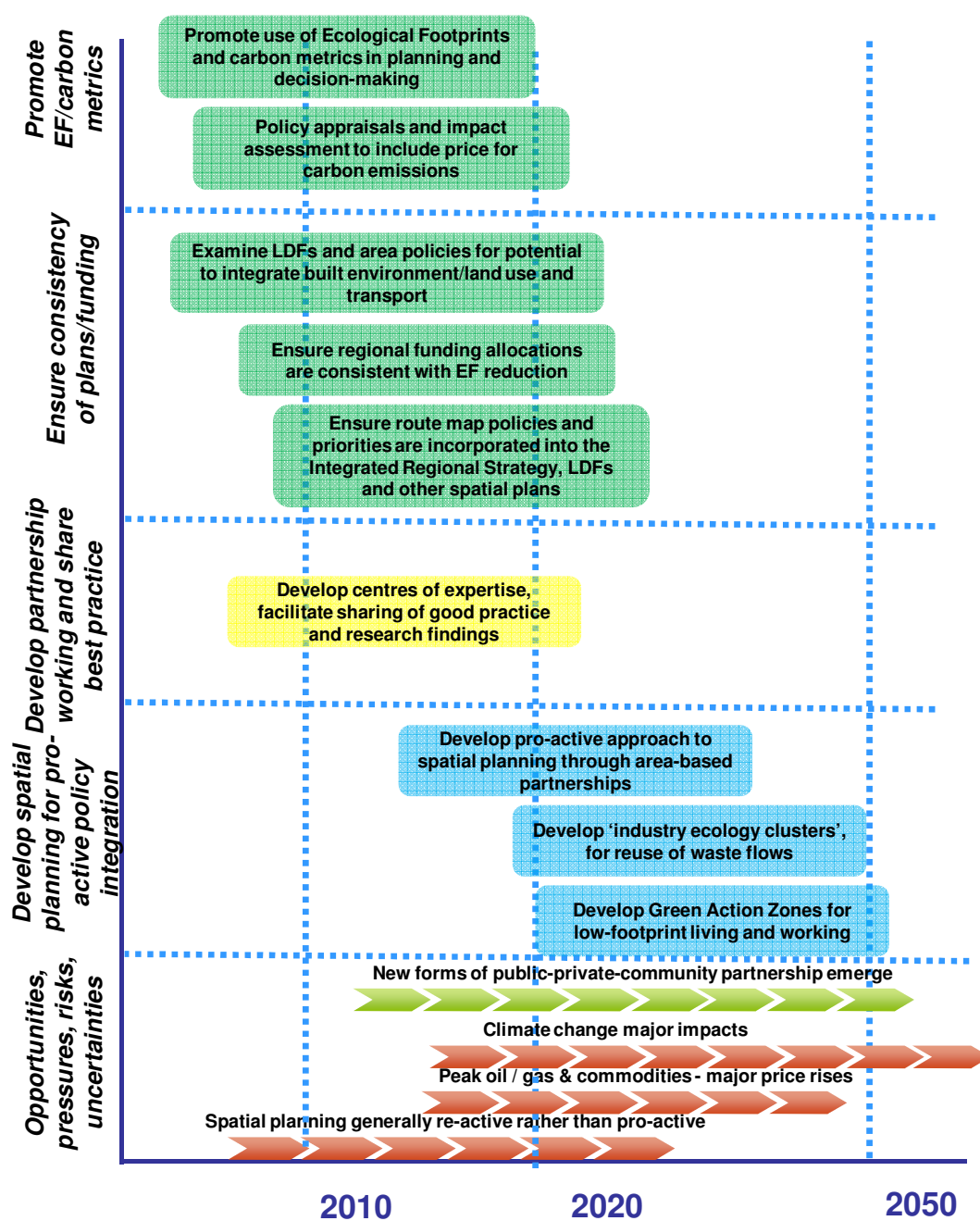


Table 13.3 Planning route map (Cross-cutting)

Key: Stabilisation actions; short-term transformation actions; longer term transformation actions

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Promote use of Ecological Footprint and carbon metrics in decision-making	See actions under 'Goods and Services'	SEEDA/Assembly Diamonds; Las	Minimal	Create decision-making framework to support Ecological Footprint and CO ₂ reduction
Reallocate funding to meet Ecological Footprint/carbon reduction objectives	Ensure that Regional funding allocations are consistent with Ecological Footprint reduction objectives (e.g. Transport; Education; Housing..)	Regional funding boards	Affects allocation, rather than level, of funding	Consistency of policy implementation with strategic direction
Take forward the actions in the Climate Change Mitigation and Adaptation Implementation Plan	Ensure that relevant actions are incorporated into the Integrated Regional Strategy	SEEDA/ the Assembly	Depend on specific actions.	Consistency of policy implementation with strategic direction
Coordinate/facilitate partnership working and sharing of best practice on spatial planning	Develop centres of expertise, facilitate sharing of good practice and research findings	SEEDA/ the Assembly/ Sustainable Futures Group	Low cost	Promote better practice on spatial planning.
Ensure sustainable policies are	Ensure that LDFs and other spatial plans carry forward relevant policies from the route maps for:	The Assembly/ local authorities	Low direct cost	Potentially high impact on the footprint of

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
carried through into spatial plans, including LDFs	• The Built Environment • Energy supply • Transport • Food • Waste • Water			development across the region.
Develop spatial planning for pro-active policy integration	Pro-active public sector approach to spatial planning through area-based partnerships and consortiums with private, civic and community sectors. Specific examples could include: • The development of 'industry ecology clusters', where waste from one industry is used as a resource in another; • The development of 'Green Action Zones' involving area-wide transformation for low-footprint living and working. Good spatial planning and urban design could enable integration of many aspects of footprint reduction (e.g. services and employment within walking/cycling distance of housing; facilities for home or tele-working and community enterprise; LZC energy, housing, property and transport; low-impact local food production; low-footprint local services; facilities for reuse and recycling of resources/waste; water efficient technology).	Local authorities/ the Assembly/ with utilities, private, civic and community organisations	Low direct cost. Implementation could have significant costs.	Potentially far-reaching impact on the region's footprint.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	Specific levers could include: • Planning agreements and obligations • Public licensing, building regulations and quasi-voluntary building codes • Development partnerships which fit infrastructure investment with rising property values • Procurement partnerships with actively use public sector contracting business • Other forms of incentives and enabling.			

13.4. Diamonds and growth areas

13.4.1. Role and scope of Diamonds/growth areas

The Regional Economic Strategy (RES) identifies 8 'Diamonds for Investment and Growth'. These include those parts of the South East which are national Growth Areas (e.g. Thames Gateway Kent; Milton Keynes and Aylesbury). They also include a number of 'Regional Hubs' as defined in the Regional Spatial Strategy, although not all hubs form part of a Diamond. The Diamonds are defined as follows:

- South Hampshire (including Southampton and Portsmouth);
- Oxfordshire;
- Milton Keynes and Aylesbury;
- Reading;
- Basingstoke;
- Crawley;
- Thames Gateway Kent;
- Brighton and Hove.

The Diamonds are a focus for economic growth and innovation in the region. The local authorities within the Diamond areas have formed a number of working groups to tackle common issues, including an Ecological Footprint Diamonds Policy Group.

The Diamonds are highlighted here as a 'cross-cutting issue' because of the scope they offer for innovative work on footprint reduction, for partnership work with businesses and for the promotion of new low-impact technologies. They will offer opportunities for de-coupling economic growth from resource use and environmental impacts.

13.4.2. Current situation

Diamond Local Authorities have made a commitment to play a leadership role in the region's work towards reducing its Ecological Footprint. The reasons behind this commitment, as set out in a paper by the Policy Group, are that:

- If the Diamonds do not accelerate work to tackle their area's Ecological Footprint, no amount of action elsewhere in the region will compensate;
- Increasing housing and jobs in one part of a Diamond will inevitably increase the area's footprint no matter how high the quality of build – and will therefore need to be compensated by measures right across the Diamond (e.g. through retrofitting energy and water measures to buildings and tackling city car use);

- 'Win-win': finding and delivering low-carbon, resource-efficient solutions in the South East will create local jobs as well as providing the platform for exporting solutions, technology and skills internationally;
- A highly visible leadership role will, through providing publicity, help attract investment into the region and in turn assist with reducing footprint through technological means.

In early 2008 the Diamond Local Authorities adopted a series of targets which involve early implementation of the region's sustainability objectives.

Table 13.4 – Targets for Diamonds

Overarching:

To stabilise the Ecological Footprint of each of the Diamonds by 2014, and to achieve a 30% reduction in Ecological Footprint by 2025, on a trajectory towards a 75% reduction by 2050.

Energy:

Reduce carbon emissions in each Diamond by 20% by 2012.

Homes and buildings:

Achieve Code for Sustainable Homes Level 4 by 2012 and zero-carbon new-build by 2014; and achieve improvements in carbon performance of non-domestic buildings.

Water:

Reduce water consumption in each Diamond by 20% by 2010.

13.4.3. What needs to change – stabilisation/transformation?

The Diamond Local Authorities are potential leaders within the region for initiatives to stabilise and reduce the Ecological Footprint. Being relatively buoyant areas for private investment, they offer opportunities for piloting approaches to partnership and joint action between the private and public sectors. They also offer opportunities for innovation in de-coupling economic growth from resource use and environmental impacts.

Our recommendations for actions by the Diamonds are summarised in Chart 13.6 below, and presented in more detail in Table 13.4. Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and

blue (long term actions). In Chart 13.6, a black border indicates that an action involves lobbying for change at national level or above.

Recommendations for short-term priority actions are listed in Table 8.1.

The remaining chapters in Part II of this report examine particular sectors in turn (e.g. the built environment, transport, energy supply and so on).

Chart 13.6 Diamonds and growth areas – route map chart

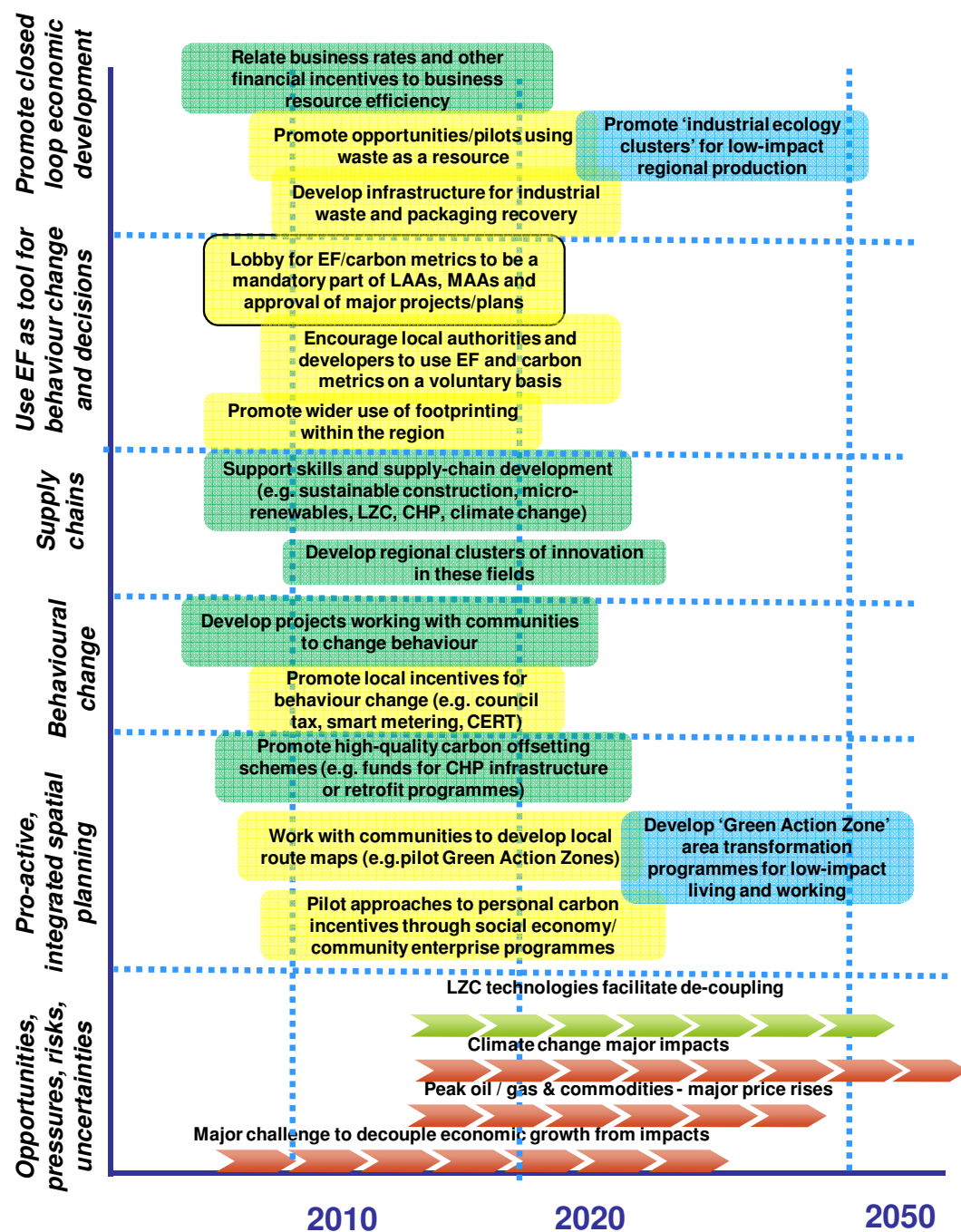


Table 13.4 Route map table – Diamonds and growth areas (cross-cutting)

Key: **Stabilisation actions;** **short-term transformation actions;** **longer term transformation actions**

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Promote 'closed loop' economic development in the wider economy	Relate business rates and other financial incentives to the resource efficiency of businesses Promote opportunities for waste as a resource (e.g. pilot the development of 'industrial ecology clusters') Develop infrastructure of industrial waste and packaging recovery Promote 'industrial ecology clusters' for low-impact regional production	SEEDA/ Diamond Local Authorities/ Envirobusiness	Self-financing Significant costs	Create decision-making framework to support Ecological Footprint and CO₂ reduction Significant learning benefits for the Diamonds, and the region as a whole
Use the Ecological Footprint as a tool for promoting behaviour change and more sustainable decision-making	Lobby national government to make Ecological Footprint and carbon metrics/ targets a mandatory part of LAAs and MAAs, and part of the approval process for major projects/plans (e.g. via Strategic Environmental Assessment) Encourage local authorities and developers to integrate Ecological Footprint and carbon metrics into their plans and targets on a voluntary basis Promote and support wider use of	Diamond Local Authorities Diamonds/ Business Link/ Envirowise	Minimal direct cost Moderate cost	Create decision-making framework to support Ecological Footprint and CO₂ reduction Part of behaviour change work

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	footprinting within the region (including Footprinter and 'corporate stepwise' for businesses)			
Support technological and supply-chain development in appropriate fields	Support skills and supply-chain development in the following fields: • Sustainable construction • Micro-generation • Renewable and LZC technologies • CHP • Design for climate change Develop regional clusters of innovation in these fields	SEEDA/ Diamond Local Authorities	Significant	High – would support Ecological Footprint and CO ₂ reduction across the region, and create export opportunities.
Promote major behavioural change across households, businesses and other organisations	Implement behaviour change strategy – targeting individuals, communities, businesses, government and other organisations Support the development of projects working with communities to change behaviour Promote local incentives for behaviour change through CERT, council tax banding and new technology (e.g. smart metering, thermal imaging)	SEEDA/ Assembly/ Diamond Local Authorities	Moderate	Potentially significant Diamonds provide opportunities to pilot approaches before wider application across the region.
Develop spatial planning for pro-active policy integration	See section 13.3 for further detail by sector (e.g. built environment; transport; water; waste; energy supply) Promote high-quality carbon offsetting schemes (e.g. use Multi-area agreements (MAAs) or the Community Infrastructure Levy to create offsetting funds for CHP	The Assembly/ Diamond Local Authorities	Minimal direct cost Share costs with developers	See above. High - could enable major investment in Ecological Footprint and CO₂ reduction

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	infrastructure or retrofit of existing stock. Work with communities – including Transition Towns - to develop and pilot local route maps towards a 'One Planet' region (e.g. pilot 'Green Action Zones') Pilot approaches to personal carbon allowances and related incentives through social economy and community enterprise programmes Develop full-scale 'Green Action Zone' area transformation programmes for low footprint living and working	Diamond Local Authorities/ Transition Towns	Significant costs	High – could pilot approaches to integration of different aspects of low-footprint living
Pursue cutting edge policies and programmes to achieve Diamonds targets	See Chapters 14-20 for detail by sector	SEEDA/ Diamond Local Authorities	Variable	Significant – scope to test new approaches and develop good practice.

14. The built environment

Key points – built environment

The Ecological Footprint of housing represented 14% of the region's total footprint in 2003, including energy use in the home and the construction supply chain. This figure would be even higher if other property were included, so the built environment is an important focus for footprint reduction.

If current policies are effectively implemented, the Ecological Footprint of the housing sector is predicted to stabilise and decrease slightly by 2020. CO₂ emissions from home energy use are also predicted to begin declining by 2020. But this requires effective implementation of measures in the Energy White Paper 2007, achievement of the Code for Sustainable Homes level 6 for new housing by 2016, and significant retrofitting of energy efficiency measures to existing housing. Support for the sustainable construction sector will be required to achieve this.

Faster and more far-reaching implementation of energy efficiency measures – to new/existing housing and new/existing property – is required if medium and long-term reduction targets are to be met. While faster improvement of standards on new housing and property should be pursued as a priority, major retrofit and behaviour change programmes will also be required to reach the majority of the housing and property stock. These will be much for effective if accompanied by national or international measures to provide strong incentives for carbon saving – e.g. carbon quotas and extension of the 'Carbon Reduction Commitment'. In the longer term, the region should develop visionary 'Green Action Zones' which combine excellent energy efficiency with other aspects of low-footprint lifestyles.

Many initiatives are already underway in the region to reduce the impact of the built environment. These initiatives will need to be prioritised and scaled-up if Current policy is to be effective. More radical action will be required within the region for the transformation of the built environment, accompanied by lobbying for national incentives to support regional initiatives.

The structure of this section is as follows:

- Definitions and boundaries;

- Where are we headed?
- How can we reach the targets?
- What type of transformation is required?
- Recommendations for the route map;
- Progress to date;
- Reference documents.

14.1. Definitions and boundaries

This theme focuses on the impact of housing and other property, in terms of construction, use and, where relevant, eventual demolition. The elements we are including within this sector are:

- **Construction supply chain** (including building and civil engineering): primary materials, products and components, construction site activity and logistics, maintenance/ improvement/ rehabilitation, demolition and end-fate;
- **Housing energy demand** (including private, public, social and institutional housing): which depends on the energy intensity and fuel mix of both new and existing housing;
- **Property energy demand** – (all other building including public, industrial, and infrastructure): which depends on the energy intensity and fuel mix of both existing and new property.

We have used both the REAP and REEIO models to examine different aspects of the sector:

- REAP models the Ecological Footprint of housing in the South East, which includes not only home energy use but also the impact of construction and related supply chains⁴¹;
- The REEIO model examines energy use by household users, as one of 45 'fuel users', but the impacts of housing construction are included within the overall analysis of the construction industry (see Chapter 18 on Goods and Services; and Chapter 19 on Waste);

⁴¹ The capital costs of housing appear in the REAP system as actual or 'imputed' rentals: i.e. the rent that the house-owner would pay if renting rather than owning their property.

- In both REAP and REEIO, the impacts of business and public-sector properties are allocated to the relevant business or service sector, so are difficult to analyse explicitly.

While REEIO makes explicit predictions for industrial and commercial energy demand, REAP allocates the footprint of these elements of energy demand to the final products and services produced by industry and commerce, so the footprint of commercial property is implicitly included in other categories of consumption.

Changes related to energy supply, including renewable energy, are considered separately in Chapter 16.

14.2. Where are we heading?

Current situation

It is estimated that in 2005 households generated just over 3m tonnes of carbon directly from their use of energy in the home, more than both the industry and commercial sectors (source: REEIO data). This does not include emissions associated with the production of electricity that they consume, where this is provided by the National Grid.

Home energy, and the construction supply chain, generated 14% of the region's Ecological Footprint in 2003. Almost all this footprint is attributable to energy land rather than real land. This does not include the impact of other types of property.

This section sets out the current impacts of the built environment sector in terms of both Ecological Footprint and CO₂ emissions, as modelled by REAP and REEIO respectively. We compare the predicted trajectories of Ecological Footprint and CO₂ for this sector under the Reference scenario (continuation of past policy) and Current policy scenario (successful implementation of current policy).

14.2.1. Predictions on Ecological Footprint

The REAP model has been used to predict the likely Ecological Footprint of the housing sector under the Reference and Current policy scenarios. The footprint of commercial and industrial property cannot be analysed separately by REAP, because it forms part of the overall footprint of the products or services produced by the relevant businesses. The footprint of commercial and industrial property is effectively presented within the overall footprint of 'goods and services' in Chapter 18.

REAP Assumptions – built environment

The **Reference scenario** is an extrapolation of past trends, which effectively assume a continuation of past levels of policy activity. This includes the continuation of past levels of energy efficiency improvements, which are significant, but excludes new measures in the Energy White Paper.

The **Current policy scenario** focuses solely on domestic energy use, and makes the following assumptions on energy efficiency in new and existing housing:

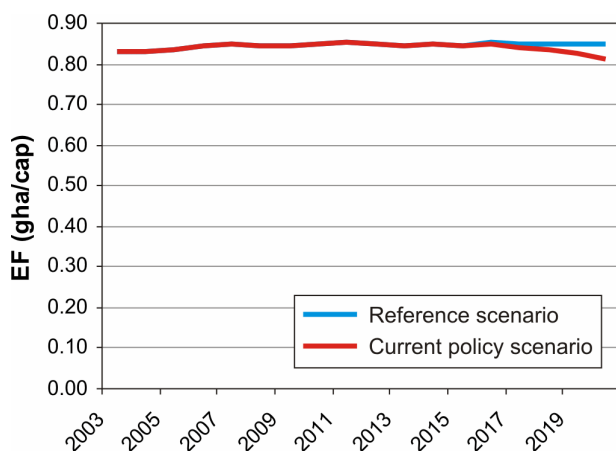
- 164,340 new houses are built to 'Code for Sustainable Homes' level 6 by 2020 – 40% of post 2008 new build;
- 10% of households provided with Smart Meters by 2010, increasing by 10% a year thereafter;
- The proportion of houses with very poor loft insulation is down to 6% by 2020;
- Condensing boilers are installed in 20% of pre 2001 homes by 2020.

In the Reference scenario, over the 17 year period from 2003-2020, the Ecological Footprint of domestic energy consumption is predicted to remain almost unchanged. This is due to the continuation of energy efficiency improvements, which balance out increasing trends in wealth and use of new electrical appliances.

As shown in Chart 14.1, from 2003 to 2020 the Current policy scenario reduces the footprint of domestic energy consumption slightly. In 2020, the Ecological Footprint of housing is predicted to be 5% below the Reference scenario level – a relatively modest decrease. Most of the change is seen between 2015 and 2020, when the Code for Sustainable Homes and retrofit programmes would have more impact.

In both the Reference and Current policy scenarios, the Ecological Footprint of housing would be stabilised by 2020.

Chart 14.1 Ecological Footprint of housing in Reference and Current policy scenarios



(Source: REAP, Stockholm Environment Institute)

14.2.2. Predictions on CO₂ emissions

We have used REEIO to predict production-based CO₂ emissions from the domestic sector. This focuses mainly on energy use in houses. Separate assumptions were made in REEIO about the future energy use in the commercial and industrial buildings, but the results of this analysis form part of the analysis of 'Goods and Services' in Chapter 18.

REEIO Assumptions – built environment

The **Reference scenario** adopts trends for energy efficiencies by different types of fuel users and possible changes in energy mix nationally as forecast by Cambridge Econometrics (CE) in UK Energy and the Environment, July 2007. This includes assessments of Energy efficiency commitment phase 1 and 2 (household); Carbon emissions reduction target (households, public, commerce); Fuel poverty scheme (households); Energy performance of buildings directive (households, public, commerce); Carbon reduction commitment (public sector, commerce); Smart metering (commerce); the Carbon Trust and other SME measures (commerce).

For the domestic sector, key assumptions are:

- Underlying trends in energy efficiency (energy per £ income) averaging 2.25% per annum (pa); and
- A modest shift from the use of gas to the use of electricity over time.

The basis for the **Current policy scenario** is achievement of the trends in energy use assumed in the Energy White Paper 2007. The key assumption is that:

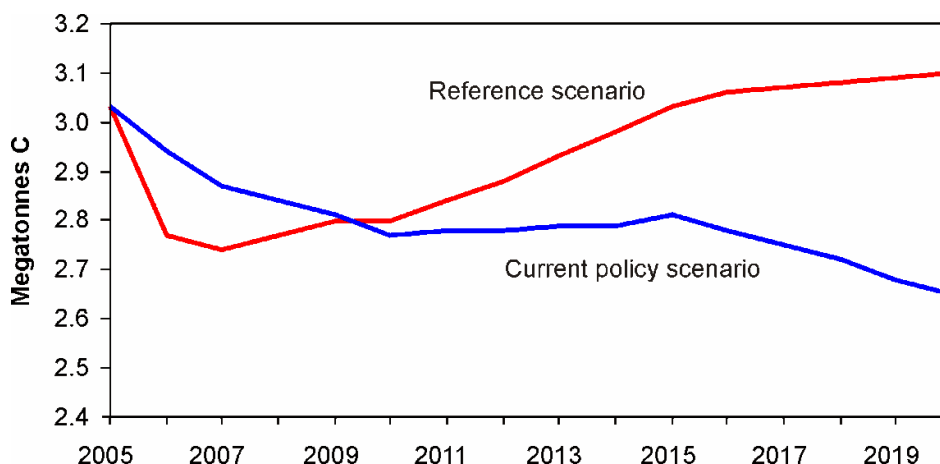
- Households achieved stronger underlying improvements in energy efficiency, with improvements averaging 3.5% pa over 2010-15 and 4.5% pa thereafter.

The 'Current policy' scenario also assumes stronger energy efficiency in non-domestic property, but the savings are attributed to energy use in the relevant sector (e.g. commerce; public services; industry). These savings are documented in Chapter 18.

Chart 14.2 shows the projections of CO₂ emissions under the two scenarios. In the Reference scenario there is steady long-term increase in emission at about 0.75%-1% pa, with the rate of efficiency gains being weaker than the growth in incomes⁴². In the Current policy scenario the additional energy efficiencies result in CO₂ emissions in 2020 being some 15% lower than in the Reference scenario, despite the increased levels of economic activity and wealth. Emissions in 2020 are similarly 15% lower than estimates in 2005. However, it is only in the long term, when the gains in energy efficiency are strongest, that a sustained downward trend in emissions is achieved.

⁴² The falls in CO₂ emissions in 2006 and 2007 reflected sharp falls in domestic energy use reported nationally. CE expects domestic energy use to increase again in the short term.

Chart 14.2 CO₂ emissions by households – Reference and Current policy scenarios



(Source: REEIO model, Cambridge Econometrics)

According to these forecasts, CO₂ emissions from domestic energy use should stabilise and begin to decline from 2015, if the 'Current policy scenario' is fully implemented.

14.2.3. Comments on 'where we are headed'

Current policy is predicted to achieve a modest decrease in the Ecological Footprint of housing by 2020. If measures in the Energy White Paper are implemented as planned, and achieve their objectives, current policy will also achieve reductions in territorial CO₂ emissions from housing.

But there are a number of uncertainties about achievement of current policy:

- How effectively will the Energy White Paper be implemented?
- Will energy supply companies meet their CERT obligations?
- Will it be feasible to implement the Code for Sustainable Homes (level 6) by 2016, or earlier, given potential supply-side constraints?
- How far reaching and effective will retrofit programmes be?
- Will householders, businesses and other organisations respond to the need to reduce their buildings' carbon emissions and energy use?

More dramatic reductions would be needed to meet the targets for transformation of the energy use in the built environment. These are discussed in the next section.

14.3. How can we reach the targets?

We have also used the REAP and REEIO models to examine how targets for 'transformation' of the built environment could be reached, in the longer term. The aim has been to examine what scale of policy change would be needed to stabilise the footprint, and then achieve medium-term target of reducing the Ecological Footprint and CO₂ emissions by 30% by 2020, and the long-term transformation target of reducing both these impacts by 80% by 2050. The concepts underlying the Transformation scenario in this sector are explained further in the next section. This section sets out:

- Assumptions and findings for Ecological Footprint under the Transformation scenario;
- Assumptions and findings for CO₂ emissions under Transformation.

The following section sets out recommendations for the route map in this sector.

14.3.1. Reaching the targets – Ecological Footprint

Stabilisation target

As shown in section 14.2, the task of stabilising the footprint of the housing sector should be achieved under current policy. Factors which tend to increase the footprint are lower occupancy rates and increased use of appliances, but this is predicted to be balanced by improved efficiency in new builds and the retrofitting of existing houses. But achievement of this target still requires significant effort to progress the Code for Sustainable Homes and implement retrofit programmes, as outlined in Section 14.2 above.

Reduction targets

This is not sufficient for the Transformation scenario where an 80% reduction is required by 2050. In the Transformation scenario, the policies should concentrate on ensuring that new houses are built to maximum efficiency, that significant changes are made to improve the efficiency of the existing stock, that energy supply has a lower carbon output and that citizens use the home more efficiently to reduce their impact.

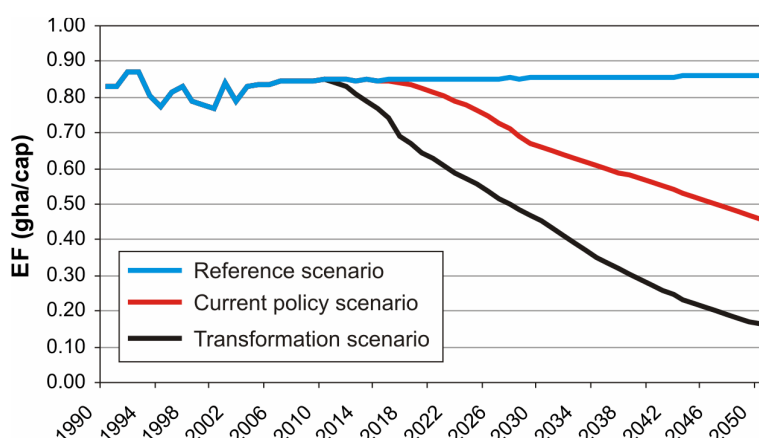
REAP assumptions – transformation of built environment

Key assumptions for the **Transformation scenario** are:

- **New Homes:** The Code for Sustainable Homes acts as a useful lever to radically improve the efficiency of new homes. In the transformation scenario all homes must be built to Code 6 standard by 2016.
- **Retrofit:** A significant retrofit programme is rolled out where every house in the region will have been assessed between 2010 and 2015 and all improvements made by 2025. This will involve loft insulation in every home, complete boiler replacement scheme (leaving boilers over 90% efficiency), every cavity wall will be filled and double/triple glazing installed in every home.
- **Energy Technical Efficiency:** This will be achieved by ensuring that electricity provision to all homes reduces its carbon output per kWh by 20% by 2020 and this trend continues into the future. This is in line with EU targets, and is discussed further in Chapter 16 on Energy supply.
- **Behaviour Change:** Every house could improve the efficiency in the use of the home. A recent study by the Energy Savings Trust (EST) demonstrated that nearly 20% of households leave the heating on when they are not in the house. We assume that a large scale behaviour change programme will be introduced that will significantly affect energy use in every single home.

Chart 14.3 shows the predicted footprint of the housing sector, assuming that these policies are successfully implemented. Together, they are predicted to achieve a footprint reduction of 80% from 1990 to 2050. Greater savings are probably achievable in the housing sector, which is relatively amenable to regional influence, than in some other sectors (e.g. consumption of goods and services).

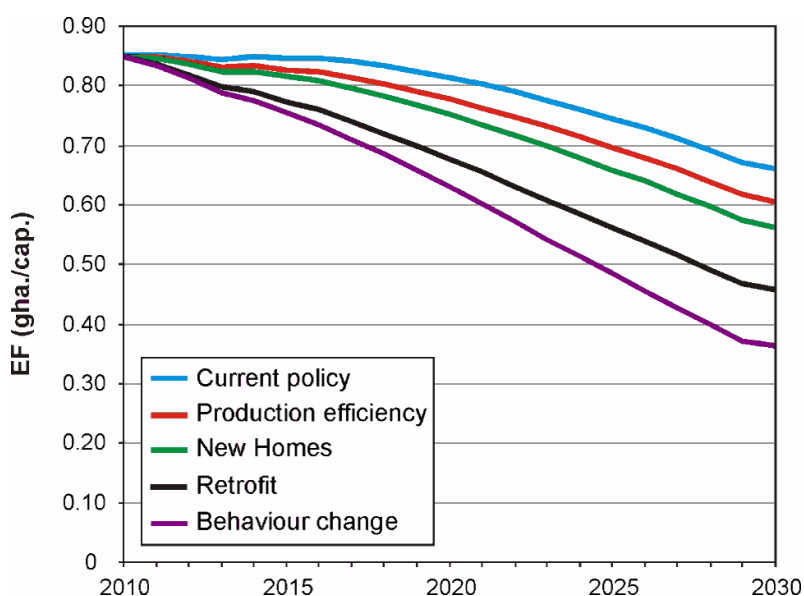
Chart 14.3 Ecological Footprint of housing in Transformation scenarios



(Source: REAP model, Stockholm Environment Institute)

Chart 14.4 below shows the predicted effectiveness of the chosen policy options relative to the Current policy scenario, up to 2030. If these policies were implemented effectively, the Ecological Footprint of housing could be reduced by more than 40% by 2030 compared to 1990 (or 25% lower by 2020). The greatest savings are attributable to the major retrofit programme (a further 15% saving compared to current policy) and to widespread behaviour change (a further 17% saving). But major savings would also result from stronger policy on new housing (a further 7%) and reducing the carbon-intensity of energy supply (a further 8%).

Chart 14.4 Effectiveness of policy wedges in reducing the housing footprint – Transformation scenario



(Source: REAP model, Stockholm Environment Institute)

It is important to note that these further savings are additional to those achieved by Current policy, which already incorporates significant action on new homes and retrofitting of energy efficiency measures to existing housing. However, a common observation for both the Current policy and Transformation scenarios is that 'retrofit' and 'behaviour change' both give greater scope for reduction than construction of 'new homes'. This is because they potentially reach a much greater proportion of the housing stock across the South East. Existing housing represents about 80% of the total housing provided for in the South East Plan.

14.3.2. Reaching the targets - CO₂ emissions

Stabilisation targets

As shown in Section 14.2, successful implementation of current policy should both stabilise CO₂ emissions and begin to reduce them by 2020.

Reduction targets

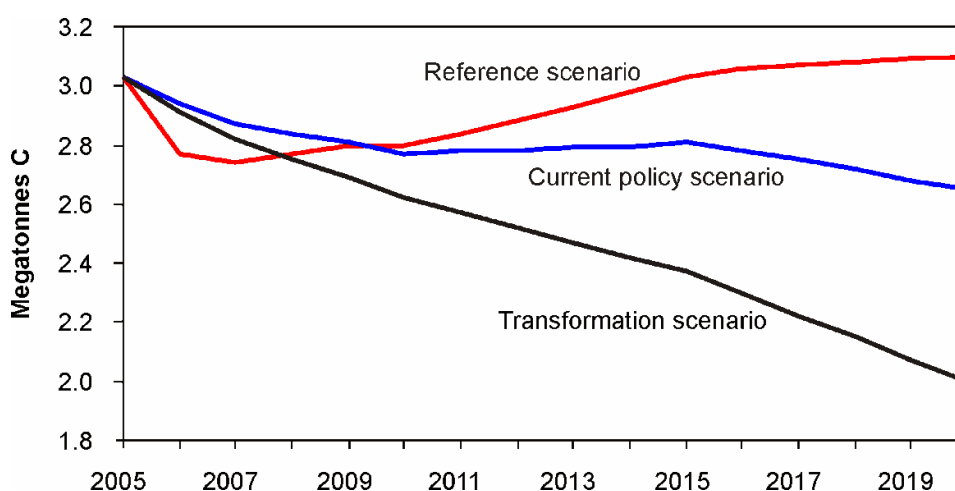
Further measures are required to reach the medium and long-term targets for emissions reduction set out in the Transformation scenario. Our analysis using the REEIO model is set out below.

REEIO assumptions – transformation of built environment

The key REEIO assumptions made, reflecting the impact of the **Transformation scenario** on the domestic sector, are:

- Rates of energy efficiency achieved are 1% per annum faster than in the current policy scenario (averaging 4.5% pa over 2010-15 and 5.5% pa thereafter);
- There is a stronger move to the use of electricity and away from gas (by 2020 35% of domestic energy needs are met through electricity, compared with an assumption of 25% in the other scenarios).

Chart 14.5 shows the effect of these assumptions on the direct CO₂ emissions from the domestic sector. The impact is to establish a clear downward trend in CO₂ emissions. By 2020 emissions are projected to be 25% lower than in the Current policy scenario and almost a third lower than historic emissions in 2005 (an annual reduction of 2.75% pa).

Chart 14.5 CO₂ emissions by households – Transformation scenario

(Source: REEIO model, Cambridge Econometrics)

14.3.3. Comments on 'reaching the targets'

Achievement of the long-term target of 80% footprint and emissions reduction targets should be feasible for the built environment, because many aspects of this sector are amenable to regional or sub-regional influence. However, major retrofit and behaviour change programmes are required to achieve these targets. These would be much more effective if supported by strong policies at national level on carbon budgets and personal carbon allowances.

14.4. What would 'transformation' involve?

This section outlines some of the uncertainties underlying 'transformation' and the types of policies that would be required to achieve the long-term target of 80% footprint and emissions reduction by 2050, and the medium-term goal of 30% reduction by 2020. Many of these would involve policy changes at national level, as well as regional or sub-regional action.

14.4.1. Issues and uncertainties

There are a number of issues and uncertainties about the long-term transformation of housing and other property, and the energy they use:

Policy:

- How much of the agenda is better tackled at national, rather than regional or sub-regional level?

- Which partners should lead within the region, in the light of the Sub-national Review and Local government bill?
- Will public investment in energy-efficiency programmes be feasible or desirable in a liberalised economy?

Economy:

- How will carbon trading schemes work, and how much incentive will they provide for reducing energy use?
- Will businesses take advantage of the opportunities presented by the Code for Sustainable Homes, and Low and Zero Carbon technology?
- What scope is there for the social economy, and community-led initiatives, to progress the behaviour change agenda?

Technology:

- How far will future technological advances reduce the energy-intensity and carbon-intensity of buildings?
- How far will the use of new gadgets, products and services take up the savings generated by more energy-efficient buildings?
- How will climate change affect energy demand as time proceeds, in relation to both winter heating and summer cooling – and to what extent can retrofit measures deal with adaption as well as mitigation?

In the context of these uncertainties, the following subsections outline the policy outcomes and policy programme groups or 'wedges' that would be required to transform the built environment in the South East, to meet the medium and long-term targets for footprint and emissions reduction. These sections examine the following sub-sectors in turn:

- Sustainable construction
- Existing housing
- New housing
- Existing property
- New property

14.4.2. Sustainable construction

Policy outcomes:

- Primary products – forestry, agriculture and other renewable sources – low impact sustainable sourcing and logistics;
- Building materials - low impact manufacture;
- Cement and concrete - low impact alternatives programme;
- Construction site practice – low energy low wastage scheme; and
- Construction and demolition waste – raising levels and grades of recycling.

Policy 'wedges' – Sustainable construction:

- Public procurement for sustainable construction scheme – (focus on outcomes);
- Public procurement for construction innovation regional clusters – (focus on supply side);
- Improving design and construction skills base;
- Accreditation and eco-labelling scheme for materials and components;
- Public backing of recycled materials exchanges; and
- Linking public subsidies with sustainable construction standards.

Added value at the regional/ sub-regional level:

- Coordination of local authority/ public agency policy, subsidy schemes and procurement power; and
- Investment in low impact and recycled materials production and distribution.

14.4.3. Existing housing

Policy outcomes:

- Whole house insulation to best practice, including wall insulation;
- Low energy appliance and lighting replacement programme;
- Low energy cooking and water heating replacement programme;
- Ventilation and cooling strategy for each dwelling with heat recovery;
- Renewable and micro-generation programme on a block basis; and
- For larger blocks and complexes, pro-active development of Combined Heat and Power (CHP) schemes.

Policy 'wedges' – Existing housing:

The policy outcomes above would be promoted and enabled through the following policies (some at national level):

- Development of Code for Sustainable Existing Housing;
- Accreditation and eco-labelling: extension of housing Energy Performance Certificate at point of sale or transfer;
- Climate protection stamp duty / mortgage supplement – 1% on sale price goes into 'climate protection' investment fund', payments covered by utility-based DSM transfer, no net costs to householder;
- Incentives for low impact upgrading through planning conditions and regeneration subsidies;
- Accounting methods for life-cycle costing and impacts in the public sector;
- 'Energy Service Company' (ESCo) schemes for utilities to invest in energy services and demand-side management, at zero cost to householder;
- Strategic housing transformation partnerships including owners, landlords, mortgage companies, utilities, public sectors: operate on street / block / neighbourhood level for coordinated upgrading programme;
- Behaviour change incentives: smart metering, thermal imaging;

- Possible carbon quotas via Domestic Tradable Quotas (DTQs) or a similar scheme.

Added value at the regional / sub-regional level:

- Coordination of Strategic housing transformation partnerships;
- Public procurement: purchasing and contracting consortiums.

14.4.4. New housing

Policy outcomes

The policy outcomes would be similar to 'Existing housing', but involving new build rather than retrofit. Additional outcomes would be:

- Accelerated programme for Code 5-6 Code for Sustainable Homes (CSH) standards;
- Strategic housing transformation partnerships including owners, landlords, mortgage companies, utilities, public sectors;
- Added potential of micro-generation, renewables and CHP-District Heating schemes;
- Added potential for integrated climate adaptation/mitigation design and construction; and
- Added potential for siting, orientation, and micro-climatic design.

Policy 'wedges' – New housing

In addition to the policy approaches for existing housing, additional approaches would be:

- Extensions of the 'Merton Rule' to take account of the 'carbon hierarchy' and proximity principle (see Chapter 16)⁴³;

⁴³ The 'Merton Rule' is a planning policy, pioneered by the London Borough of Merton, which specifies – for new developments above a certain scale – that 10% of their energy should be supplied by on-site renewable sources. A modified Merton Rule might be specified in terms of outputs (i.e. carbon emissions) rather than inputs, so as to be less prescriptive on the type of solution used (e.g. encompassing Combined Heat and Power as well as renewable energy).

- Rigorous enforcement of Building Regulations and planning conditions;
- Extension of planning powers – implementation of the proposed Community Infrastructure Levy to obtain developer contributions for renewable and CHP infrastructure;
- Public procurement and subsidy schemes to encourage provide incentives for the above.

Added value at the regional / sub-regional level

- Coordination of Strategic housing transformation partnerships;
- Public procurement: purchasing and contracting consortiums.

14.4.5. Existing property

Policy outcomes:

As for existing housing, with additional outcomes:

- Strategic transformation of the existing property stock: insulation; heating and cooling plant; lighting; equipment; whole building energy management;
- Sectoral approach to energy demand management: e.g. refrigeration; lighting; information and communications technology (ICT).

Policy 'wedges' – Existing property:

- Public estate asset management: Extension of life cycle costing to public capital/revenue accounting;
- Application of Carbon Reduction Commitment - internal climate emissions trading systems for larger properties;
- Extension of Carbon Reduction Commitment to leaseholds and building complexes.

14.4.6. New property

Policy outcomes:

As for new housing, with additional outcomes:

- Strategic transformation of design of new property: insulation; heating and cooling plant; lighting; equipment; whole building energy management;
- Reassessment of commercial property needs – and urban design needs – in the light of increased home-working and use of ICT to substitute for travel.

Policy 'wedges' – new properties:

- Public estate asset management: extension of life cycle costing to public capital/revenue accounting;
- Application of Carbon Reduction Commitment - internal climate emissions trading systems for larger properties;
- Extension of Carbon Reduction Commitment to leaseholds and building complexes; and
- Develop commercial property in the light of urban design programmes reflecting increased home-working.

14.5. Recommendations for the route map

Based on our vision of the types of transformations required (section 14.4), and our quantitative analysis of the scale of change required to meet targets (section 14.3), we have developed a set of recommendations for the region in the built environment sector. These are summarised in the route map chart below (Chart 14.6), with further detail in the route map table (Table 14.1). The region's existing progress towards this route map is discussed in the next section (14.6).

Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions). Some of the actions summarised in the table below form part of 'current policy', but effective implementation of these policies is a pre-requisite for stabilisation of the Ecological

Footprint associated with the built environment. Actions which involve lobbying higher levels of government are outlined in black on the route map chart.

Short-term priority actions are set out in Table 8.1 of Part I of this report.

Chart 14.6 Built environment – route map chart

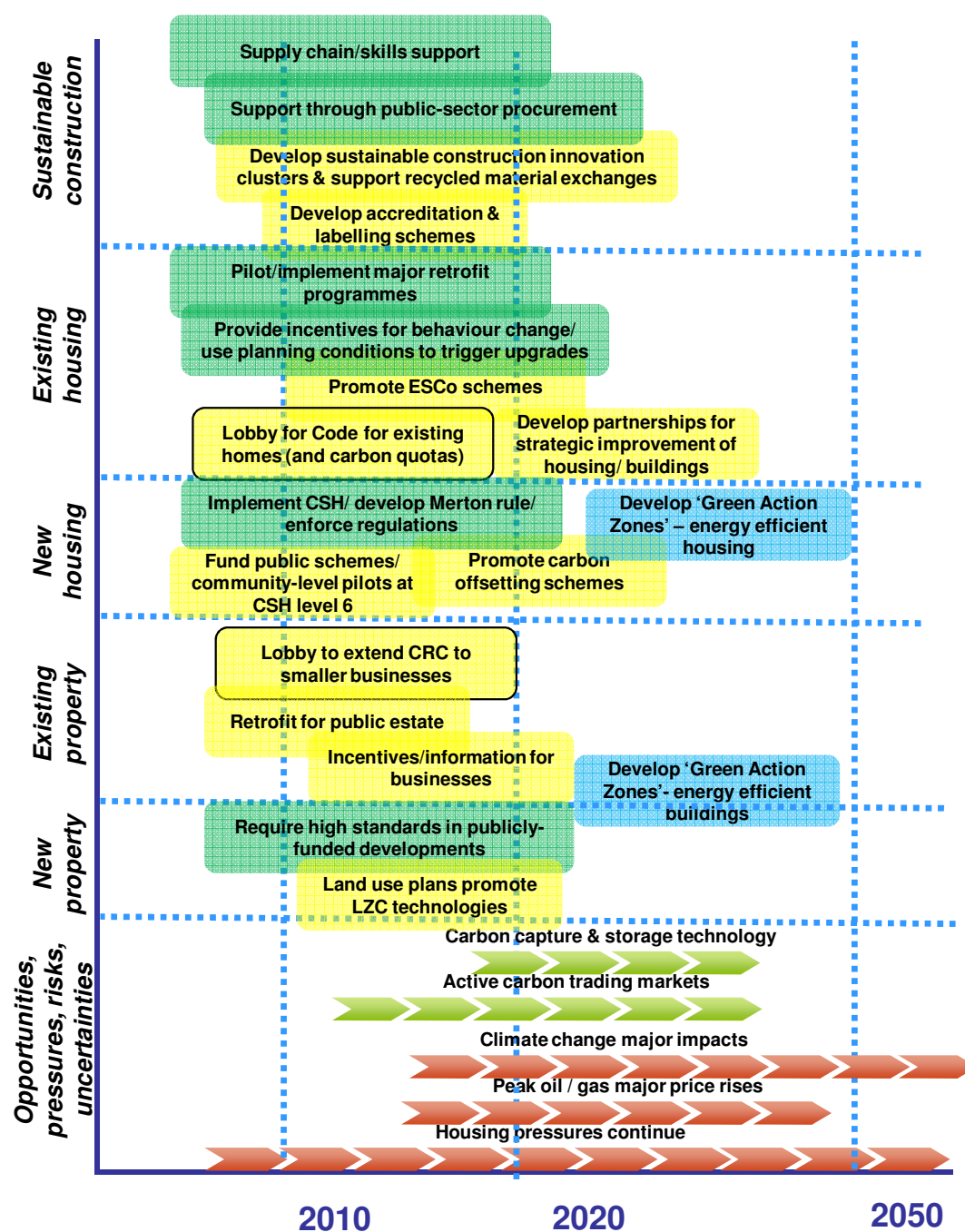


Table 14.1 Route map table – the built environment

Key: Stabilisation actions; short-term transformation actions; longer term transformation actions

Strategic priorities	Regional policies and programmes	Lead/ partners	Cost/other impacts	Potential benefits
Promote more sustainable construction	Support skills and supply chain development to support sustainable construction (including micro-generation; renewable energy; CHP; design for climate change). Use public-sector buying power, through procurement and subsidies, to promote the highest levels of sustainable construction. Develop regional clusters of innovation for sustainable construction, low/zero carbon technologies and recycled material exchanges. Develop or extend accreditation and labelling schemes for materials, components and services.	SEEDA/SECBE/ Envirobusiness	Moderate	Required to support other strategic priorities – also boosts local economy and employment Potential for export opportunities Support informed choices by businesses and individuals
Strategic transformation of the existing housing stock (low energy; low carbon; micro-generation and CHP)	Provide information on, and supplements to, grants/incentives for retrofit of existing housing (e.g. condensing boilers, double-glazing, insulation, decentralised and renewable energy). Promote incentives for behaviour change through CERT, council tax banding and new technology (e.g. smart metering; thermal imaging).	Local authorities/ EST/ utilities As above	Significant costs – balanced against the economic benefit of reduced energy costs for households	Large, successful retrofit programmes could stabilise and begin to reduce the footprint of the built environment – potentially larger impact than new housing because they can reach a greater proportion

Strategic priorities	Regional policies and programmes	Lead/ partners	Cost/other impacts	Potential benefits
	Use planning conditions to trigger upgrading requirements (e.g. loft and cavity wall insulation). Promote and coordinate Esco schemes for utilities to invest in energy services and CHP. Lobby national government for the development of a Code for Sustainable Existing Homes; the extension of the Energy Performance Certificate scheme; carbon quotas; and other incentives for owners/occupiers to reduce the impact of existing housing. Develop strategic housing transformation partnerships for coordinated upgrading programmes – make energy efficiency a key consideration in housing renewal decisions.	Local authorities SEEDA/ local authorities/ utilities SEEDA/ Assembly/ SECBE Local authorities/ regeneration programmes/ SEEDA	Moderate Minimal direct cost Major investment required by public/private partners,	of the housing stock. Local heat/power distribution networks provide future scope for low carbon energy Appropriate regulations and incentives could massively help implementation of other actions. Cost balanced by long-term savings in energy costs/carbon quotas
New housing to meet Code for Sustainable Homes (level 6) or above by 2016, or earlier	Ensure land use plans promote, and where possible fast-track, the energy component of the new Code for Sustainable Homes. Broaden the Merton rule to take account of the 'carbon hierarchy' and proximity principle.⁴⁴	The Assembly /local authorities	Minimal direct costs	Successful implementation of CSH, up to level 6, could help to stabilise and begin to reduce the footprint of the built

⁴⁴ The South West has defined a 'Low Carbon Hierarchy', analogous to the waste management hierarchy. The principles, in order of priority, are:

1. Reduce (energy use)
2. Replace (fossil fuels with low or zero carbon energy)
3. Neutralise (CO₂ emissions, by offsetting or capturing carbon)

Strategic priorities	Regional policies and programmes	Lead/ partners	Cost/other impacts	Potential benefits
	Ensure rigorous enforcement of Building Regulations and planning conditions. Ensure that all publicly funded schemes meet CSH Level 6, in advance of 2016. Develop, and partly fund, one or more community-level pilots at CSH Level 6. Promote high-quality carbon offsetting schemes (e.g. use Multi-area agreements (MAAs) or the Community Infrastructure Levy to create offsetting funds for the retrofit of existing stock). Develop 'Green Action Zones' area transformation programmes for low-footprint living.	The Assembly /local authorities Local authorities/ SEEDA SEEDA/ Diamonds SEEDA/ Diamonds/ developers SEEDA/ local authorities/ developers	Public and private investment required Some costs for developers Significant construction/ refurbishment cost	environment (but the scale is less than retrofit.) Leadership role Pilot could test CSH level 6, and suggest amendments Neutralise footprint of major developments Create model of low footprint living – integrating energy efficiency with other aspects of low footprint living.
Strategic transformation of the existing property stock (whole building energy management)	Ensure that public estate is transformed to reduce impacts. Lobby for extension of the Carbon Reduction Commitment, or similar, to smaller businesses.	All public bodies in South East SEEDA	Significant investment required Minimal direct cost	Leadership role – plus savings in energy costs/carbon allowances Would support other actions by providing more incentives for change

Strategic priorities	Regional policies and programmes	Lead/ partners	Cost/other impacts	Potential benefits
	Provide information on, and supplements to, subsidy and incentives to encourage private investment in transformation.	SEEDA/ Business Link/Carbon Trust/ Envirowise/ other...	Moderate cost	Potentially significant benefit, across industry
New property to meet challenging standards for low footprint and carbon impact	In addition to the above: Require standards above building regulations in developments funded, or part-funded, by SEEDA; Ensure land use plans promote low and zero carbon technologies as strongly as possible, and continue to do so as technology/policy advances; Ensure rigorous enforcement of Building Regulations and planning conditions; Develop 'Green Action Zones' for low-footprint living and working.	SEEDA The Assembly /local authorities Local authorities SEEDA/ Diamonds	Significant public investment required, Minimal direct costs Minimal direct costs Significant costs	Leadership role – plus long-term savings in energy costs and carbon allowances Major impact on new properties Significant impact on new properties Create model of integrated low-footprint lifestyles

Some elements of the 'route map' cut across several sectors (e.g. behaviour change; procurement; land use planning). Overarching actions on these 'cross-cutting issues' are discussed further in Chapter 13.

14.6. Progress to date

Many initiatives are already underway within the region to reduce the impact of the built environment. These include:

Sustainable construction

- Advice and information from EnviroBusiness, supported by SEEDA, to promote energy and resource-efficient businesses;

Existing housing

- Grants and advice from energy suppliers, national government, the Energy Savings Trust, local authorities and the South East Sustainable Energy Partnership to encourage retrofit of energy efficiency and micro-generation measures to existing homes;
- Small-scale behaviour change initiatives (e.g. the Low Carbon Households programme in Lewes and a number of 'Transition Towns');

New housing

- Commitments to energy efficiency in new housing within the South East Plan and many Local Development Framework documents, equivalent to at least level 3 of the Code for Sustainable Homes;
- Initiatives by some leading local authorities (e.g. Woking, Brighton and Hove) to 'fast-track' the requirement for Code for Sustainable Homes level 6, if this is allowed by national policy-makers;
- Pilot schemes such as the 'One Planet Living' initiative by Bio-regional in Brighton and Hove;

New and existing property

- Signposting and advice to businesses, to help them reduce energy use in buildings, from the Carbon Trust and Business Link;
- Existing CHP schemes, including sizeable schemes in Woking and Southampton (the latter using geothermal energy), and the Slough CHP plant using biomass – although wider replication of the Woking/Southampton schemes has not yet been achieved.

These initiatives will need to be prioritised and scaled-up as part of the 'route map' programme, if stabilisation targets are to be achieved. More radical action will be required within the region for transformation of the built environment, accompanied by lobbying for national incentives to support regional initiatives.

14.7. Reference documents

The following documents have been used in analysing and preparing the route map for the built environment:

- South East Plan
- Regional Economic Strategy
- Climate Change Mitigation and Adaptation Implementation Plan
- Energy White Paper, 2007
- Draft Climate Change Bill
- PPS1 – Supplement on Climate Change

Fuller references are given in Appendix 3.

15. Transport

Key points – transport

Personal transport represented 18% of the region's Ecological Footprint in 2003. This share would increase significantly if freight transport were also included. Similarly transport generated 33% of the region's territorial CO₂ emissions in 2005.

The region's demand for road transport and air transport is still growing. The Ecological Footprint of personal travel is increasing at just under 2% per year, despite current efforts to promote more sustainable transport modes. And CO₂ emissions from transport are also increasing. There is considerable good practice within the region, but this is currently not doing more than scratching the surface of people's travel patterns. Policies in other areas (e.g. the choice agendas in health and education; rationalisation of services such as the Post Office network) are increasing the need to travel for some people.

Stabilisation of the Ecological Footprint of personal travel would require strong policies to constrain growth in car use. This would require measures to reduce the availability of car parking, reallocate road space, promote more sustainable travel modes and create 'car free' town centres – following the model demonstrated by Oxford. This can be done with existing technology, and without changes at national level, but it will require local support. Commitments would also need to be made to curb growth in air travel.

Much stronger measures, backed up by road pricing, carbon quotas or other incentives at national level, are required if medium and long-term reduction targets are to be met. Low-carbon transport technologies will assist with this agenda in the longer term, as will the use of advanced ICT to reduce the need to travel. There will be scope to develop 'low emission' and 'Green Action Zones', based on low footprint living and low travel lifestyles.

The structure of this section is as follows:

- Definitions and boundaries;
- Where are we headed?

- How can we reach the targets?
- What type of transformation is required?
- Recommendations for the route map;
- Progress to date; and
- Reference documents.

15.1. Definitions and boundaries

The topic being considered here is freight and passenger transport by road, rail, water, and air. Private and business travel are both included within our scope. As well as looking at the direct impact of transport, we are also concerned with the development of infrastructure (e.g. road, rail, other) and with the vehicle and fuel supply chains (e.g. manufacture, maintenance, life cycle).

The REAP model examines travel by South East residents on a consumption basis, including their holidays and travel overseas. The impact of both car purchase and fuel are included. REAP models personal travel explicitly, but allocates freight transport impacts to the overall impact of the sectors producing the relevant goods (e.g. food, consumer items and so on).

The REEIO model examines travel from a territorial production perspective, within the boundaries of the South East. Both freight and passenger transport are modelled. Domestic air travel to and from Gatwick is included, but not Heathrow or other London airports which lie beyond the region's boundaries. Some aspects of international air travel are included, namely take offs and landings at Gatwick, but not the 'cruise' element of the flights or flights taken by South East residents from other airports. The REEIO model also includes inland water transport, but not international marine transport.

In both cases, cycling and walking are modelled as 'non-polluting' modes of transport, which do not contribute to the region's footprint or CO₂ emissions.

Biofuel use in transport is not explicitly modelled at present. The REAP model assumes that biofuels are neutral from an Ecological Footprint viewpoint (i.e. the 'real' land required to grow the fuel is broadly balanced against the 'energy' land saved by substituting biofuel for fossil fuels). This is discussed further in Chapter 16 on Energy Supply. In REEIO, increases in the use of biofuels for transport have been modelled in the same way as vehicle efficiency improvements (i.e. biofuels have been assumed to be a carbon-neutral substitute for carbon-based fuels).

Aeroplanes have strong global warming impacts at high-levels in the atmosphere ('radiative forcing'). Some studies have 'factored up' their direct CO₂ impacts by up to 2.0-3.0 to reflect this. **We have not done so in the estimates below, in part**

because of difficulties in separating out the air-travel component of footprint estimates.

15.2. Where are we heading?

Current situation

In 2003, Transport comprised 18% of the region's Ecological Footprint and was the fastest growing sector. South East transport impacts are high relative to other regions because of commuting patterns and relative affluence. There has recently been a shift of freight from rail to water and from road to rail. Road transport currently generates the greatest impacts, followed by air.

Similarly, transport generated 33% of the region's CO₂ emissions in 2005. This does not include all aspects of air travel, nor does it include the indirect emissions from electricity consumed by the transport sector. The majority of transport's direct emissions were generated by road transport (73%) but air travel also represented a significant proportion (24%) of the total. The contributions from water and rail were low (about 2% each).⁴⁵

15.2.1. Predictions on Ecological Footprint

The REAP model has been used to predict the likely Ecological Footprint of personal travel under the Reference and Current policy scenarios. The footprint of freight transport cannot readily be analysed by REAP, because it forms part of the overall footprint of the products or services produced by businesses. The footprint of freight transport is implicitly included within the overall footprint of 'goods and services' in Chapter 18.

⁴⁵ Rail impacts may be under-represented because these emissions do not include indirect emissions from electricity – and much of the rail network in the South East is electric-powered.

REAP assumptions – transport

The **Reference scenario** is an extrapolation of past trends, which effectively assumes a continuation of past levels of policy activity. This scenario therefore assumes that past efforts are continued, for example to reduce the need to travel through spatial planning, to encourage people to switch to safer modes, and to improve the fuel efficiency of vehicles.

Key assumptions for the **Current policy scenario** are:

- Air travel by South East residents continues to grow, on the basis that SEEDA still supports airport expansion;
- A quarter of local authorities (reaching 25% of the population in the South East) will implement 'Smarter Choices' to the same extent and with the same potential success rate as leading authorities over the Local Transport Plan period 2006-2011, and that this contributes to a modal shift from cars to more sustainable travel modes;
- The work of the Regional Assembly and others doubles the number of local authorities with specific and significant reference to Smarter Choices in a next round of Local Transport Plans (2012 – 2016), reaching 50% of the population;
- For the population targeted up to 2011 we assume the following modal shift:
 - 15% of the population reduce the distance they travel by car by 25% for commuting (in line with Hampshire target) by 2011;
 - distance travelled to school by car reduces by 4%;
 - travel awareness reduces all other travel by car by 5% for 40% of the population;
- The overall impact on modal shift is small, representing a 0.1% decrease in passenger km by car over the period 2006-2016.

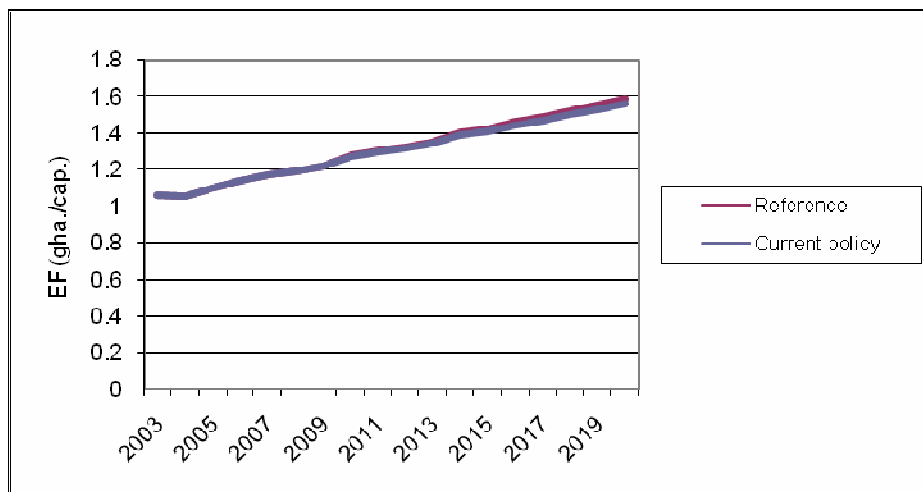
In the Reference scenario the average annual growth in the Ecological Footprint of travel is predicted to be nearly 2% a year between 2010 and 2030. This growth can be attributed to two key issues: the growth in distance travelled by private vehicles and the growth in aviation.

We expect to see a 30% increase in the footprint of car fuel and a 62% increase in aviation impacts over this time period. Over the same time period there is predicted to be a reduction in bus use of 2% a year, while rail use remains stable.

Based on the assumptions above, the **Current policy scenario** shows a minimal change from the Reference scenario between 2003 and 2020 – as shown in Chart 15.1.

There is still a strong upward trend in the footprint of transport in this scenario, rising at just under 2% per year.

Chart 15.1 Ecological Footprint of transport in Reference and Current policy scenarios



(Source: REAP model, Stockholm Environment Institute)

Three key trends emerge from analysis of the Reference and Current policy scenarios:

- A continued shift to unsustainable modes of transport;
- Modest efficiency gains in all modes; and
- If growth is left unconstrained, the distance that people travel will continue to increase.

15.2.2. Predictions on CO₂ emissions

REEIO – assumptions for transport

The key assumptions made in the **Reference scenario** are:

- The level of passenger kilometres travelled grows at a slower rate than Gross Value Added (GVA) with an elasticity of 0.4 (i.e. a 1% growth in GVA leads to a 0.4% growth in passenger km);
- Passenger kilometres travelled by air grow by 3% pa (in line with national aviation forecasts);
- There is no significant change in modal shares of passenger transport, although car occupancy rates are expected to reduce slightly;
- The level of freight tonne-kilometres travelled grows at a slower rate than GVA (with an elasticity of 0.37 – i.e. a 1% growth in GVA leads to a 0.4% growth in freight tonne-km);
- The modal share of freight travel remains unchanged through the forecast;
- Energy efficiency of vehicles is expected to improve by 1% pa for road and rail and 2% pa for air travel; and
- As a result, the growth in demand for passenger travel will rise at a faster rate than will the demand for freight traffic.

In the **Current policy scenario**, stronger economic growth is assumed. The key transport-related assumptions for this scenario are:

- The rate of growth of demand for transport, relative to the growth of the economy as a whole is reduced by 20% (i.e. elasticity is around 0.3 rather than 0.4, so a 1% growth in GVA leads to a 0.3% growth in passenger km);
- Growth in demand for air transport is more modest, being half that of overall demand for transport;
- There is assumed to be a modal shift from road to rail for passenger transport. Rail's share of passenger travel is assumed to double by 2020 (up to 3.5%) while buses increase its share from 4% to 5%;
- Occupancy rates on buses are assumed to increase; and
- There is a small shift in freight transport mode in favour of rail and away from road (2% by 2020).

Charts 15.2 and 15.3 show the projected contribution the different transport modes make to CO₂ emissions in the two scenarios. It is clear that the overwhelming majority of emissions are from road transport, and to a lesser extent air transport.

In the Reference scenario overall emissions from transport rise by around 0.5% pa, with similar rates of growth from all modes. The stronger demand for air travel appears to be compensated by increases in occupancy rates and stronger energy efficiencies than in, say, road transport. But this analysis of air travel focuses only on airports within the South East region (i.e. excluding Heathrow) and does not include the cruise element of flights.

Overall emissions from transport are lower in the Current policy scenario than the Reference scenario, despite the stronger economic activity. This is largely due to the assumption that current strategies can 'loosen' the link between economic growth and demand for transport. Compared to the Reference scenario, the greatest reductions in CO₂ emissions by 2020 are from road transport, which are reduced by 25%. Emissions from rail are higher in this scenario, owing to the modal shift towards rail.

Chart 15.2 CO₂ emissions from transport – Reference scenario

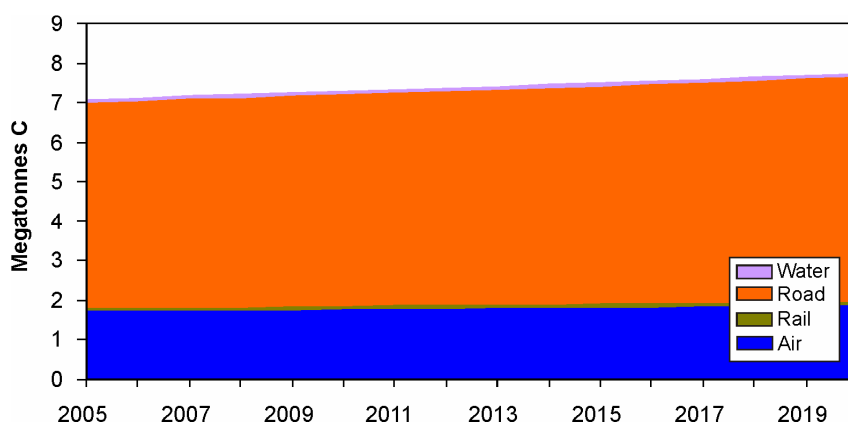
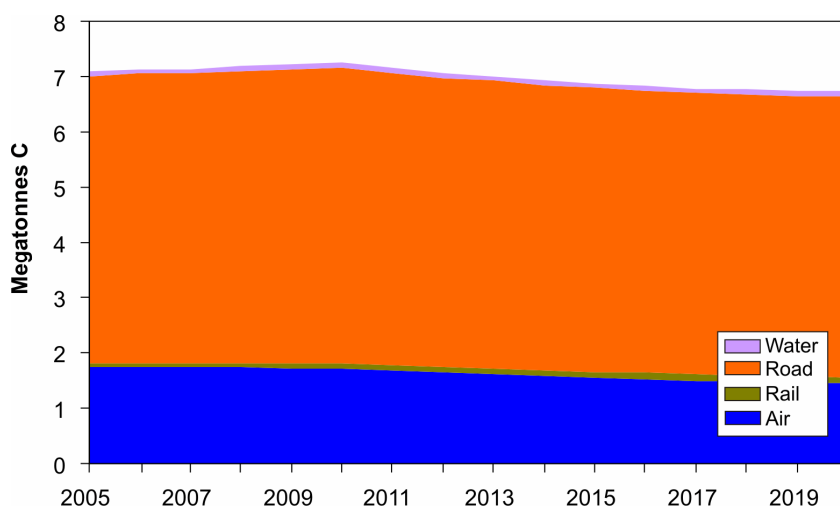


Chart 15.3 CO₂ emissions from transport – Current policy scenario



(Source: REEIO model, Cambridge Econometrics)

15.2.3. Comments on 'where we are heading'

The projected 'flat' profile in CO₂ emissions from transport by REEIO contrasts strongly with the projected increase in the region's transport footprint by REAP. The REEIO forecast assumes efficiency gains in freight as well as passenger transport, but the REAP forecast provides a more complete assessment of air travel impacts which are currently growing.

In both cases, significantly stronger policies would be required to meet the reduction targets for transformation of the transport sector. These are discussed in the next section.

15.3. How can we reach the targets?

We have used the REAP and REEIO models to examine the 'transformation' of the transport sector in more detail, to achieve both stabilisation and reduction targets. The aim has been to examine what scale of policy change would be needed to stabilise the sector's footprint, and to achieve the medium-term target of reducing the Ecological Footprint and CO₂ emissions by 30% by 2020, and the long-term transformation target of reducing both these impacts by 80% by 2050. This section sets out:

- Assumptions and findings for Ecological Footprint under Transformation;
- Assumptions and findings for CO₂ emissions under Transformation.

The following section sets out recommendations for the route map in this sector.

15.3.1. Reaching the targets – Ecological Footprint

Stabilisation target

There is a strong upward trend of nearly 2% per annum in the footprint of personal travel under the Current policy scenario (see section 15.2). Analysis using the REAP model suggests that strong policies to constrain car growth, and air travel growth, would be needed to stabilise this trend.

Growth in car use could be constrained by reducing the availability of car parking spaces, reallocating road space to more sustainable modes and creating 'car free town centres' (using Oxford as a model). This would need to be accompanied by measures to improve access by other modes. While these measures might be fairly radical, they would not be dependent on changes in national government policy or technology, and could be implemented now, as demonstrated in the city of Oxford.

Measures would also be needed to curb growth in air travel: any growth should be matched by efficiency gains. The first step would be for the regional bodies to make and publicise a commitment to curbing air travel impacts and opposing expansion of London's airports. This would need to be accompanied by initiatives asking individuals and businesses to make a similar commitment, both to 'cap' their own air travel and to limit their purchase of air-freighted goods. Actions would also need to be taken to promote domestic tourism.

Reduction targets

Constraining growth in car use and aviation impacts would also be a prerequisite for meeting reduction targets in the Transformation scenario. This section outlines the types of policies needed to achieve major reductions in the Ecological Footprint of transport.

REAP assumptions – transformation of transport

Constraining Growth

Between 2010 and 2016, we assume that the following policies are phased in to ensure stabilisation of the sector's footprint by 2016:

- Decommissioning of car parking spaces;
- Reduction in capital infrastructure expenditure that support unsustainable modes;
- Local Accessibility Programmes;
- Introduction of car free centres with Oxford as the model.

Demand Management

The scenario assumes that the various 'Smarter Choices' schemes (including work and school travel plans, personalised travel planning and increased awareness raising) are rolled out over a 5 year period so that every individual in the region is targeted through one of these options. This will result in a 3% per year reduction.⁴⁶

Modal Shift

There will still be a need to travel even though demand for travel will be constrained. For the remaining travel it is essential that the low carbon modes are used more predominately. In terms of a 'Mode Hierarchy' walking and cycling have the lowest carbon output followed by the train, buses, cars and planes. There are numerous examples across Europe where the modal split for cars is not higher than 35% and public transport at 10%. The rest is by walking and cycling. We assume that 50% of all personal travel by South East residents would be walking or cycling.

Technological improvement

All modes of transport are becoming more efficient every year (i.e. their carbon output per km is reducing). There are strict EU standards for buses and standards for cars are also being introduced. We believe that we will see continuing progression towards lower carbon vehicles. This will result in a 1% a year improvement in efficiency of all vehicle types. This is greater than the historical patterns but there is a clear policy initiative in place that will ensure that this will happen. Between 2010 and 2030 this would result in a 20% improvement in efficiency.

Infrastructure efficiency

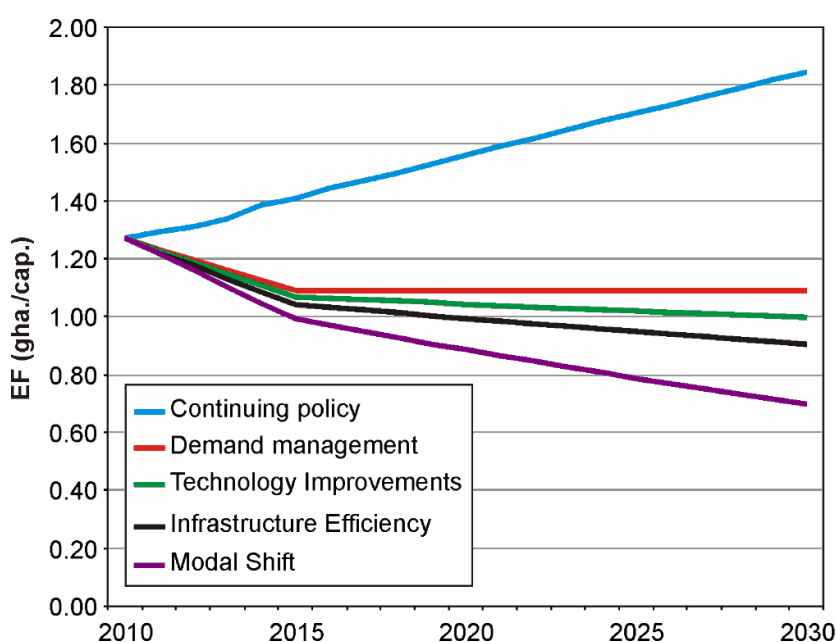
There has been a continual decline in the occupancy rates of cars with some journey types, such as commuting, having an average occupancy rate of 1.1 persons. With the average car potentially able to carry 5 people this is an extremely inefficient system. Therefore, improving occupancy must be a key priority. We therefore advocate the encouragement of car sharing and also the stronger policy of high occupancy lanes on dual carriageways and motorways. We suggest that this would lead to an occupancy improvement of 1% a year.

⁴⁶ For further information on Smarter Choices please visit <http://www.dft.gov.uk/pgr/sustainable/smarterchoices/>

Chart 15.4 below shows the predicted reduction in the transport footprint under the Transformation scenario, relative to both the Reference and Current policy scenarios.

- If the policy to 'constrain growth' was implemented with no further measures, we estimate stabilisation of the transport footprint by 2016;
- We estimate that demand management would reduce the footprint by a further 15% over a five-year period;
- The major modal shift we have assumed would reduce the transport footprint by 22% between 2010 and 2030;
- Technological improvement in vehicle efficiency could bring about a 20% reduction between 2010 and 2030, and new technologies (e.g. hydrogen) might be able to bring further efficiencies thereafter;
- Improving infrastructure efficiency is predicted to bring a 10% reduction between 2010 and 2030.

Chart 15.4 Effectiveness of policy wedges in reducing the transport footprint – Transformation scenario



(Source: REAP model, Stockholm Environment Institute)

In this chart, policies aiming to 'constrain growth' have been included within the overall category of 'demand management'. Based on our assumptions, demand management appears to be by far the most effective of these policy options.

15.3.2. Reaching the targets – CO₂ emissions

Stabilisation target

Under the Current policy scenario, CO₂ emissions are predicted to stabilise and decline slightly, despite economic growth being slightly higher than in the Reference scenario. Stabilisation is more easily achieved for REEIO's projections of CO₂ emissions than for REAP's projections of transport Ecological Footprint because:

- The full impacts of air travel are not included within REEIO's projections; and
- The full impacts of the transport supply chain, including vehicle supply, are not included; but
- Freight impacts are included, although these are assumed to grow less strongly than GVA growth.

Reduction targets

Much stronger policies are required to achieve the medium and long-term targets for reduction of CO₂ emissions from transport.

REEIO assumptions – transformation of transport

The **Transformation scenario** assumes:

- Further weakening in the link between economic growth and demand for transport (elasticity of passenger demand is 0.2 from 2010 and that for freight demand is 0.1, so a 1% increase in GVA leads to a 0.2% and 0.1% increase in passenger and freight demand, respectively);
- Trends in energy efficiency of road vehicles improve by 2% pa and there is a shift from conventional fuels to carbon-neutral biofuels equivalent to further reduction in conventional fuels of 2% pa.

Charts 15.5 and 15.6 show the impact of these assumptions on CO₂ emissions from transport.

The effect is that transport-related CO₂ emissions fall throughout the period to 2020, by which time they are 40% lower than in the Current policy scenario. As Chart 15.6 shows, there is a downward-trend in emissions from both air and road, but it is most marked for road transport.

Chart 15.5 CO₂ emissions from transport – comparison of scenarios

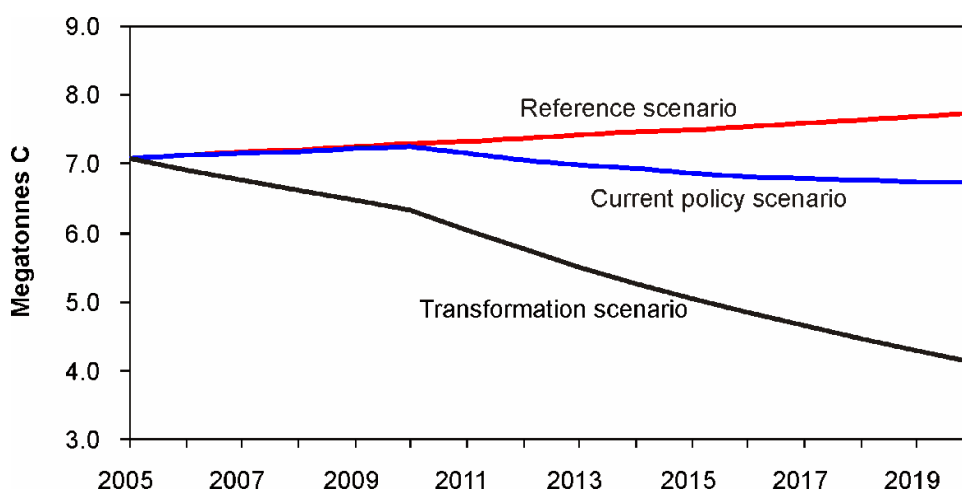
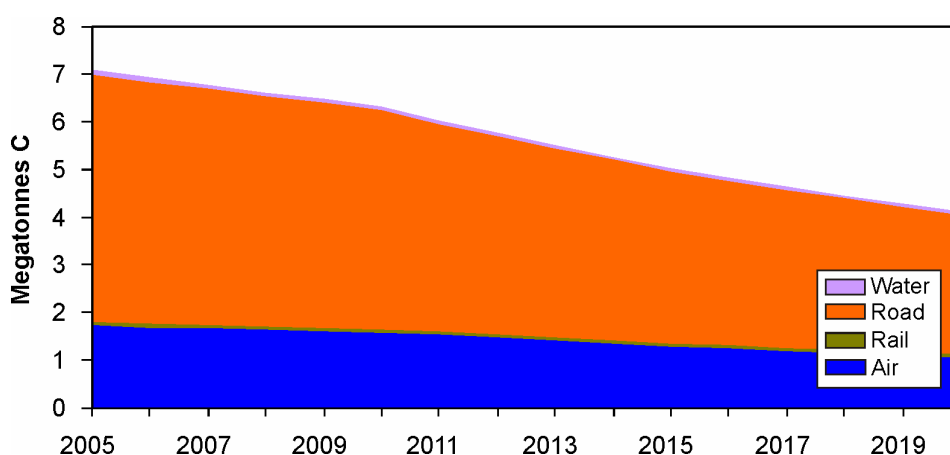


Chart 15.6 Modal breakdown of CO₂ emissions from transport – Transformation scenario



(Source: REEIO model, Cambridge Econometrics)

15.3.3. Comments on 'reaching the targets'

Strong policies are required to meet the targets for stabilising and reducing the Ecological Footprint and CO₂ emissions from transport. In particular, action needs to be taken to cap emissions from air travel, to constrain growth in car use and to create a major shift from car use towards walking and cycling. Regional policies would be much more effective if supported by strong policies at national level, such as road pricing (designed to raise revenue for more sustainable modes), carbon budgets and personal carbon allowances.

15.4. What would 'transformation' involve?

This section outlines some of the uncertainties underlying 'transformation' and the types of policies that would be required in the Transformation scenario, to achieve the long-term target of 80% footprint and emissions reduction by 2050, and the medium-term goal of 30% reduction by 2020. Many of these would involve policy changes at national level, as well as regional/sub-regional action.

15.4.1. Issues and uncertainties

There are a number of issues and uncertainties about the long-term transformation of the transport sector, many of which are common to other sectors:

Policy

- Great uncertainty on the Sub-National Review structures and Local Government Bill;
- The regional level may not be the most effective level for many issues;
- In a liberalised economy, will direct public investment in transport be possible or desirable?

Economy

- What might be the economic effects of a strong transport policy – depends whether this is sectoral or integrated?
- Would road pricing imply increasing the tax take, and will this work at the regional level?
- What might be the transport effects of strong economic growth – depends whether this is conventional or dematerialized growth?

Technology

- How far and how fast will vehicle and fuel technologies change (e.g. hydrogen technology)? How far is it possible to hedge bets against the technological uncertainties?
- How will EU biofuels policy evolve, being at present complex and uncertain?
- Does full integration of all transport modes assume that public transport can be privately operated?
- Will it be possible to cap aviation emissions, so that air passenger growth is only allowed at the same rate as efficiency gains via technological progress?

In the context of these uncertainties, the following subsections outline the policy outcomes and policy programme groups or 'wedges' that would be required to transform the transport sector in the South East, to meet the medium and long-term

targets for footprint and emissions reduction. These sections examine the following sub-sectors in turn:

- Road traffic programme;
- Public transport programme;
- Freight programme;
- Air transport programme.

15.4.2. Road traffic programme

Policy outcomes:

- Lowering overall demand;
- Vehicle occupancy increase;
- Vehicle efficiency increase;
- Vehicle fleet shift to low impact;
- Alternative fuels shift: electric; gas; hydrogen; hybrid;
- Localised impacts – congestion, parking and so on.

Policy 'wedges' – road traffic:

- Public estate travel management;
- Procurement and contracting for travel services;
- Green travel planning with employer's incentives;
- Local congestion or cordon charging;
- Parking progressive charging regime;
- Community infrastructure levy on new development;
- Compulsory parking fees on new development;
- Accessibility spatial planning;
- National level: differential road tax; differential fuel duty;
- Road/lane access quotas;
- Single occupancy lane management;
- Car sharing and lift sharing clubs;
- Business travel and logistics management.

Added value at the regional/sub-regional level:

- Coordination of spatial planning;

- Coordination of public procurement;
- Coordination of fiscal policy, parking, congestion policy and so on; and
- Investment in key infrastructure.

15.4.3. Public transport programme

Policy outcomes:

- Shift to low impact modes;
- Vehicle occupancy increase;
- Vehicle efficiency increase;
- Vehicle fleet shift to low impact;
- Alternative fuels shift: electric; gas; hydrogen; hybrid.

Policy 'wedges' – public transport:

- Quality bus programmes;
- Real time information and communications technology (ICT) for public transport;
- Extensions to Light Rail Transit and 'Personal Rail Transit' (e.g. personal pods travelling along a rail network);
- Responsive bus/taxi systems;
- High speed rail investment; and
- Integrated bus/ rail/ taxi/ air systems.

Added value at regional and sub-regional level:

- Coordination of spatial planning;
- Coordination of public procurement;
- Coordination of fiscal policy, parking, congestion and so on;
- Investment in key infrastructure.

15.4.4. Freight transport programme

Policy outcomes:

- Stabilise net growth rate in tonne-km and vehicle-km;
- Shift to low impact modes;
- Vehicle loading/occupancy increase;
- Vehicle efficiency increase;
- Vehicle fleet shift to low impact;
- Alternative fuels shift: electric; gas; hydrogen; hybrid.

Policy 'wedges' - freight:

- Freight compacts and quality corridors;
- Investment in multi-mode interchanges;
- Investment in low impact modes.

Added value at regional and sub-regional level:

- Freight and distribution coordination at industrial site and cluster level;
- Freight demand management for local infrastructure;
- Direct investment in low impact infrastructure;
- Procurement and contracting for low impact logistics.

15.4.5. Air travel programme

Policy outcomes:

- Assume that aviation emissions are capped – otherwise the transport sectoral targets are not achievable;
- Supply side efficiencies in operation;
- Fuel chain shift towards 'second generation' biofuels;
- Demand side management to reduce growth rate to 1% (which could be offset by efficiency gains).

Policy 'wedges' – air travel:

- Demand side management via quotas and levies;

- Demand side substitution by advanced ICT.

Added value by region and sub-region:

- Coordination of demand side management;
- Investment in advanced ICT;
- Substitution by local tourism and leisure.

15.5. Recommendations for the route map

Based on our vision of the types of transformations required (section 15.4), and our quantitative analysis of the scale of change required to meet targets (section 15.3), we have developed a set of recommendations for the region in the transport sector. This is summarised in the table and route map chart below. The region's existing progress towards this route map is discussed in the next section (15.6).

Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions). In Chart 15.7, a black border indicates that an action involves lobbying for change at national level or above.

Some of the stabilisation actions listed in the table below form part of 'current policy', but more effective implementation of these policies at local levels is required to reverse current growth trends in this sector.

Recommendations for short-term priority actions are listed in Table 8.1.

Chart 15.7 Transport – route map

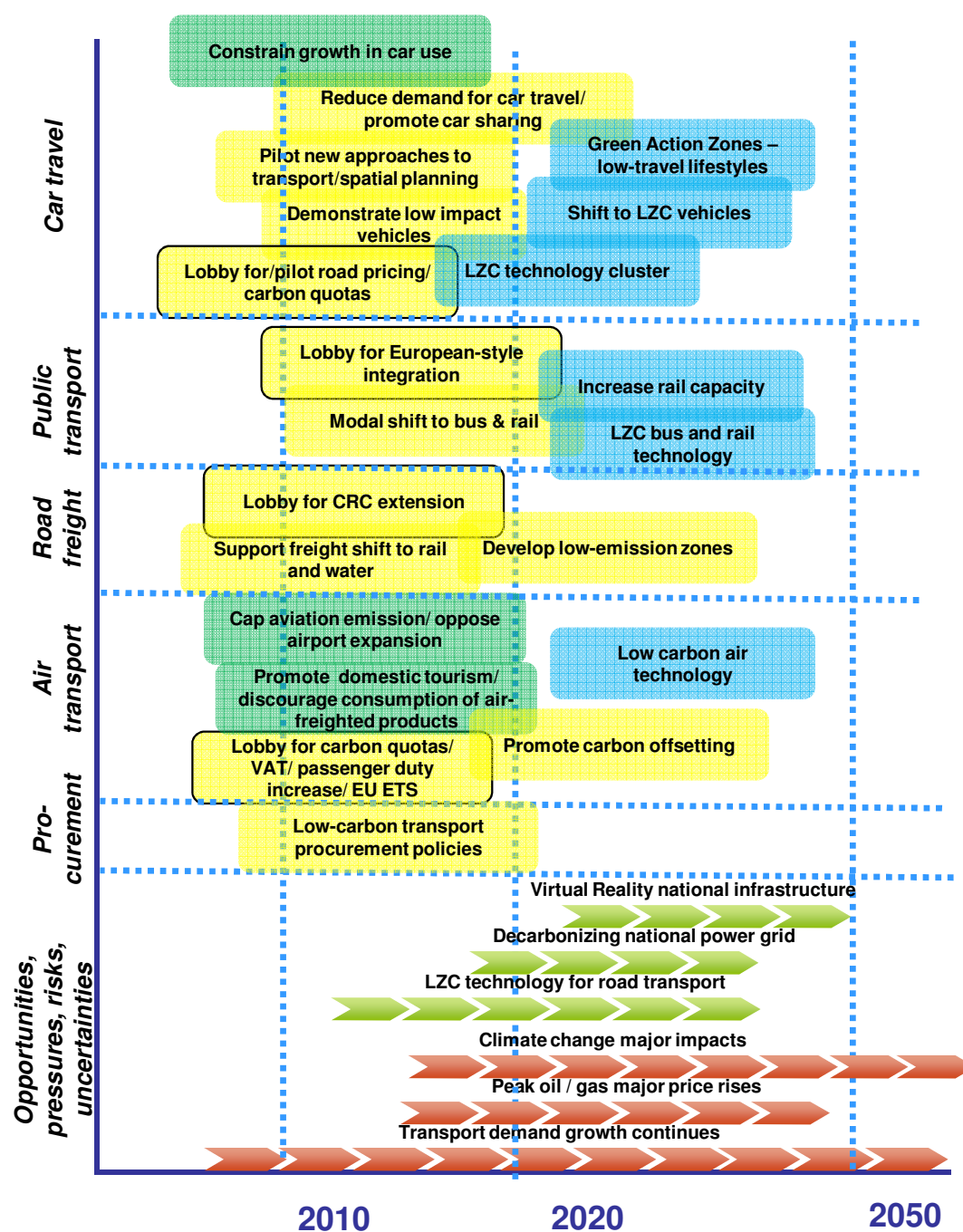


Table 15.1 Transport route map

Key: Stabilisation actions; short-term transformation actions; longer term transformation actions

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Reduce the impact of passenger transport by road	Strong action to constrain growth in car use (e.g. through spatial planning, travel assessment of new developments, reduction in road space/car parking, low emission zones, reallocation of road building funds to more sustainable modes and local access improvements) Pilot new approaches to coordination of spatial planning and transport planning, particularly in two-tier authorities Develop 'Green Action Zones' for low-travel and low-carbon lifestyles Strong action to reduce demand for car travel (e.g. through workplace and residential travel plans, home working, travel awareness, car sharing, car clubs, improved infrastructure for walking and cycling)	The Assembly/ local authorities/ SEEDA/ Regional Transport Board SEEDA/ Diamonds/Local authorities SEEDA/ Diamonds Local authorities/ Regional Transport Board/ developers/ businesses/ communities/	Funding would be reallocated from roads to 'smarter choices' and more sustainable transport modes. Generate revenue through charges for parking and car use. To avoid adverse economic impacts, growth constraints must go hand in hand with improvements in infrastructure for more sustainable	High benefits: Constraining growth in car use could reduce the region's transport footprint by 0.25 gha/cap between 2008 and 2016 – contributing towards stabilisation of the region's footprint Demand management could reduce the transport footprint by a further estimated 15% over a 5 year period

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	Demonstrate and encourage use of lower impact vehicles (including hydrogen technology when available) – through purchase/leasing by individuals, organisations and businesses Develop LZC vehicles technology cluster Lobby national government (and support local pilots) for incentives to reduce travel impacts (e.g. road pricing; congestion charging; carbon quotas) Encourage more efficient use of infrastructure and vehicles (e.g. through car sharing schemes and high occupancy lanes)	Local authorities/ communities/ public sector/ businesses SEEDA/Diamond s/Envirobusiness SEEDA/ local authorities/ the Assembly Local authorities/ businesses	modes, and advice on low-impact alternatives to car use ('carrot and stick'). Moderate cost. Minimal direct cost. Modest direct cost.	Technology improvements could bring about 20% reduction in transport footprint by 2030, and more thereafter More efficient use of infrastructure could bring 10% reduction in transport footprint by 2030
Promote low impact public transport	Lobby national government for a more integrated, coordinated European-style model of public transport Encourage modal shift towards bus and rail (e.g. by investing in improved infrastructure; quality bus programmes; real-time ICT; light rail transit; demand responsive taxi-bus systems; high-speed rail) Lobby rail companies to increase the capacity for rail travel, particularly on routes into and	SEEDA/ the Assembly Local authorities/ Regional Transport Board/ SEEDA SEEDA/ the Assembly/ rail companies	Reallocate funding from road building to public transport improvements. Also use funding generated through road pricing, parking fees or congestion	High – required as complement to car use reduction measures.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	out of London Reduce the impact, and increase the occupancy, of bus and rail transport (e.g. through investment in vehicle fleet; shift to alternative fuels including hydrogen, when available)	Rail companies	charging schemes. Significant investment is likely to be needed in some rail infrastructure schemes.	
Reduce the impact of freight transport	Lobby national government for incentives for companies and public bodies to reduce freight transport impacts (e.g. road pricing; extension of Carbon Reduction Commitments) Ensure freight impacts are included within the transport and environmental assessments of new developments Support freight shift from road and air to rail and water, for local production and imports (e.g. through investment in infrastructure and transfer points) Develop 'low emission zones' covering vehicle efficiency as well as local air impacts	SEEDA/ the Assembly The Assembly/ Local authorities SEEDA/ Regional Transport Board Local authorities/ communities	Minimal Minimal Significant investment may be required. Moderate investment	Potentially high impact, complementing regional measures. Indirect impact – potentially significant. Significant impact on freight footprint. Could be linked to 'car free' town centres.
Limit, and subsequently reduce, the impact of passenger and freight transport	Make – and publicise – a policy commitment to cap aviation emissions at, or below, current levels (so that any growth is balanced by efficiency improvements) Oppose further expansion of London airports,	SEEDA/ the Assembly/ local authorities SEEDA/ the Assembly/ local	Minimal direct costs. There will be indirect costs for individuals	Potentially high benefit: Air transport is a fast-growing element of the

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
by air	including a third runway at Heathrow and any further runway at Gatwick Promote carbon offsetting by the aviation industry Lobby national government for incentives to reduce demand for air travel, particularly for tourism and freight (e.g. impose VAT on aviation fuel; major increase in Passenger Duty; introduce carbon quotas; include air within the EU Emissions Trading Scheme) Promote use of ICT to substitute for business and personal air travel Promote domestic tourism as an alternative to air-based overseas tourism Encourage consumers to buy low impact products, avoiding air freighted goods wherever possible – as part of behaviour change programmes Promote innovation and investment in lower-impact aeroplanes and flying patterns	authorities Aviation industry SEEDA/ the Assembly SEEDA/ ICT businesses SEEDA/ tourist businesses Local authorities/ communities/ SEEDA SEEDA/ air industry	and businesses. But the economic impact could be minimised by promoting ICT as a substitute for air travel, and by prioritising business air travel at the expense of air-based tourism (which can partly be substituted by domestic tourism).	footprint, so capping emissions would contribute to stabilisation. Synergy between local economic development and carbon reduction goals.
Reduce impact of transport procurement	Promote the use of ICT and home working to reduce staff travel Promote the procurement of low impact transport services by public bodies, major businesses and SMEs	SEEDA/Assembly / local authorities/ businesses	Possibly some increased costs – for low carbon transport options and ICT – but saving of	Moderate benefit – but important leadership role

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	Ensure that the carbon impacts of transport are off-set wherever possible		staff travel time and costs	

15.6. Progress to date

There is already considerable awareness at regional and local authority level of the need to reduce the need to travel and shift from car use to more sustainable modes. Examples of initiatives underway within the region include:

Reducing passenger transport by road

- The Regional Transport Strategy (within the South East Plan) supports moves towards more sustainable transport, incorporating policies on mobility management, shifting passenger and freight transport to more sustainable modes and encouraging development patterns which reduce the need to travel. Advice has been prepared for Local Transport Authorities on how to incorporate these policies into their Local Transport Plans;
- The Regional Transport Board (RTB) now places more emphasis on sustainability issues in prioritising regional-level funding for transport schemes, including integrated multi-modal projects such as 'Access to Oxford';
- The RTB is currently considering how to take forward 'Mobility Management' and whether to fund infrastructure initiatives in support of behaviour change;
- Leading authorities within the region (e.g. Hampshire, Oxfordshire, Brighton and Hove, Buckinghamshire) have put considerable effort into 'Smarter Choices' and other means of shifting demand away from road-based transport and towards sustainable travel modes. Both Aylesbury and Brighton and Hove were selected as Cycling Demonstration Towns from 2005-2008;
- The MATISSE programme, run by Hampshire County Council, is promoting and researching the scope for home working, flexible working and ICT to reduce the need to travel;
- A number of local authorities across the region use hybrid or gas-powered vehicles within their own fleets, to demonstrate use of more efficient vehicles.

Improving public transport

- The train operating companies are considering ways to improve the energy efficiency of their services, and relieve congestion on crowded commuting services;
- SEEDA has supported improvements to rail infrastructure and transport integration in a number of towns, including Ashford, Hastings and Reading;
- Quality bus partnerships and real-time information systems form part of Local Transport Plan initiatives for many local authorities;

Freight transport

- The South East Plan includes a commitment to shift freight from road to water and rail. SEEDA is supporting projects such as FINESSE, which aims to shift cross-channel freight transport from road to rail;

Air transport

- While SEEDA supports expansion of London's airports, on the grounds of economic growth objectives in the RES, the Assembly supports only the expansions that are already planned.

Despite these initiatives, the demand for road transport and air transport is still growing. There is considerable good practice within the region, but it is currently not doing more than scratching the surface of people's travel patterns. Much stronger measures, backed up by incentives at national level, are required if these trends are to be reversed. Policy makers also need to be aware that some policies in other areas (e.g. the choice agendas in health and education; rationalisation of services such as the Post Office network) will tend to increase the need to travel for some people.

15.7. Reference documents

We have prepared the route map for Transport with reference to the following documents:

- South East Plan
- Regional Economic Strategy
- Climate Change Mitigation and Adaptation Implementation Plan
- Smarter Choices – Cairns et al, DfT, 2004
- The Future of Transport – White Paper, DfT, 2006
- The Eddington Transport Study – HM Treasury, 2006

More detailed references for these reports can be found in Appendix 3.

16. Energy supply

Key points – energy supply

Power stations within the South East contributed nearly 30% of the region's CO₂ emissions. Electricity generated by these stations is fed into the National Grid. Electricity consumption within the region is not necessarily produced by these power stations, but comes from the grid as a whole. We therefore need to look at developments in energy supply across the UK, not just supply within the South East.

The UK government is now committed to generating 15% of total energy supply from renewable sources by 2020. This equates to nearly 40% of electricity at present day levels, in response to EU commitments.⁴⁷ If the 15% target for renewables is met by 2020, then CO₂ emissions from power stations within the region, and Greenhouse Gas emissions associated with grid electricity consumed in the region, are predicted to decline even though overall electricity demand remains relatively stable.

Our REEIO predictions assume lower shares for renewable energy, based on the Energy White Paper (2007) and RES targets rather than the new EU targets which emerged after modelling work was complete. In the Current policy scenario we assume that – nationally – 20% of electricity is generated from renewable sources by 2020, and in the Transformation scenario this rises to over 30%. In the Transformation scenario we also assume additional implementation of Combined Heat and Power schemes (CHP) and partial introduction of 'Carbon Capture and Storage' for UK coal and gas power plants. Electricity use in the region increases, as people are encouraged to switch to this newly low-carbon energy source. But emissions associated with electricity generation would decline strongly.

There remain considerable barriers to faster development of renewable energy sources and CHP, most of them institutional rather than technical. Pilot projects such as Woking's Thameswey Energy have shown that it can be done, but few are following their example. These barriers need to be tackled in the short term, if transformation of the energy supply sector is to become a reality.

⁴⁷ '2020 VISION – How the UK can meet its target of 15% renewable energy', Renewables Advisory Board (2008).

The structure of this section is as follows:

- Definitions and boundaries;
- Where are we headed?
- How can we reach the targets?
- What type of transformation is required?
- Recommendations for the route map;
- Progress to date;
- Reference documents.

16.1. Definitions and boundaries

16.1.1. Defining 'energy supply'

The topic being considered here is the supply of energy, both directly and through power generation. By 'energy supply' we mean the supply of electricity and heat for industry, services and domestic use. There is increasing overlap between energy supply and demand, in the emerging context of distributed generation, networked heat and other ambient sources. The scope of this sector includes:

- Direct emissions, waste and the life cycle impacts of energy technology;
- Resource depletion/impacts of each fuel options;
- Energy conversion and distribution technology, for electricity and heat.

We also consider a wide range of energy supply technology options:

- Fossil fuels;
- Renewables;
- Micro-generation/co-generation and distribution;
- Nuclear – this is a challenging issue which is not covered specifically in this study;
- Transport fuels are included in the transport sector (Chapter 15) - except where grid electricity is used in transport.

16.1.2. Modelling the energy supply sector

REAP focuses primarily on household consumption issues, and so does not collate findings on energy supply. The impacts of energy supply are built into the supply chains of each consumption activity, rather than being analysed separately.

Electricity demand and supply

From a production perspective, the REEIO model examines energy supply in two ways:

- It identifies the primary energy needs of firms and households in the region; and
- It considers the level and nature of electricity generation from power plants in the South East that feed into the National Grid.

In meeting their electricity needs, consumers (domestic or other sectors) could use Combined Heat and Power (CHP) or onsite renewable sources instead of sourcing electricity from the Grid. Both of these are treated as 'zero carbon' sources (since emissions associated with the fuels used to run CHP schemes will be identified through the use of the primary fuel). The nature of the UK electricity generation mix therefore influences the level of emissions associated with the electricity consumed in the region, as does the decision on how the electricity energy is sourced.

Combined Heat and Power (CHP)

In REEIO, assumptions are made on the CHP capacity for different fuel users (e.g. industry sectors, commerce, domestic and so on). The model assumes that an increase in CHP capacity (as a proportion of total power generation capacity) does not increase primary energy consumption in the region but does decrease electricity demand from the National Grid. Essentially, the electricity generated by CHP plants is treated as a by-product of heat production.

Biomass

In REEIO, biomass is identified as a specific fuel for electricity generation, with associated emissions. The sequestration effect of growing the biomass is not currently modelled, because of the 'territorial' perspective of REEIO: sequestration would happen outside the region for biomass that is grown elsewhere. So the model currently understates the benefits of energy from biomass - biomass has a positive carbon footprint if it substitutes for conventional energy sources.

In REAP, energy from biomass is modelled very simply. Biomass production generates an Ecological Footprint because it is assumed to require dedicated land; but substitution of biomass energy for conventional fuels then balances this out to produce a net zero Ecological Footprint for biomass. This may understate the benefits of some types of biomass energy (e.g. woodland which fixes some carbon permanently in the soil).

Renewable energy

In both REAP and REEIO, power generation using renewable sources (other than biomass) is assumed to generate no direct emissions. This means that adding renewable electricity generation capacity does not change the region's Ecological or carbon footprint. But substituting renewable capacity for existing conventional-fuelled generation capacity (e.g. by mothballing some plants early) would reduce the footprint of the region's power generation sector.

16.2. Where are we heading?

Current situation

It is estimated that there is currently around 12.6 GW of power station capacity in the region. Of this just over 360 MW (3.5%) is from renewable sources, the largest of which is landfill gas (142 MW). In addition, there is 840 MW installed CHP capacity.

In 2005 power generation accounted for nearly 30% of CO₂ emissions from activities in the region. This does not include the impact of electricity consumption from the National Grid.

This chapter considers the production side of energy supply and power generation within the region, as the consumption-based REAP model cannot be used to analyse these issues. Within this chapter, we therefore focus exclusively on CO₂ emissions, rather than Ecological Footprint. There are other tools, such as Corporate Stepwise (developed by Best Foot Forward (www.bestfootforward.com/corptestwise.html)), which could be used to estimate Ecological Footprints for producers – but there would be a risk of double-counting with REAP's consumption-based approach.

16.2.1. Predictions on CO₂ emissions

The assumptions used in our REEIO projections are set out below.

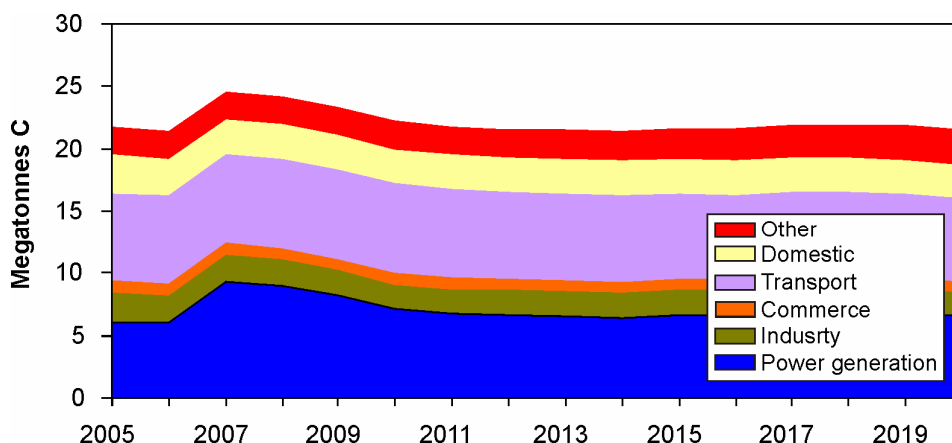
In the **Reference scenario** the future profile of generation at the existing power plants in the region are informed by the assumptions in Cambridge Econometric's forecasts for the UK published in 'UK Energy and the Environment', July 2007. In this forecast, it is expected that just under 20% of UK electricity generation will be from renewables by 2020. National developments could result in capacity from existing stations in the region falling to around 6GW by 2020 with the closure of stations at Didcot A, Fawley, Kingsnorth and a capacity reduction at Grain. New, conventionally-powered stations will be required in the UK, but no view has been taken as to where in the UK these are sited. To this extent, the projections may underestimate the power generation activity in the region, particularly in the longer term.

The **Current policy scenario** does not vary the assumptions for activity at existing power plants but assumes that:

- Electricity generation from renewable sources rises to be 20% of total generation in the region by 2020;
- The introduction of CHP schemes is increased, particularly in the service sector and domestic sector. Levels of capacity in these sectors in 2020 are twice as high as in the Reference scenario. Overall there is an additional 310 MW (33%) of capacity above the levels in the Reference scenario.

As Chart 16.1 shows, the CO₂ emissions from the region's power stations are projected to see a fair degree of fluctuation in short term as load factors rise to meet demand, but in the longer term will fall (as some existing plants close). By 2020 emissions from power generation are expected to be 30% lower than estimated in 2007. These projections do not include any trend for 'end of pipe' technologies such as 'Carbon Capture and Storage'.

Chart 16.1 CO₂ emissions by sector, including regional power generation



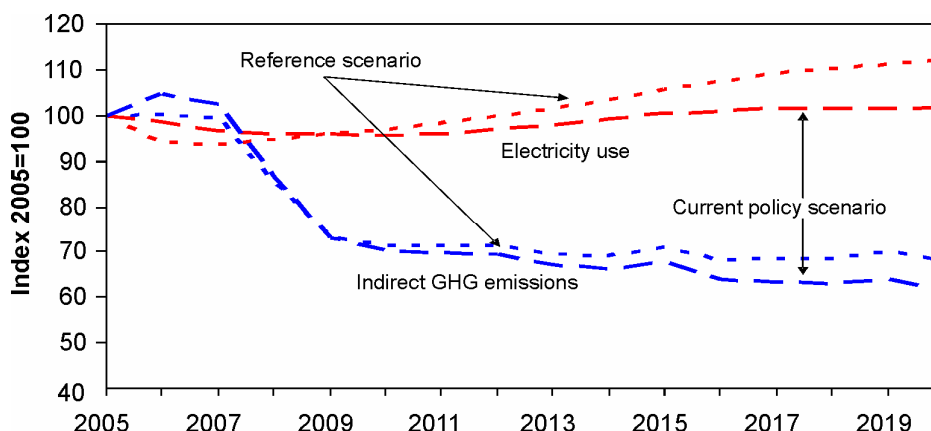
(Source: REEIO model, Cambridge Econometrics)

The direct emissions from the current power generation sector in the Current policy scenario are the same as in the Reference scenario for the reasons outlined above. Renewable capacity is higher in the Current policy scenario but this does not add to CO₂ emissions, and we assume no change in generation from other sources.

As Chart 16.2 below shows, demand for electricity sourced from the National Grid is lower in the Current policy scenario than in the Reference scenario. By 2020 demand is 10% lower than in the Reference scenario, although still slightly higher than currently estimated.

The main influence of the additional energy policies in the Current policy scenario is to reduce the region's demand for National Grid electricity relative to the Reference scenario. This is caused by faster development of CHP capacity and stronger efficiency gains in domestic and commerce. At the same time, the growth in overall energy use is set to be higher than in the Reference scenario as a result of stronger economic growth. This factor will lead to stronger growth in overall energy demand by both industry and households.

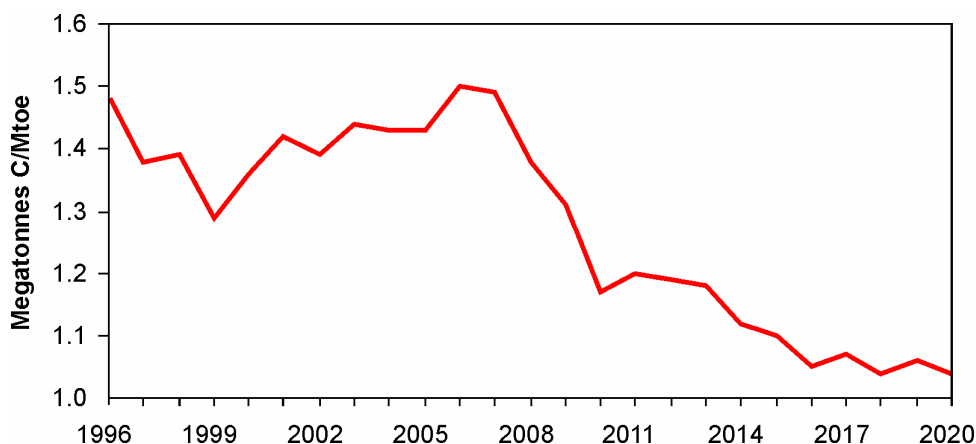
Chart 16.2 – Electricity demand from the National Grid and indirect CO₂ emissions



(Source: REEIO model, Cambridge Econometrics)

As shown in Chart 16.3 below, the Greenhouse Gas (GHG) intensity of UK generation is expected to fall sharply by 2020. This is mainly because of the phasing out of older coal-fired power stations (prompted by new flue-gas desulphurisation standards) and the increased generation from renewable sources (assuming that the target of 20% of electricity from renewable is met by 2020). As a result, the GHG emissions associated with electricity consumption in the region fall sharply in both scenarios.

Chart 16.3 – Greenhouse Gas Intensity of UK electricity generation



(Source: REEIO model, Cambridge Econometrics)

16.2.2. Comments on 'where are we heading'

The Current policy and Reference scenarios both assume that the UK meets the target for 20% of electricity to be generated from renewable sources by 2020. If this target is met, then CO₂ emissions from power stations within the region, and GHG emissions

from grid electricity, are predicted to decline strongly even though electricity demand remains relatively stable.

But within the South East, it is not clear whether the RES target for 20% of electricity demand to be from renewable energy by 2020 will be met. A more realistic outcome, barring major changes to the rate of implementation, may be the South East Plan target of 8% of generating capacity to be renewable energy by 2016, and 16% by 2026.

But the recently-announced EU target for 15% of the UK's total energy consumption to be derived from renewable sources by 2020 would require 40% of the UK's electricity to be generated from renewable sources by 2020. This new target could stimulate more support for and faster implementation of wind, marine and other renewable energy projects.

16.3. How can we reach the targets?

Stabilisation targets

Our Ecological Footprint calculations, using the REAP model, assign energy supply impacts to the end consumer. So, for example, the electricity required to run a food processing factory is allocated to the 'food' consumption category. This means that we cannot readily assess whether the footprint of energy supply is stabilised or reducing – this would risk double-counting with the end-use consumption categories.

However, we can examine stabilisation of CO₂ emissions from power generation using the REEIO model. The analysis above shows that, if current targets for renewable energy and Combined Heat and Power are met, CO₂ emissions from power stations within the region are predicted to decline slightly over the period 2005-2020. This electricity is not necessarily 'used' within the South East, but is supplied to the National Grid. However, CO₂ emissions from the South East's use of electricity from the National Grid are also predicted to decline. This is due to the closure of older coal-fired power stations and the take-up of renewable energy.

So, provided that current targets for renewable energy and CHP are achievable, CO₂ emissions will be stabilised and will have started to reduce by 2020.

Reduction targets

More radical policies, both within the South East and across the National Grid, are required to meet the medium and long-term reduction targets in the Transformation scenario.

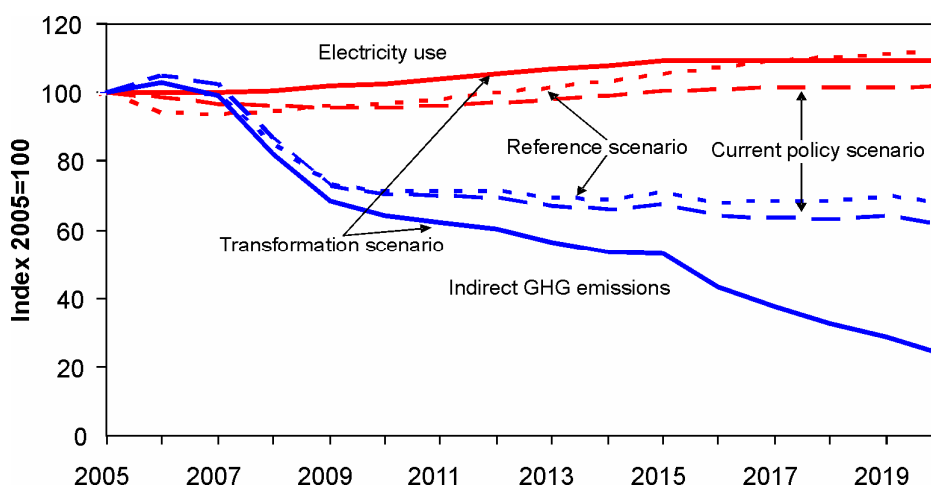
REEIO assumptions – transformation of energy supply

The **Transformation scenario** assumes that:

- The carbon-intensity of the UK electricity generation sector is further reduced through a greater shift towards renewable energy and use of Carbon Capture and Storage, offsetting a decline in nuclear power (see section 16.3 for more details);
- Rates of energy efficiency by firms and households are 1% per annum faster than in the Current policy scenario;
- The take-up of CHP increases so that by 2020 some 1.3 MWe of capacity is installed (a third higher than in the Current policy scenario);
- There are stronger trends towards the use of electricity (an increasingly low-carbon source of energy). The additional shift in share taken by electricity is generally stronger among industry than services, as the current importance of electricity as a fuel source is lower.

Chart 16.4 shows the outcome of the scenario for electricity demand met through the grid in the region. Compared to the Current policy scenario, electricity demand is higher throughout to 2020: the effect of the switch into electricity from other fuels exceeds the take-up of CHP or micro-generation.

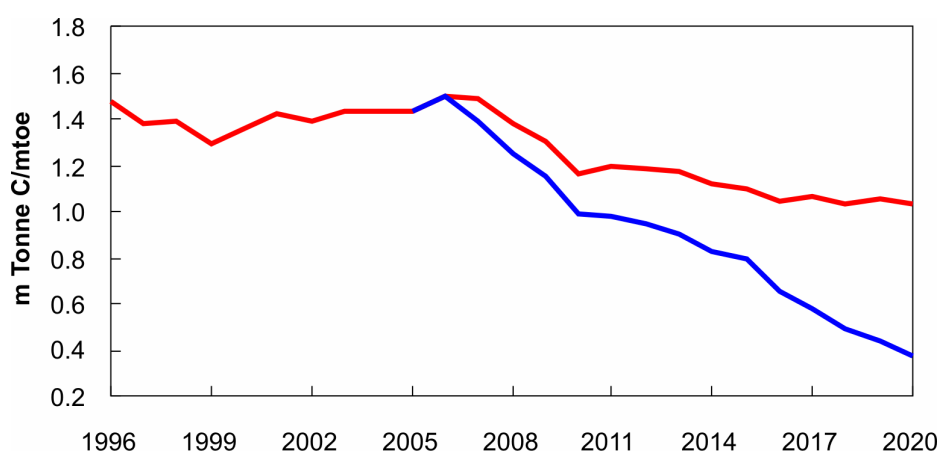
Chart 16.4 Electricity demand from the grid and indirect GHG emissions - Transformation scenario



(Source: REEIO model, Cambridge Econometrics)

Despite the increase in electricity demand relative to the Current policy scenario, the level of emissions associated with meeting the region's electricity needs are much lower than in the Current policy scenario. This is because we have assumed further substantial reductions in the Greenhouse Gas (GHG) intensity of national generation (see Chart 16.5). The Transformation scenario assumes that by 2020 the GHG-intensity of UK electricity generation falls to just 36% of its 2005 level, and that further decarbonisation occurs thereafter. As a result of this, the GHG emissions associated with electricity consumption in the scenario are 40% below those in the Current policy scenario.

Chart 16.5 Greenhouse gas intensity of UK electricity generation – Transformation (blue); Current policy (red)



(Source: REEIO model, Cambridge Econometrics)

16.3.1. Comments on 'reaching the targets'

The Transformation scenario sets out a dramatic change in the profile of electricity generation within the UK. This is premised on rapid development of renewable energy, as outlined in the CAT report 'Zero-Carbon Britain', within which the South East would need to play its part. This would only be achievable with concerted policy effort to overcome barriers to implementation of both large and small-scale renewable energy schemes, and national policy support in terms of incentives to de-carbonise the energy sector and reduce energy demand. The next section provides further details on the possible composition of energy supply in the Transformation scenario.

16.4. What would transformation involve?

Policy outcomes

There are various scenarios for low impact energy supply, depending on social and economic conditions, technology developments and so on. We select a trial one here which appears to be plausible in terms of the long-term 80% CO₂ reduction target, and is broadly comparable with recent studies:⁴⁸

- Total final energy demand (household, commercial, industry, transport) reduces at -2% per year;
- Total GHG intensity of energy supply: reduces at -2% per year;
- Existing fossil fuels shift towards electricity (hydrogen may be the common platform): with limited Carbon Capture and Storage (CCS) as an interim measure;
- Nuclear power is phased out;
- Power generation shifts towards renewables:
- Renewables shift towards lower impact modes.

This could be achieved using a mix of sources:

- Transport biofuels (where these are sustainable);
- Wind (on/off shore) and solar;
- Tidal;
- Micro-generation and CHP-District Heating;
- Local bio-mass;
- Fossil fuels.

Further details on the possible composition of energy supply in the Transformation scenario are presented below.

⁴⁸ In developing the transformation scenario for energy supply, we have drawn on the IPPR 80% study (<http://www.ippr.org/publicationsandreports/publication.asp?id=573>) and the One Planet Economy (OPEN UK) project, due to report later in 2008.

16.4.1. Outcomes – UK electricity generation

We have reviewed the IPPR-80% report⁴⁹ and work for the current OPEN-UK study, and developed a plausible 'central' case for UK electricity generation under the Transformation scenario. Table 16.1 presents our assumed UK electricity generation profile from 2005 to 2025. We have used this to calculate the indirect emissions from electricity use in the South East in the Transformation scenario.

Table 16.1 Profile of UK electricity generation – Transformation scenario

Generation source (% contribution)	2005	2010	2015	2020	2025
Nuclear electricity	18%	18%	15%	10%	0%
Landfill gas (Renewables obligation)	1%	1%	1%	1%	2%
Waste (Renewables obligation)	2%	2%	3%	4%	5%
Other Renewables obligation (mainly wind / marine)	2%	5%	10%	20%	25%
Other Renewables	2%	2%	3%	4%	5%
Biomass	0%	1%	2%	3%	4%
Coal	31%	30%	25%	10%	0%
Coal with CCS	0%	0%	5%	20%	30%
Gas	37%	35%	31%	18%	14%
Gas with CCS	0%	0%	0%	5%	10%
Other sources and import	7%	6%	5%	5%	5%
Total power generation:	100%	100%	100%	100%	100%
Power generation (Million Tonnes Oil Equivalent)	6.7	6.82	5.83	5.35	5.35

(Source: CURE)

The potential supply of renewable energy, for the UK and the South East, is discussed further below.

16.4.2. Outcomes – regional renewable supply

The IPPR 80% study models take costs into account in developing future energy supply scenarios. The predicted renewables mix is very sensitive to assumptions and uncertainties on costs, learning, policy constraints and so on. The 'central' 80% reduction scenario in the IPPR study (MM C80 INT2) has the following mix:

- Hydro – 5% of electricity generation total
- Wind – 23%

⁴⁹ <http://www.ippr.org/publicationsandreports/publication.asp?id=573> We drawn particularly on the central case for 80% reduction: MM C80 INT2.

- Biomass and waste – 13%
- Solar – 0%

However there is a strong case that the allocation will not turn out purely on net cost grounds (assuming perfect markets and so on), but rather that there is a wider range of influences such as:

- Policy for diversity and security;
- Local and regional constraints and opportunities;
- The 'localisation' of zero-carbon targets (e.g. in buildings);
- Technological innovation;
- Uncertainties on external impacts (e.g. what are 'sustainable' biofuels?);
- Linking energy policy with other objectives (e.g. waste, agriculture etc).

For a more detailed review we have referred to the Centre for Alternative Technology (CAT) 'Zero-Carbon Britain' report. This proposes that 50% of total national emissions can be cut through efficiency gains, and 50% through a rapid shift to low carbon technologies, by 2027. It also proposes that the entire surface transport fleet is shifted to electric power (hydrogen for larger vehicles).

Our renewables development scenario for the 'Transformation scenario' is presented in the table below both for the UK as a whole (as for the CAT's projected zero carbon scenario for 2027) and for the South East's regional allocation of renewables. In adjusting the UK figures to fit the South East, we have taken account of the South East's characteristics as a high density, urbanised region with a decentralised population and heavily protected rural landscapes.

These assumptions have yet to be reviewed against the forthcoming report on renewable energy in the South East, which is being prepared by TV Energy on behalf of SEEDA.

Table 16.2 Renewable energy profile - Transformation scenario (2027)

PRIMARY SUPPLY	TWh/ yr national	% national	SE region issues	SE region allocation (% of regional generation from renewables)
Ambient energy via heat pumps	80	6.5%	Less access to ambient sources?	5%
Solar hot water	28	2.3%	Better than average potential on commercial buildings in warm climate	5%
CHP bio-mass / hydrogen / waste	247	20.0%	Less bio-mass / more waste than national average	20%
Wind (mainly offshore)	474	38.4%	Less % coastline than national average	35%
Wave / marine	324	26.3%	As for offshore wind	25%
Hydro	10	0.8%	Less hydro than national average.	0
SolarPV	30	2.4%	Better than average potential on commercial buildings in warm climate	5%
Nuclear	10	0.8%	To phase out....	
Bio-diesel	30	2.4%	Residual transport fuel, could link to farm diversification	5%
TOTAL	1233	100.0%		100%

(Source: CURE)

16.4.3. Policy 'wedges – energy supply

The types of policy approaches and programmes that would be needed to achieve these outcomes for energy supply are outlined below:

Proposals in the Energy White Paper 2007:

- 10 year energy strategy for partnership working with Research and Development (R&D) organisations;
- Energy skills programme with Sector Skills Councils and Regional Skill Partnerships;
- Advocacy for the development of critical energy infrastructure;
- Identify opportunities for CHP and power generation heat recovery;
- Local ESCOs for energy production and demand management;
- Community Energy Solutions partnership and social enterprises.

Policy issues – further potential:

- Full scale industrial cluster development for energy technologies sector;
- Partnership investment for industrial ecology integrated energy solutions;
- Procurement for innovation and market transformation in energy supply chain;
- Full carbon markets across all public sector, for integrated energy solutions.

Sub /regional added value:

- Economic development framework for the above;
- Public procurement and contracting for the above;
- Spatial planning policies to facilitate the above.

16.5. Recommendations for the route map

Based on our vision of the types of transformations required (section 16.4), and our quantitative analysis of the scale of change required to meet targets (sections 16.3), we have developed a set of recommendations for the region in the energy supply sector. This is summarised in the table and diagram below. The region's existing progress towards this route map is discussed in the next section (16.6).

Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions). In Chart 16.6, a black border indicates that an action involves lobbying for change at national level or above.

Some of the stabilisation actions listed in the table below form part of 'current policy', but more effective implementation of these policies at local levels is required to achieve targets in this sector.

Recommendations for short-term priority actions are listed in Table 8.1.

Chart 16.6 Energy supply – route map chart

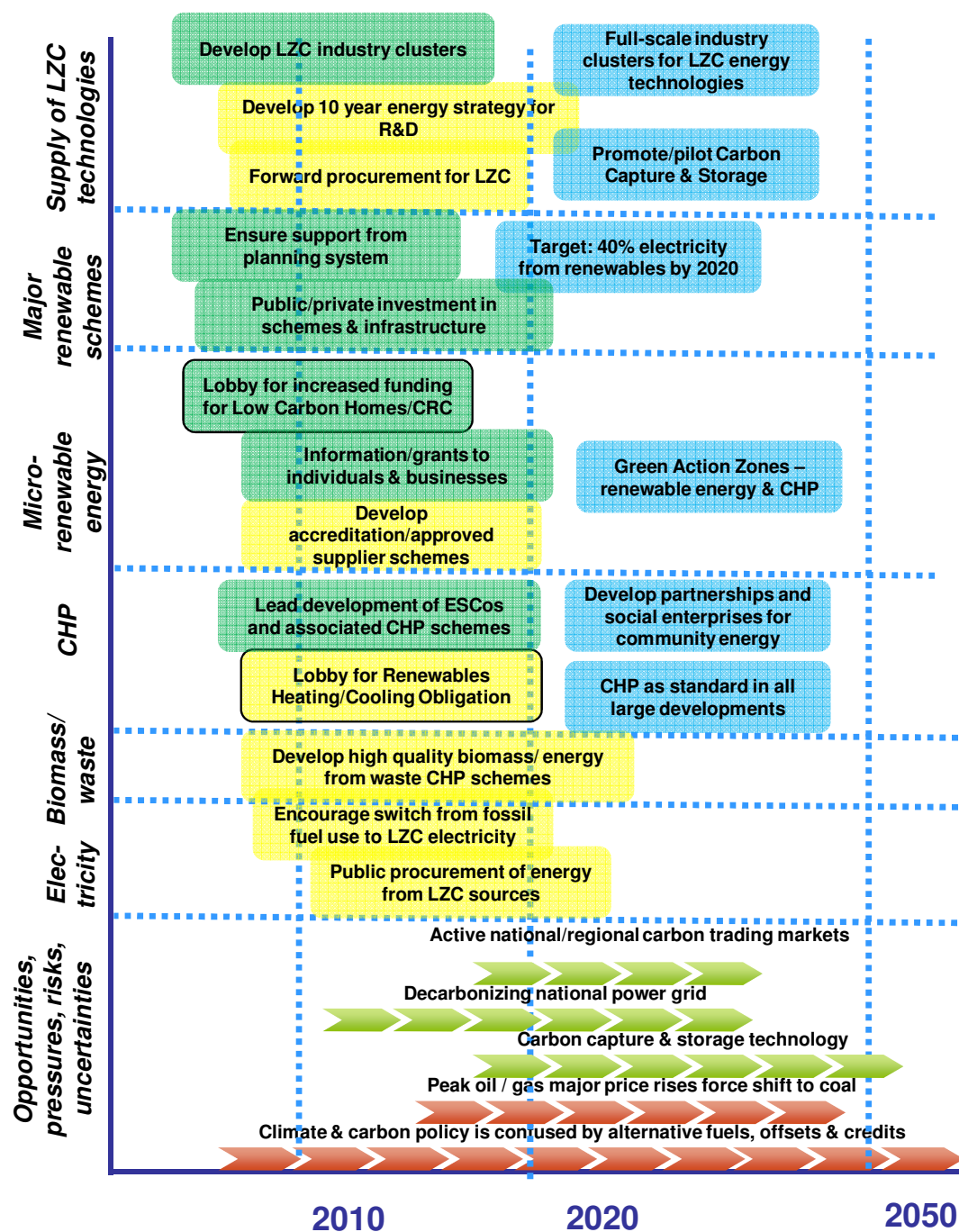


Table 16.3 Energy supply route map

Key: Stabilisation actions; short-term transformation actions; longer term transformation actions

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Promote innovation in the supply of energy from low and zero carbon sources	Support the development of industry clusters for the services, systems and components – for local markets and export Develop 10 year energy strategy for partnership working with R&D Use Forward Procurement to provide the financial security required for technological development of low/zero carbon sources Promote the development of, and possibly piloting of, Carbon Capture and Storage Full-scale industrial clusters for energy technologies sector	SEEDA/Envirobus iness/businesses SEEDA/ partnerships/ businesses SEEDA/ local authorities/ developers SEEDA/ national government SEEDA/ businesses	Moderate Some additional costs and risks, balanced by eventual cost and carbon savings.	Support achievement of renewable energy targets Synergy with economic development objectives and export opportunities
Promote major renewable energy schemes in the region and offshore	Ensure the planning system is supportive of major renewable energy schemes, where appropriate Encourage private and public-sector investment in schemes, and associated infrastructure	The Assembly/ local authorities SEEDA/ local authorities/ businesses	Minimal direct cost – but the relative priority of different environmental objectives needs to be determined where there are	Major contributor to meeting renewable energy targets by 2020.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	Aim for 20% of electricity from renewable sources by 2020, and 40% from renewable sources by 2040		potential conflicts (e.g. onshore wind; some types of biomass)	
Promote micro-generation from renewable sources	Lobby national government for increased grant funding for Low Carbon Homes and incentives (including the Carbon Reduction Commitment, and other carbon quotas) which support investment in renewable energy Provide information on, and supplements to, grants/incentives for investment by householders and businesses in micro-renewables Develop or extend accreditation and approved supplier schemes for renewable energy (e.g. solar; ground-source heat pumps) Develop 'Green Action Zones' area transformation programmes, incorporating renewable energy and CHP	SEEDA/ the Assembly/ Sustainable Energy Partnership/ Climate Change Partnership Local authorities/ utilities/ EST/ Carbon Trust/ Business Link/ Envirowise SEEDA/ Local authorities/ EST SEEDA/ partnerships	Minimal direct cost Potentially significant cost for grants/ subsidies– but economies of scale should reduce costs as take-up increases.	Major contributor to meeting renewable energy targets by 2020.
Promote CHP schemes	Strong leadership for, and investment in, the establishment of ESCOs, local heat distribution networks and associated CHP schemes in both existing and new housing and commercial property – aim for 310MW additional capacity by 2020, compared to 2005.	Local authorities, with SEEDA and energy supply companies	Significant costs, particularly for investment in heat distribution networks in	Major contributor to reducing electricity demand from National Grid, and associated CO ₂ emissions.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	Lobby national government for a 'Renewables Heating/Cooling Obligation', obliging suppliers to source an increasing proportion of heat from renewable sources; and for new planning powers (e.g. a 'Community infrastructure levy') Develop partnerships and social enterprises for community energy solutions (renewable energy and CHP) CHP mains as standard in all large developments	SEEDA/ the Assembly SEEDA/ Local authorities/ communities/EST Local authorities/ developers	existing stock. Minimal direct costs Significant costs, balanced by carbon savings	CHP capacity and local heat/power distribution networks, even if initially using fossil-fuel sources, provide scope for later substitution of renewable energy.
Promote quality biomass schemes	Support development and demonstration of decentralised CHP projects using biomass produced as a by-product from the ongoing management of local woodland.	SEEDA/ local authorities/ utilities	Biomass schemes may conflict with air quality standards in some cases. Avoid using biomass supplies which have a significant land use footprint. (e.g. competing with food production – particularly in developing	Synergy with local woodland management and local economic/ rural development objectives.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
			countries).	
Encourage domestic and other users to switch from gas and oil to electricity	Provide information and/or incentives for households and businesses to reduce direct fossil fuel use and switch to renewables or (renewably sourced) electricity Ensure public/private sector procurement policies include purchase of low/zero carbon energy supplies by organisations and, where appropriate, their suppliers	SEEDA/ local authorities/ EST/ utilities SEEDA/ local authorities/ public sector bodies/ businesses	Modest cost.	Longer term action – benefits will be realised through the decarbonisation of electricity supply

16.6. Progress to date

Considerable efforts are already underway in the region to de-carbonise energy supply and develop decentralised electricity supplies. Examples include:

- Support for businesses involved in the supply chain for renewable energy and CHP (through EnviroBusiness and other SEEDA-supported channels);
- SEEDA's coordination and support for the development of onshore infrastructure in Kent to service the proposed London Array, and future offshore wind schemes in the Thames Estuary;
- Grants for innovative sustainable energy projects via the South East Sustainable Energy Partnership (subject to availability of Defra funding);
- Leading local authorities, the Energy Savings Trust (EST) and Carbon Trust offering grants and advice on micro-renewables to households and businesses;
- Public sector-led initiatives to develop major Combined Heat and Power schemes, ESCos and local heat distribution networks (e.g. Woking, Southampton);
- The establishment of smaller CHP plants using locally sourced woodchips (e.g. Slough CHP; West Dean Estate).

But there remain considerable barriers to faster development of renewable energy sources and CHP, most of them institutional rather than technical. Pilot projects such as Woking's Thameswey Energy have shown that it can be done, but few are following their example. The forthcoming report by TV Energy for SEEDA may shed light on some of the barriers that need to be tackled in the short term, if transformation of the energy supply sector is to become a reality.

16.7. Reference documents

We have used the following documents in preparing the route map:

- South East Plan
- Regional Economic Strategy
- Climate Change Mitigation and Adaptation Implementation Plan
- Energy White Paper, 2007
- Draft Climate Change Bill
- PPS1 – Supplement on Climate Change



- IPPR- 80% study
- CAT study – Zero Carbon Britain
- 2020 VISION – How the UK can meet its target of 15% renewable energy

Fuller references are given in Appendix 3.

17. Food

Key points – food

Food consumption, and its related supply chain, generated 19% of the region's Ecological Footprint in 2003.

But data has recently emerged to suggest that the footprint of this sector has declined slowly in the period 1990-2003, owing to efficiency gains within the food sector. Further declines are predicted in the Current policy scenario, particularly if the WRAP campaign to reduce food waste is successful (see www.wrap.org.uk).

This decline could be accelerated to achieve the medium-term and long-term targets in the Transformation scenario. Greening the farming sector and encouraging low-impact diets would be two key actions to achieve these targets. Reductions in the footprint of food consumption could be offset against Ecological Footprint increases in other sectors that are less amenable to regional influence (e.g. goods and services).

There are significant gaps in terms of the current level of understanding of what constitutes 'low carbon food' or 'low impact food', both nationally and within the region. Locally produced and organic food may be lower impact, but this depends on the production and transport methods used. Similarly, seasonal and low-meat foods tend to be lower impact, but research is needed at a national or international level to define which types of food products and which production methods are really 'low impact'.

The promotion of 'low footprint diets' or 'low carbon diets' would require the communication of new messages to consumers (e.g. the health and environmental benefits of eating 'less but better' meat). These messages would need to take into account not only Ecological Footprint concerns, but also issues related to rural development and landscape management within the South East, and issues relating to international development and fair-trade overseas.

The structure of this section is as follows:

- Definitions and boundaries;
- Where are we heading?
- What type of transformation is required?

- How can we reach the targets?
- Recommendations for the route map;
- Progress to date;
- Reference documents.

17.1. Definitions and boundaries

17.1.1. Defining the food sector

In examining the supply and demand of food within South East England, the types of issues that need to be considered include:

Demand side factors:

- Consumer choice: meat or vegetable-based; organic or processed; local or globally produced;
- Ancillaries: soft drinks and alcohol;
- Diet and health (includes retail and consumer issues, distribution and so on);

Supply side factors:

- Agriculture and primary production (includes forestry, fisheries and so on);
- Food supply chain (including food and drink processing; logistics; packaging; waste);
- Food delivery: particularly for the catering and tourism sectors;

Related issues:

- UK imports and overseas development;
- World food resources and depletion;
- Competition with biofuels production;
- Non-food outputs of agriculture, forestry and fishing.

17.1.2. Modelling the food sector

The impact of food consumption is modelled by REAP only, in terms of Ecological Footprint. Food impacts are not analysed separately in the REEIO model. The 'food' component of the Ecological Footprint incorporates the consumption of food and drink in the home as well as the purchase of alcoholic beverages. It includes restaurant meals, catering and take-away meals – where these are purchased by consumers. It does not include hospital and school meals which are provided within institutions: these are classified under private or public services.

REAP measures the material and energy use associated with food consumption through the supply chain. This is sometimes described as from 'farm to fork' and includes the impacts associated with farming, processing, packaging and freight distribution (food miles).

REAP can distinguish the Ecological Footprint associated with 15 broad categories of food and drink. It is possible to show the impact of meat compared to fruit but not lamb compared to beef, or packaged apples compared to loose apples. Until the evidence improves, REAP makes no distinction between local and non local food. A food product produced in the UK is assumed to have the same impact as one produced in Spain or China.

Some studies have looked at the supply chain impacts of food at a greater level of detail but often they are not comparable. Different studies take into account or define the supply chain in different ways. Additionally, the complexity of food supply chains makes impacts difficult to trace. REAP uses a standardised approach which models the entire supply chain for each product group.

Cooking and food shopping activities are generally accounted for in the domestic energy and transport components of the Ecological Footprint (which are presented in Chapters 14 and 15). Food waste is considered only in the sense that it affects the quantities of food purchased. Waste issues are considered in more detail in Chapter 19.

17.2. Where are we heading?

Current situation

Food makes up one of the largest components of the Ecological Footprint in the South East and the UK as a whole (about 19% of footprint in 2003). A recent Cabinet Office Discussion Paper described existing patterns of food production as 'not fit for a low-carbon, more resource constrained future'. Particular issues are:

- **Meat consumption:** This is increasing, both in the UK and globally. Animal protein consumption, per person per day, has increased by 11% between 1990 and 2005/6. Vegetable protein consumption has also increased by about 5% over this period. In 2005/6 about 60% of protein in the diet came from animal sources and 40% from vegetable. (Source: Defra/ONS statistics);
- **Food waste:** An estimated 6.7 million tonnes of household food waste is produced each year in the UK. A recent WRAP study estimated that the edible food thrown away by households equates to between £250 and £400 a year. WRAP figures suggest people throw away one sixth (17%) of all edible food. The latest research indicates that salads, fruit, cooked meat, bread and milk are the most likely food stuffs to be wasted;
- **Diet:** Obesity levels are rising quickly in the UK. But the UK is slowly moving towards its 5-a day targets. In 2005/06 fruit and vegetable purchases showed an increase of 13% since 1990 and 9% since 2001/02; and
- **Local food:** About 40% of food consumed by residents in the South East is produced in the UK. But REAP does not have enough evidence to assume that local food is lower impact than non-local.

17.2.1. Predictions on Ecological Footprint

REAP assumptions – food

For the **Reference scenario**, we extrapolate past trends in the Ecological Footprint of the food sector. This implicitly assumes that past trends in policies, efficiency gains and consumer choices will be continued, within the UK and elsewhere.

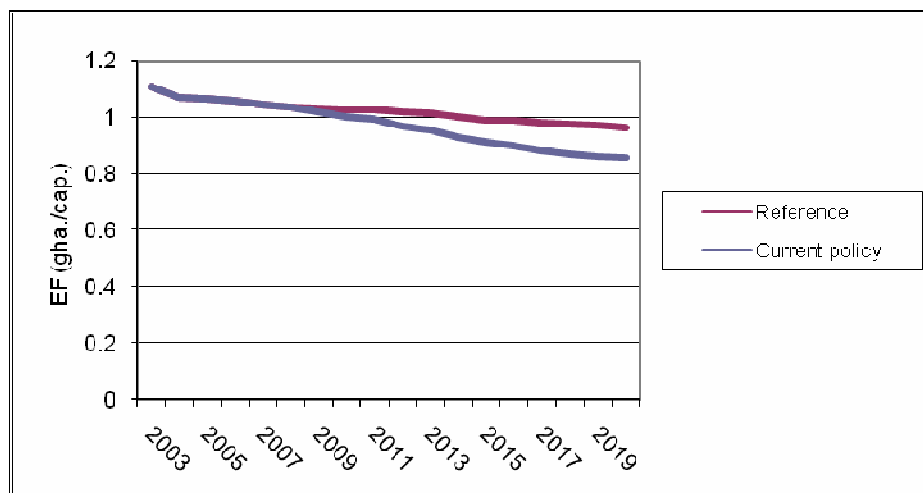
In the **Current policy scenario**, we assume that the WRAP campaign to reduce food waste will continue, in spite of recent funding cuts, and that targets for the UK will be met through action in the South East. We assume that a reduction in food waste equals a reduction in food items being bought.

Based on WRAP's 2008 target and the amount of food waste produced each year, we assume that continuation of the campaign will lead to a 1.5% reduction a year in consumption of the following items from 2008 up to 2018: fruit, vegetables, bread, meat and dairy. This equates to a 15% reduction over a ten year period for these items. In other respects the Current policy scenario is unchanged from the Reference scenario.

As Chart 17.1 illustrates, there is a slight downward trend in both the Reference and Current policy scenarios, in spite of the increasing trend in meat consumption. This appears to be due to efficiency gains within the food sector:

- Over the period from 2003-2020 the footprint of food consumption is predicted to decrease by 13% in the Reference scenario. This is equivalent to a decrease of about 0.8% per year;
- From 2003 to 2020 the Current policy scenario is predicted to reduce the footprint of food consumption by 23%, equivalent to 1.5% per year. This is due to reduced food waste in this scenario.

Chart 17.1 Ecological Footprint of Food - Reference and Current policy scenarios



(Source: REAP, Stockholm Environment Institute)

17.2.2. Commentary on 'where are we heading'

The Ecological Footprint for food consumption has declined slightly since 1990, probably owing to efficiency gains in production and distribution, and is predicted to continue declining. If WRAP's campaigns to reduce food wastage are successful, this decline would speed up slightly to about 1.5% per year between 2003 and 2020.

Significantly stronger policies would be required to meet the Ecological Footprint reduction targets in the Transformation scenario. These are discussed in the next section.

17.3. How can we reach the targets?

We have used the REAP model to examine 'transformation' of the food sector in more detail. The aim has been to examine what scale of policy change would be needed to stabilise the footprint or achieve the medium-term and long-term targets for Ecological Footprint reduction.

This section sets out the assumptions and findings for the Ecological Footprint under the Transformation scenario. We have not been able to predict CO₂ emissions for this scenario as REAP does not explicitly model the impacts of food production.

17.3.1. Reaching the targets – Ecological Footprint

Stabilisation target

The trend data on the region's Ecological Footprint, which has only recently been available from REAP, shows that the target of stabilising the region's Ecological Footprint has already been achieved in the food sector. The footprint of food has been declining slightly in recent years and is predicted to continue declining under the Current policy scenario. Further Ecological Footprint reductions in this sector could be offset against footprint growth in other sectors which are less amenable to influence (e.g. goods and services).

But stronger policies on food are needed to meet the medium and long-term reduction targets in the Transformation scenario.

Reduction targets

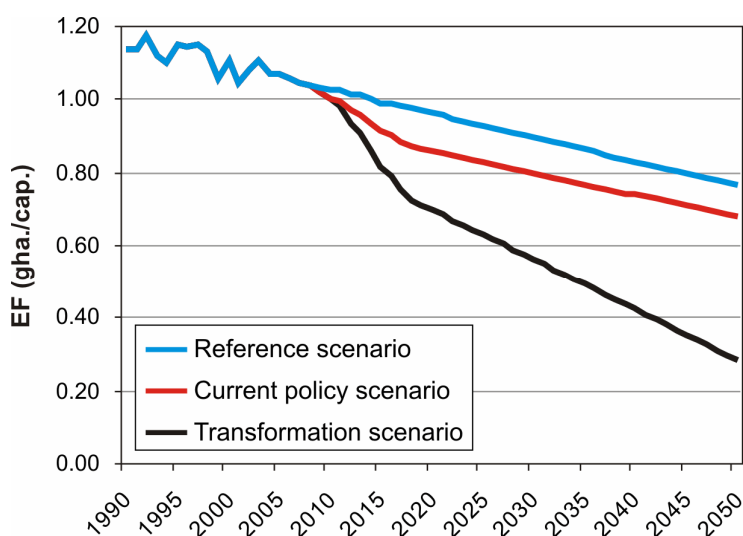
REAP assumptions

In the Transformation scenario, we assume the following policy interventions along the supply chain, accompanied by significant changes in consumer attitudes and behaviour:

- **Green farming:** we assume that farmers will move to onsite renewable energy, and that this will account for 80% of the agricultural energy mix by 2050;
- **Efficient food sector:** we project an increase in efficiency of the food and drink sector and the catering industry of 2% a year from 2010 onwards;
- **Low carbon diet:** we assume that meat consumption is halved and that the consumption of dairy products is reduced by one third, as these are generally high-carbon foods;
- **Low waste households:** we assume that minimisation of food waste in the home reduces the amount of food items purchased by between 15 and 25%.

The combined impact of these measures is predicted to reduce the Ecological Footprint of food by just over 30% between 2010 and 2020, and just over 40% between 2010 and 2030.

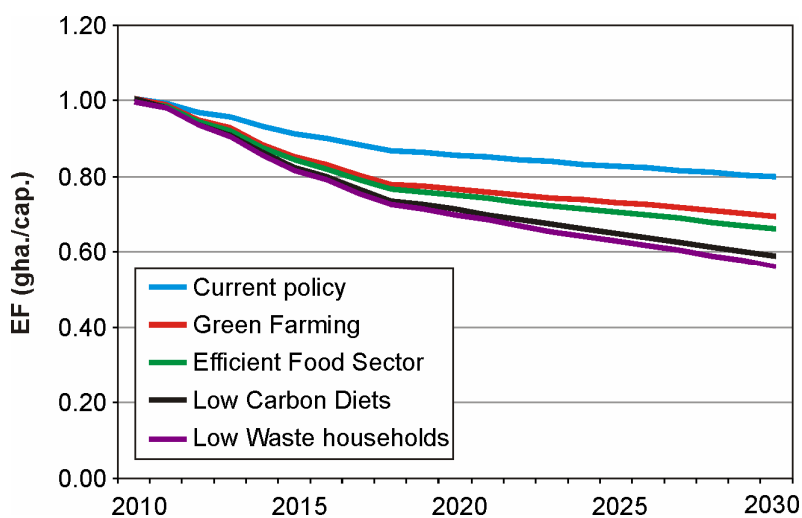
Chart 17.2 Ecological Footprint of food consumption



(Source: REAP, Stockholm Environment Institute)

Further analysis of the differences between the Current policy scenario and Transformation scenario suggests that the greatest savings would be generated by initiatives on Green Farming (e.g. renewable energy use on farms) and Low Carbon Diets (e.g. lower meat and dairy consumption) (as shown in Chart 17.3).

Chart 17.3 Ecological Footprint of food in the Transformation scenario



(Source: REAP, Stockholm Environment Institute)

17.3.2. Commentary on 'reaching the targets'

Achieving significant reductions in the Ecological Footprint of food consumption should be feasible, given that this footprint is already declining slightly. But the types of policies that would achieve this require the promotion of sustainable energy in the farming sector, and the integration of 'low impact food' into healthy eating campaigns.

Further information is required to clarify what is meant by 'low impact food', as there is great scope for customer confusion. For example:

- When does 'local' mean 'low impact'?
- Does 'organic' farming have a greater or lesser footprint than high-input farming, given the lower yields obtained?
- Do some types of meat (e.g. chicken and game) have a lower footprint than others?

While there have been some studies on these issues, further research is needed to provide consistent, reliable evidence.

17.4. What would transformation involve?

This section explores some of the issues and uncertainties underlying transformation of the food sector, and then sets out policy outcomes and policy options for transformation.

17.4.1. Issues and uncertainties

Regional public bodies will need to decide on the priority for food and farming issues, in the context of overall climate/footprint objectives alongside rural, landscape and public health issues. Some of the issues include:

Policy

- Is food a valid theme for regional governance, from the viewpoint of the local economy, public health and footprint?
- Should UK farming diversify into niche areas?
- Will biofuels continue to displace food production on world markets?

Economy

- Will world food prices continue to rise, as biofuels displace food production?
- If so, how will suppliers react (e.g. by intensifying supply or by extending farming land)?

- Should or would consumers pay more for healthy, low impact or fair trade food and drink?

Technology

- What are the true life cycle effects of meat versus vegetarian choices; organic versus technological production and local versus imported products?
- How will the effects of climate change influence food production in the longer term, within the region, within the UK and elsewhere?
- Will genetic modification and precision farming provide the step change in efficiency required to meet growing world demand for food?
- Should we rely more on imports, or favour local and regional farming?

The types of policy outcomes envisaged in the Transformation scenario, and the policy programme groups required to deliver them, are outlined below under the following headings:

- International trade and development;
- Farming and rural development;
- Food supply chain; and
- Demand side.

17.4.2. International trade and development

Policy outcomes:

- Low impact production and logistics;
- Contribution to overseas development;
- Fair trade and ethical investment programmes.

Policy 'wedges' – International trade and development

Potential policy programmes or 'wedges' within the South East could include:

- Public procurement and contracting;
- Incentives for retailers and distributors.

17.4.3. Farming and rural development

Policy outcomes:

- Energy efficiency in farming;
- Decarbonisation of energy supply;
- Reduction in non-CO₂ Greenhouse gas emissions from farming practice.

Policy 'wedges' – farming and rural development

At national and regional level, these outcomes could be progressed through:

- Extension of Stewardship schemes; and
- Low impact farming programmes.

Regional and sub-regional bodies can particularly add value in linking these policies with rural diversification, tourism and other rural development policies.

17.4.4. Food supply chain

Policy outcomes:

- Energy efficiency in production, packaging, logistics;
- Decarbonisation of energy supply.

Policy 'wedges' – food supply chains

National and regional initiatives could include:

- Low impact food chain programmes, in partnership with producers, suppliers, distributors and retailers; and
- Public procurement for low impact food.

Again, there is scope to link regional and sub-regional policies to those concerned with rural diversification, tourism and other rural development policies.

17.4.5. Demand side

Policy outcomes:

- Shift from meat to vegetarian, or low-meat, diet;
- Shift from processed to fresh, local and seasonal products.

Policy 'wedges' – demand side

These shifts could be achieved through the following types of initiative at national, regional and sub-regional level:

- Healthy eating programmes;
- Public procurement for low impact food.

The region and sub-regional bodies can particularly add value in linking these policies with the health and education sectors, and creating a holistic approach to 'healthy, low-impact eating'.

17.5. Recommendations for route map

Based on our vision of the types of transformations required (section 17.4), and our quantitative analysis of the scale of change required to meet targets (section 17.3), we have developed a set of recommendations for the region in the food sector. This is summarised in the table and route map chart below. The region's existing progress towards this route map is discussed in the next section (17.6).

Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions). In Chart 17.4, a black border indicates that an action involves lobbying for change at national level or above.

Recommendations for short-term priority actions are listed in Table 8.1.

Chart 17.4 Food – route map chart

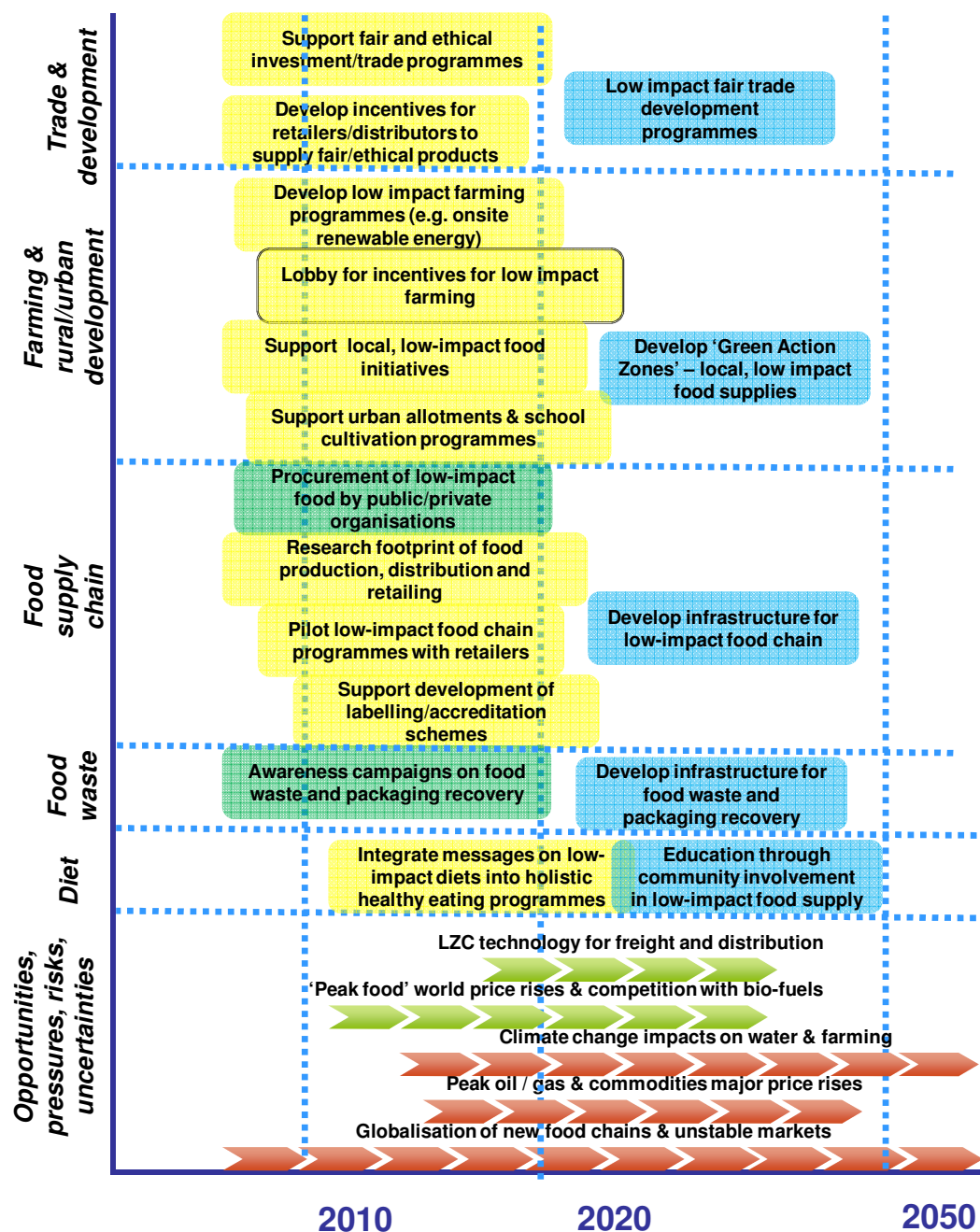


Table 17.1 Food route map

Key: **Stabilisation actions;** **short-term transformation actions;** **longer term transformation actions**

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Reduce the adverse impacts of food-related trade and development	Support fair and ethical investment/trade programmes Provide incentives for retailers and distributors to supply fair trade/ethical products Establish low-impact fair trade development programmes	SEEDA/ retailers/ distributors/ local authorities	Potential tensions between low carbon and international development objectives (e.g. local sourcing means less trade for developing countries)	Ethical trade and investment are consistency with One Planet Economy principles
Promote synergies between low impact farming and rural development/ urban regeneration	Develop/support low impact and climate-friendly farming programmes (e.g. onsite renewable energy) Lobby national government for incentives/ support for low impact farming (including Stewardship schemes) Support local and regional farmers markets and food chains, where these promote both rural development and footprint reduction objectives Support urban allotments and school cultivation programmes – linked to behaviour change initiatives	SEEDA/ Defra/ Sustainable Energy Partnership/ SE Rural Partnership SEEDA/ local authorities/ SE Food Group Partnership SEEDA/ local authorities/ regeneration and	Potential tensions between different environmental objectives (e.g. organic farming is low impact in certain respects, but tends to have lower yields and therefore a greater 'real	Potentially significant effect on food footprint. These initiatives would also promotes regional rural development and farming opportunities.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	Develop 'Green Action Zones – area transformation for low footprint living	education partnerships	land' footprint than conventional farming)	
Reduce the impact of the food supply chain	Encourage procurement policies, for public and private-sector bodies, focusing on low impact food Research the contribution of local food initiatives to footprint/carbon reduction objectives Support and pilot low impact food chain programmes, with both large and smaller retailers Support the development and demonstration of labelling schemes for consumers, based on carbon content and/or footprint Develop infrastructure for low-impact food production, distribution and retailing	SEEDA/ NHS/ local authorities/ Carbon Trust/ Envirowise SEEDA/SE Food Group Partnership SEEDA/ Leaf Marque campaign SEEDA/ food industry SEEDA/ food industry	Budgetary constraints are tight – emphasise the scope for using 'less but better' The feasibility of labelling schemes is not yet clear – there is a trade-off between simplicity and accuracy. Potentially significant cost.	Leadership role for the regional bodies. These initiatives would help to fill information gaps about the Ecological Footprint of the food supply chain. Potential benefits to rural economy.
Reduce food waste by households, businesses and public organisations	Run awareness raising and education campaigns on food waste and package recovery, as part of behaviour change work Develop infrastructure for food waste and packaging recovery	SEEDA/WRAP/ local authorities/ public bodies/ Carbon Trust/ Business Link	Moderate cost Potentially significant cost.	Significant effect on food footprint. Potential benefit through reduction in waste disposal.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Promote behaviour change towards low-impact, healthy diets	Integrate messages on low-impact diets into holistic healthy eating programmes Education through community involvement in low-impact food supply	SEEDA/ National Health Service/ local authorities Local authorities/ communities	Moderate cost, as part of behaviour change work	Low-impact diets could be a major influence on food footprint.

17.6. Progress to date

Considerable efforts are already being made, within the region and at national level, to promote more sustainable and local food sources. Some of these are clearly supportive of efforts to reduce the Ecological Footprint of the food sector, while others generate local economic benefits but are not yet supported by evidence to demonstrate that they reduce the sector's footprint:

Food Waste

- WRAP and its partners are running a national 'Love Food Hate Waste' consumer campaign to encourage behavioural change. WRAP's aim is to reduce consumer food waste by 100,000 tonnes by March 2008 and new targets are currently being drawn up for 2011;

Diet

- The Government promoting the '5 a day' campaign, and is taking action to tackle increasing obesity;
- The South East Food and Health Action Plan, led by GOSE, includes a commitment to support the 'food economy' of the South East by reducing food miles, increasing local markets and reconnecting consumers with the food chain;

Local food

- The South East Food Group Partnership is leading initiatives to improve supply chains linking local producers to consumers in the South East and London. Examples include 'Hampshire Fare' which has successfully established links between local food producers and procurers for local schools and, increasingly, local hospitals. While this has strong benefits for the local economy and for landscape management, we do not currently have the information to assess whether these initiatives tend to reduce the footprint of food consumption;
- The Carbon Trust is developing a carbon footprint labelling scheme which examines energy use not only in transport but also in production (e.g. heated glasshouses, inputs), processing and packaging; and
- The 'LEAF marque' campaign is promoting local, low-impact food to supermarket and other buyers within and beyond the South East.

There are significant gaps in terms of the current level of understanding of what constitutes 'low carbon food' or 'low impact food', both nationally and within the region. Some of the strategies for reducing food impacts would require communication of new messages to consumers (e.g. the health and environmental benefits of eating 'less but better' meat). These messages would need to take into account not only Ecological Footprint concerns, but also issues related to rural development and landscape management within the South East.

17.7. Reference documents

We have used the following documents in preparing the route map:

- South East Food and Health Action Plan
- SE Rural Development Framework (SE Rural Partnership)
- Delivery Plan – Farming and Food: Our Healthy Future (GOSE, SEEDA)
- Public Sector Food Procurement (Defra, 2006)
- Food Industry Sustainability Strategy (Defra, 2006)
- Understanding Food Waste
- UK fruit and vegetable consumption
- Food: an analysis of the issues
- Food Climate Research Network

Fuller references are given in Appendix 3.

18. Goods and services, public services and capital investment

Key points – goods and services, public services and capital investment

Consumption-side

Goods and services consumed by residents in the South East represented 25% of the region's Ecological Footprint in 2003. Public services and capital investment represented a further 24% of the region's footprint. These categories together make up nearly 50% of the region's footprint. Their footprint has increased significantly over the period 1990-2003. These are clearly areas that must be tackled if the overall Ecological Footprint is to be stabilised and reduced. But this is a difficult issue, as many of the goods and services consumed within the region are produced elsewhere in the UK or overseas.

Reversing the current upward trend in the Ecological Footprint of goods and services will require radical action. The REAP Transformation scenario for goods and services requires a long-term energy or resource efficiency gain of 5% per annum for this consumption sector. REAP also requires a 4% efficiency gain per annum in the impact of national and local public services and capital investment. These gains will need to be achieved primarily through changes in consumption and procurement patterns, as many of the goods and services are produced outside the region. Influencing consumption to this degree will be a great challenge. This may be achievable if supported by national/international incentives such as carbon quotas or taxes. Without such support, it may be more realistic to aim initially for stabilisation rather than reduction in this sector, while pursuing greater savings in other sectors.

Production-side

Looking at production within the region, industry and commerce represented about 16% of the region's direct CO₂ emissions in 2005. These emissions are fairly stable. The implementation of energy efficiency measures and the decline of manufacturing will tend to decrease emissions, but GVA growth will have the opposite effect.

Again, more action is needed if emissions are to decline rather than simply stabilise. Efficiency gains of about 5% per annum are again required to meet reduction targets for CO₂ emissions from industry and commerce in the region. While still demanding, this should be more achievable given that the relevant production activity is within the region, and that there are emerging incentives for efficiency gains (e.g. the Carbon

Reduction Commitment). The 'Diamond' groupings of local authorities offer important opportunities for progressing innovative work with commerce and industry.

The structure of this section is as follows:

- Definitions and boundaries;
- Where are we heading?
- What type of transformation is required?
- How can we reach the targets?
- Recommendations for the route map;
- Progress to date;
- Reference documents.

18.1. Definitions and boundaries

Under this theme, we consider the impact of the consumption and production of goods and services which are not included in the other themes (which are transport; built environment; energy supply; food; waste; and water). This section considers:

- Services provided by national, regional and local government;
- Capital expenditure, where this has not been allocated to a specific consumption category;
- Other goods and services purchased by consumers.

There is a major difference between the profile of goods and services consumed by the region (or for our purposes, by the region's residents) and those produced by the region. At present, the degree of overlap between local consumption and local production (i.e. the proportion of local production that is consumed within the region) is simply not known. Research into this issue would require the development of regional 'Input-Output' tables. These do not currently exist: the models used in this study both use national-level Input-Output tables.

Boundary questions are crucial, and we need to track several accounts:

- Industrial production and services activity within the region – the wider economy (measured via the REEIO model);
- Product supply chains which end up with the household consumer (REAP model);

- Public services which are consumed within the region (REAP model);
- Consumer services which are increasingly globalised, such as tourism, media, finance and so on. (REAP model).

18.2. Where are we heading?

Current situation

Looking first at the region's household consumption, the goods and services consumed by residents in the South East represented 25% of the region's Ecological Footprint in 2003. Public services and capital investment represented a further 24% of the region's footprint. So these categories together make up nearly 50% of the region's footprint. Both of these categories have increased significantly over the period 1990-2003.

Now looking at the wider economy within the region, industry and services represented about 16% of the region's direct CO₂ emissions in 2005. This does not include emissions from power generation (which are discussed in Chapter 16 on Energy Supply) or those related to fuel processing activities.

18.2.1. Predictions on Ecological Footprint

We have analysed of the Ecological Footprint of goods and services consumed within the region, using REAP. Many of the goods and services are produced outside the region, or indeed outside the country. The consumption-based Ecological Footprint includes the impact of, say, manufactured goods that are produced in China but consumed by residents of South East England.

The Ecological Footprint of goods and services consumed by the South East is increasing steadily, as incomes and wealth rise within the South East. It rose from 1.17 gha/capita in 1990 to 1.60 gha/capita in 2003, an increase of 36%. Similarly, the footprint of public services and capital investment rose from 0.98 gha/capita in 1990 to 1.35 gha/capita in 2003, an increase of 38%.

The economic assumptions outlined in Chapter 13, as contained within the Regional Economic Strategy, assume that both GVA and incomes within the region continue to grow. Trends in the footprint of this sector are likely to be strongly linked to incomes and – unless there is a recession – will continue to rise.

It is difficult to estimate the future production efficiency of goods and services imported from other countries, which make up a significant proportion of this footprint. Action

by the South East region can only influence this through purchasing policies and consumer preferences.

Public services are more amenable to influence, particularly those at regional and local level. Procurement policies and service-level efficiencies can offer scope for Ecological Footprint reduction, but there is not yet clear evidence that current policy represents a significant change in activity level from recent years, which is already incorporated into the Reference scenario.

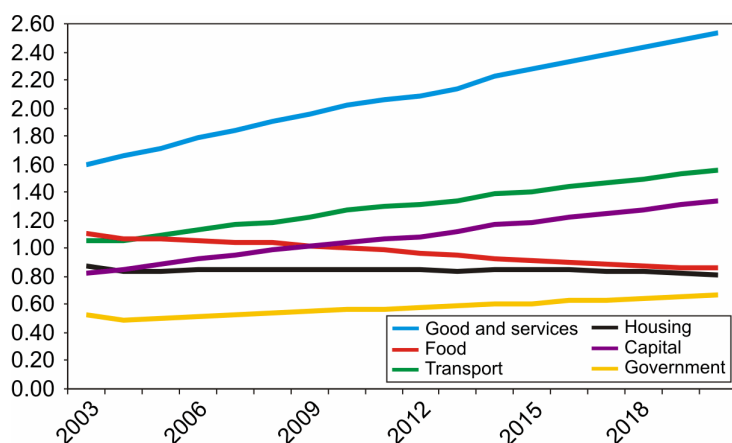
REAP Assumptions – goods and services, public services and capital investment

We have therefore assumed, in both the Reference scenario and the Current policy scenario, that past trends in footprint growth are continued. Both of these scenarios assume that the Ecological Footprint of goods and services consumed in the region will grow from 1.6 gha/capita in 2003 to 2.5 gha/capita in 2020. This represents an increase of 2.5% per year and a total increase of 117% above the 1990 level.

Similarly, we have assumed that the Ecological Footprint of public services and capital investment will continue to grow, from 1.35 gha/capita in 2003 to 2.00 gha/capita in 2020. Again, this is an increase of 2.4% per year: the footprint of this sector is predicted to double between 1990 and 2020.

Chart 18.1 Ecological Footprint of goods and services, public services and capital investment

(Projections for both the Current policy and Reference scenarios)



(Source: REAP model, Stockholm Environment Institute)

18.2.2. Predictions on CO₂ emissions

On the production side, we have estimated territorial CO₂ emissions from the production of goods and services by commerce and industry in the South East, using the REEIO model. We have not used REAP to make projections of Ecological Footprint in this case, because the REAP footprint measure is not production-orientated.

The region has more potential influence on the local production of goods and services than on consumption of goods and services from elsewhere. We distinguish below between the Reference scenario, which would involve little new regional action, and the Current policy scenario, in which current policies contained in the national Energy White Paper (EWP, 2007), the RES and South East Plan are successfully implemented.

REEIO assumptions – industry and commerce

The **Reference scenario** represented in REEIO adopts trends for energy efficiencies by different types of fuel users and possible changes in energy mix nationally as forecast by CE in 'UK Energy and the Environment', July 2007. In summary:

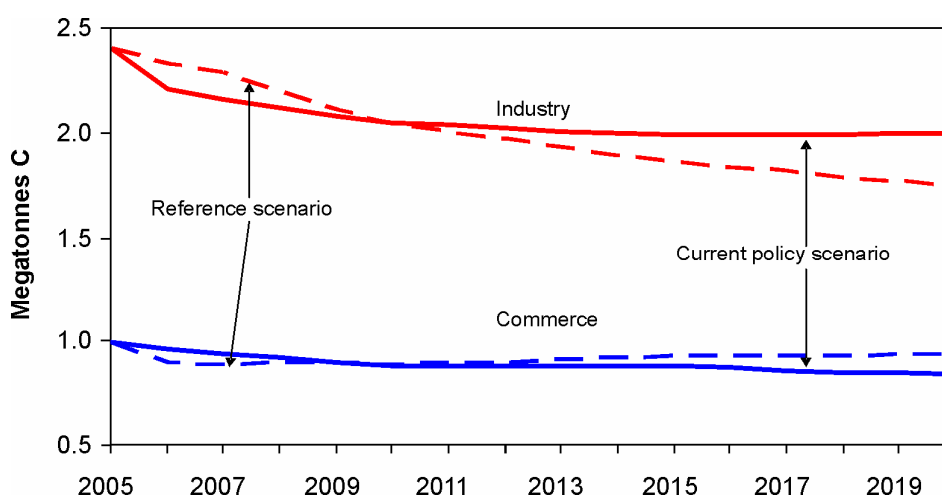
- Most industries are expected to achieve strong reductions in the energy-intensity of output. For some energy-intensive sectors, such as mineral products and rubber and plastics), these rates could be as high as 3.5-5.5% pa;
- In the period to 2015 services are expected to achieve smaller reductions in the energy-intensity of output than are manufacturing sectors, although rates of improvement are expected to quicken in the longer term;
- There is expected to be a modest shift from the use of gas to the use of electricity by most sectors over time.

The basis for the **Current policy scenario** is achievement of the trends in energy use proposed in the Energy White Paper. The impact is mainly seen in the less energy-intensive sectors such as services and households. In summary, the energy efficiency by commerce improves by 2.5-4% pa rather than 2-2.5% pa in the Current policy scenario.

Chart 18.2 shows the projected CO₂ emissions from general industry and commerce under the two scenarios. While the Ecological Footprint of the consumption of goods and services is rising strongly, the emissions profile of industry and commerce within the region is fairly stable. This reflects the increasing tendency for manufactured goods to be imported from elsewhere, or from other UK regions, rather than produced within the region.

In the Reference scenario CO₂ emissions from industry can be expected to follow a clear downward trend, with levels in 2020 some 25-20% below the 2005 level. In contrast emissions from services fall only marginally. The fall in emissions from industry reflects the downward trend expected in energy use by the sector due to the relatively weak growth prospects in manufacturing and the strength of energy efficiency trends that could be expected. In contrast, the smaller fall in emissions by services is despite a slight increase expected in the sector's energy needs, reflecting the increasing importance of electricity as a fuel source that is expected in some key sectors.

Chart 18.2: CO₂ emissions by industry and commerce in the Reference and Current policy scenarios



(Source: REEIO model, Cambridge Econometrics)

In the Current policy scenario, the higher levels of economic activity among industry sectors results in higher energy demand than in the Reference scenario, despite the increased rates of energy efficiency. This in turn results in higher levels of CO₂ than in the Reference scenario. Indeed, in the long term it is possible that the higher levels of activity would be sufficient to prevent further falls in CO₂ emissions from the sector. The overall impact is that by 2020 CO₂ emissions from industry are higher than in the Reference scenario (but still lower than in 2005).

In contrast, the stronger energy efficiency trends in the Current policy scenario for commerce are sufficient to offset the effects of the stronger economic growth so as to establish a sustained long-term decline in emissions from the sector (albeit it at a modest rate). By 2020 emissions from services are 10% lower than in the Reference scenario.

18.2.3. Comments on 'where we are headed'

The Ecological Footprint for regional consumption of public services, capital investment and other goods/services is rising steadily. Together, these sectors represent a significant proportion of the region's Ecological Footprint (nearly 50% in 2003). These are clearly areas that must be tackled if the overall Ecological Footprint is to be stabilised and reduced. But this is a difficult issue, as many of the goods and services consumed within the region are produced elsewhere in the UK or overseas.

CO₂ emissions from industry and commerce within the region are more stable. Factors tending to decrease emissions from these sectors are the implementation of energy efficiency measures and the decline of manufacturing. But in the Current policy scenario, these factors are largely counteracted by stronger GVA growth, to meet the targets set by the RES. Again, more action is needed if emissions are to decline rather than simply stabilise.

The next section examines what could be done to achieve reduction targets in both the Ecological Footprint and CO₂ emissions.

18.3. How can we reach the targets?

We have used the REAP and REEIO models to explore how the long-term 'transformation' targets for the production and consumption of goods and services could be met. We have assessed the scale of policy change needed to stabilise the Ecological Footprint, and to achieve the medium-term target of reducing the Ecological Footprint and CO₂ emissions by 30% by 2020, and the long-term transformation target of reducing both these impacts by 80% by 2050. This section sets out:

- Assumptions and findings for the Ecological Footprint under Transformation;
- Assumptions and findings for CO₂ emissions under Transformation;

The types of policy changes involved in Transformation are discussed in more detail in the next section.

18.3.1. Reaching the targets – Ecological Footprint

Stabilisation target

Stabilisation of the Ecological Footprint for this sector would require current growth to be constrained i.e. a reduction in impacts of 2.4-2.5% per year. Some of this might be achieved by general efficiency gains in industry and commerce, both within and outside the South East. But some will require changes in consumption patterns by individuals,

businesses and government bodies in the South East. The three main types of initiatives that would be needed to stabilise this aspect of the footprint would be:

- Incentives and accreditation/labelling schemes to inform and encourage low-impact consumption and production choices;
- Widespread awareness-raising campaigns and behaviour change programmes, including support for community-led initiatives;
- Low impact procurement by the public sector and its suppliers (discussed further in Chapter 13 above).

More radical policies would be required to reduce, rather than stabilise, these aspects of the region's Ecological Footprint.

Reduction targets

Major changes in consumption patterns or production efficiencies are required to reduce the Ecological Footprint of goods and services, public services and capital investment to the extent required in the Transformation scenario – the current upward trend needs to be stabilised and then reversed.

REAP assumptions – transformation of goods and services, capital investment and public services (consumption)

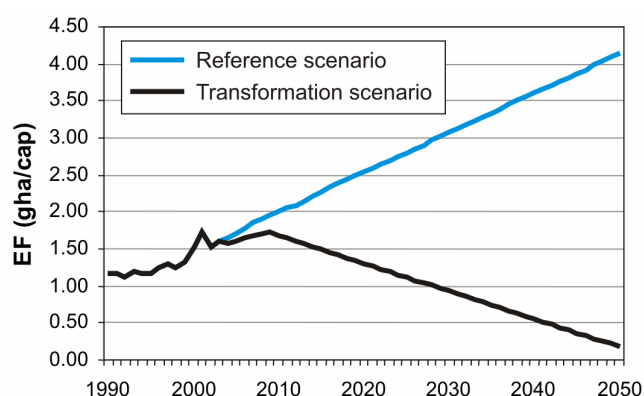
We have assumed that there would be a 5% increase in resource efficiency per year in the production of goods and services across the global economy, from 2010 onwards. A similar transformation could be achieved through a combination of reducing consumption and improving resource efficiency. This is an extremely ambitious level of change, similar to that envisaged for the REEIO Transformation scenario after 2015 (see below). But this is the level of change required to meet the targets. Policy options to achieve this type of change are outlined in the next section.

The Transformation scenario also examines the scale of change required for the footprint of public services to be 80% below 1990 levels by 2050. This equates to a footprint reduction of nearly 4% a year between 2010 and 2050.⁵⁰ This could be achieved through energy and resource efficiency measures in operations, as well as the development of procurement standards for the carbon intensity of goods and services purchased.

In the Transformation scenario for capital investment, the footprint needs to reduce by about 4% a year. There are no direct measures that can be used to influence this but reductions would reflect general efficiency improvements in the structure of the economy.

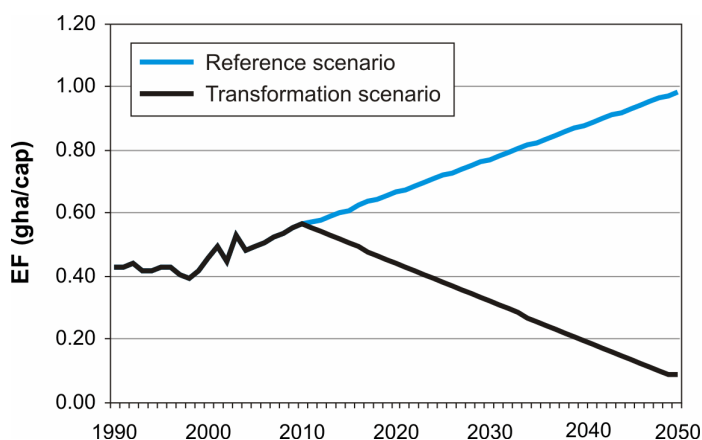
The following charts illustrate the scale of change needed to reverse current upward trends, and reduce the footprint of these sectors by 4-5% per year between 2010 and 2050. Chart 18.3 presents projections for the footprint of goods and services, while Chart 18.4 presents similar projections for public services and capital investment.

Chart 18.3 Ecological Footprint of goods and services – Transformation scenario



⁵⁰ This annual decrease is calculated in geometric terms, keeping the rate of change (rather than the absolute decrease) constant over the period 2010-2050.

Chart 18.4 Ecological Footprint of public services and capital investment – Transformation scenario



(Source: REAP model, Stockholm Environment Institute)

18.3.2. Reaching the targets – CO₂ emissions

Stabilisation target

CO₂ emissions from industry and commerce within the region are predicted to be fairly stable. Slight increases or decreases are predicted, depending on the level of economic growth and the speed with which energy efficiency measures are implemented within these sectors. But essentially, successful implementation of current policy (including Energy White Paper measures such as the Carbon Reduction Commitment) can be expected to stabilise these emissions. Further action would be required to meet reduction targets.

Reduction targets

REEIO assumptions – industry and commerce (production)

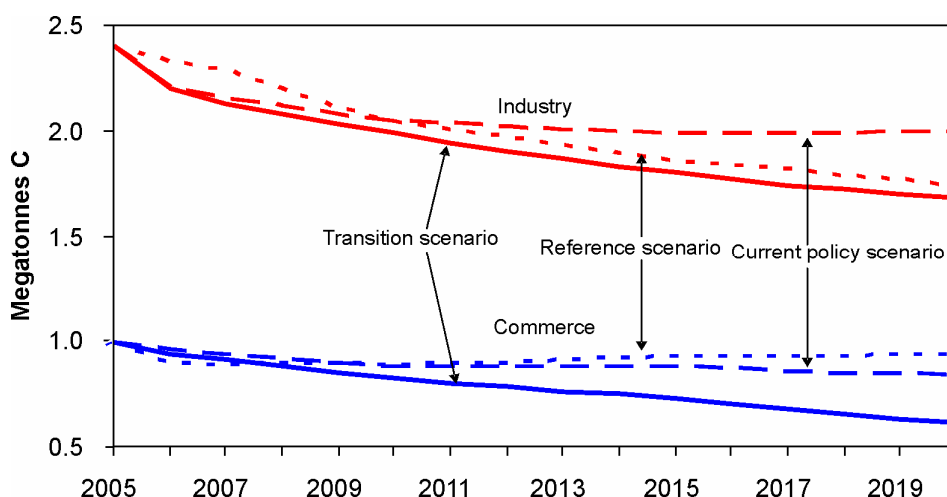
The key assumptions made for REEIO, to reflect the impact of the **Transformation scenario** on the South East economy are:

- Rates of energy efficiency achieved are 1% per annum faster than in the Current policy scenario (averaging 3.5% pa for industry and for services 3.5% pa over 2010-15 and 5% pa thereafter);
- There is a stronger move to the use of electricity and away from gas (this will give greater impact for industry where electricity is currently less important fuel source than for services. By 2020 at least 30% of industry's energy needs are assumed to be met by electricity);
- There is greater take up of Combined Heat and Power (CHP) so that by 2020 some 1.2MWe of capacity is installed in industry and services (a third higher than in the Reference scenario).

Chart 18.5 shows CO₂ emissions from industry and commerce in the Transformation scenario. It is clear that the assumptions outlined above have an important impact on CO₂ emissions from industry and services. Indeed, emissions from industry are lower in the Transformation scenario than in the Reference scenario, despite the much higher levels of economic activity in the scenario.

By 2020 emissions by industry are 15% lower than in the Current policy scenario and 30% below levels in 2005 while the emissions from services are lower by 30% and 60% respectively.

Chart 18.5: CO₂ emissions by industry and commerce in the Transformation Scenario



(Source: REEIO model, Cambridge Econometrics)

18.3.3. Comments on 'reaching the targets'

Reversing the current upward trend in the Ecological Footprint of goods and services will require radical action. The REAP Transformation scenario for goods and services requires a long-term energy or resource efficiency gain of 5% per annum across industry and commerce. REAP also requires a 4% efficiency gain to reduce the impact of public services and capital investment. These gains will need to be achieved primarily through changes in consumption and procurement patterns, as many of the goods and services are produced outside the region. Influencing consumption to this degree will be a great challenge. This may be achievable if supported by national/international incentives such as carbon quotas or taxes. Without such support, it may be more realistic to aim initially for stabilisation rather than reduction in this sector, while pursuing greater savings in other sectors.

Similar levels of efficiency gains are required to meet reduction targets for CO₂ emissions from industry and commerce in the region. However, there are two key differences here: firstly, efficiency gains will be easier to influence because production activity is within the region; and secondly, initiatives such as the Carbon Reduction Commitment (proposed by the Energy White Paper 2007) are already providing some incentives for efficiency gains.

The next section discusses the types of policy changes that would be required to deliver large-scale change to the consumption and production of goods and services.

18.4. What would 'transformation' involve?

This section outlines some of the uncertainties underlying 'transformation' and the types of policies that would be required in the Transformation scenario, to achieve the medium-term target of reducing the Ecological Footprint and CO₂ emissions by 30% by 2020, and the long-term transformation target of reducing both these impacts by 80% by 2050. Many of these would involve policy changes at national level, as well as regional/sub-regional action.

Issues and options for procurement by public and private organisations are explored in more detail in Chapter 13 (Cross-cutting issues).

18.4.1. Issues and uncertainties

Key issues and uncertainties about the long-term transformation of the commerce and industry sectors in the South East, and the consumption of goods and services within the region are highlighted below.

Policy

There are a number of uncertainties in relation to national and regional policy, which underlie future transformation of this sector. For example, it is not yet clear how regional structures and responsibilities will evolve in the light of the Sub-National Review (SNR) and Local Government Bill.

Also, the regional level may not be the most effective level for influencing many types of industry and services. National or international initiatives may be required to have a significant impact on some producer issues.

Finally, in a liberalised economy, to what extent will direct public investment be possible or even desirable? This will affect the extent to which SEEDA, in its post-SNR form, can use investment as a tool for change.

Economy

Major companies are already dealing with the EU Emissions Trading Scheme and from 2010 will also start implementing the Carbon Reduction Commitment, which involves tradable permits for CO₂ emissions. The Energy White Paper and Climate Change Bill make commitments to introducing further carbon budget and trading schemes. But it is not yet clear how these will be implemented for public, private and partnership bodies, and how strong an incentive they will provide for carbon reduction.

Another uncertainty is the extent to which the upfront investment required to improve energy and resource efficiency will unlock new opportunities for competition and innovation, or simply be a cost to households, business and public bodies. The economic costs of transformation will depend on the capacity of policy integration to mobilise opportunities from costs, through a 'smart green growth' development path.

Finally, long-term transformation may involve a shift of products and services from the formal to the social economy. The 'Transition Town' movement is an early example of social initiatives to reduce climate change impacts. Similarly, there may be a shift from the product life-cycle to more service/lease-based types of consumption. It is not clear what effect these types of transition/transformation might have on growth and restructuring.

Technology

There is clearly a great deal of scope for technology advances to reduce the resource and energy intensity of both products and services, but the timing and extent of this is currently unknowable.

Counteracting this, new products and services are emerging all the time. A few years ago, few people had energy-intensive High Definition (HDD) television screens, but their take-up is fast increasing. Some new products are energy and resource intensive, and will tend to increase rather than decrease both Ecological Footprint and CO₂ emissions.

18.4.2. Policy options – goods and services, public services and capital investment

Transformation of commerce, industry, public services, capital investment (and of consumption of goods and public/private services) would involve the following types of policy outcomes.

Policy outcomes:

- Low energy production, per unit output;
- Low Greenhouse Gas (GHG) intensity of energy sources, per unit energy;
- Integrated supply chain management, including packaging, logistics, peripherals and so on;
- Increase product life, flexibility and re-manufacturing;
- Shift from material-based output, to dematerialised value-added output based mainly on 'services' rather than 'goods';
- Reduce waste arising (pre- and post-consumer), and increase high level recycling.

The types of policy programme groups or 'wedges' required to deliver these outcomes are described below under the following headings:

- Products;
- Services;
- Cross-cutting programmes;
- Regional/sub-regional added value.

Opportunities for reducing impacts through procurement policies are discussed further in Chapter 13.

18.4.3. Policy 'wedges' - Products

- **Materials and imports sourcing:** this should aim at 100% sustainable sourcing (low footprint and low carbon) and ethical trading, with incentives from public procurement, market accreditation and eco-labelling;
- **Integrated supply chain management:** greater coordination in sectors and clusters on the industrial ecology principle, with groups of suppliers, processors, distributors, utilities using each other's products and waste streams;
- **Product life design:** the life cycle of products includes energy, maintenance, waste, and the consequent demand for new products; low footprint and low carbon lifecycles can be achieved through total quality management and design.
- **Demand side management:** there is an agenda for social enterprise, as an alternative to private material consumption. This can include leasing/sharing of products, re-use and recycling exchanges, and awareness campaigns. These can form an important part of behaviour change programmes.

18.4.4. Policy 'wedges' - Services (commercial and public)

- **Public services:** health and education are the first priority for change, to promote supply chain partnerships and innovation strategies for suppliers and contractors;
- **Financial services and other business services:** these have a crucial role in setting the incentives for all other sectors. There is a transformation agenda which includes carbon/eco-system trading, community credits, triple bottom line accounting (taking account of environmental and social impacts as well as financial), and mutual/cooperative equity structures;
- **Retail and distribution:** these have large on-site impacts through buildings, logistics and waste/packaging, as well as wider impacts on local economies and communities. There is a 'sustainable retail' agenda, for logistics, premises, sourcing, product life, equity structure and local markets;

- **Tourism:** a wide-ranging agenda for sustainable transport, catering, accommodation, diversification and landscape management.⁵¹
- **Demand side management:** social enterprise, intermediate labour markets (e.g. using local labour for projects which benefit the community) and community self-help are sustainable alternatives in many areas such as social care, landscape protection and urban regeneration.

18.4.5. Cross-cutting programmes

The following measures overlap with the 'policy wedges' for products and services:

- New measures of wealth and prosperity as a basis for investment and decision making;
- Integration of efficiency investment costs into production supply chains – a future more comprehensive EU Emissions Trading System and/or Carbon Reduction Commitment;
- Industrial ecology clusters for low impact regional production, where groups of industries are conveniently located to use each other's resource and waste streams;
- Public partnerships for innovation and market transformation of integrated supply chains, in selected sectors;
- Retailer and distributor incentives programme for low impact products and services, including imports (e.g. Corporate Social Responsibility, Fair trade, eco-certification and so on);
- Social economy and community enterprise programmes to promote sustainable consumption and increase local value added.

18.4.6. Sub/regional added value:

Particular areas where regional or sub-regional bodies can add value to the policies outlined above are:

- Developing the economic development framework for the above policies;
- Public procurement and contracting in support of these policies;

⁵¹ Technically, the consumption-based impact of tourism is the net balance of 'domestic tourism' plus 'tourism outside the region by South East residents' less 'incoming tourism by residents of other regions/countries'.

- Pro-active enabling and implementation of national/EU policy for relevant sectors and markets;
- Focusing of services and spending by local government and other public services;
- Leading on infrastructure and urban development partnerships (regional bodies);
- Leading partnerships for awareness/behaviour programs (regional bodies).

18.5. The route map – what needs to be done?

Based on our vision of the types of transformation required (section 18.4) and our quantitative analysis of the scale of change required to meet targets (section 18.3), we have developed a set of recommendations for the region relating to the production and consumption of goods and services. This is summarised in the table below. The accompanying diagram sets out possible timing of initiatives, given underlying uncertainties and opportunities. The region's existing progress towards this route map is discussed in the next section (18.6).

Actions to support stabilisation of the region's Ecological Footprint are highlighted in green, while those which would promote deeper transformation are highlighted in yellow (shorter term actions) and blue (long term actions). In Chart 18.6, a black border indicates that an action involves lobbying for change at national level or above.

Some of the actions listed in the table below form part of 'current policy', but more effective implementation of these policies is required to achieve the stabilisation targets in this sector

Recommendations for short-term priority actions are listed in Table 8.1.

Chart 18.6 Goods and services, public services and capital investment – route map chart

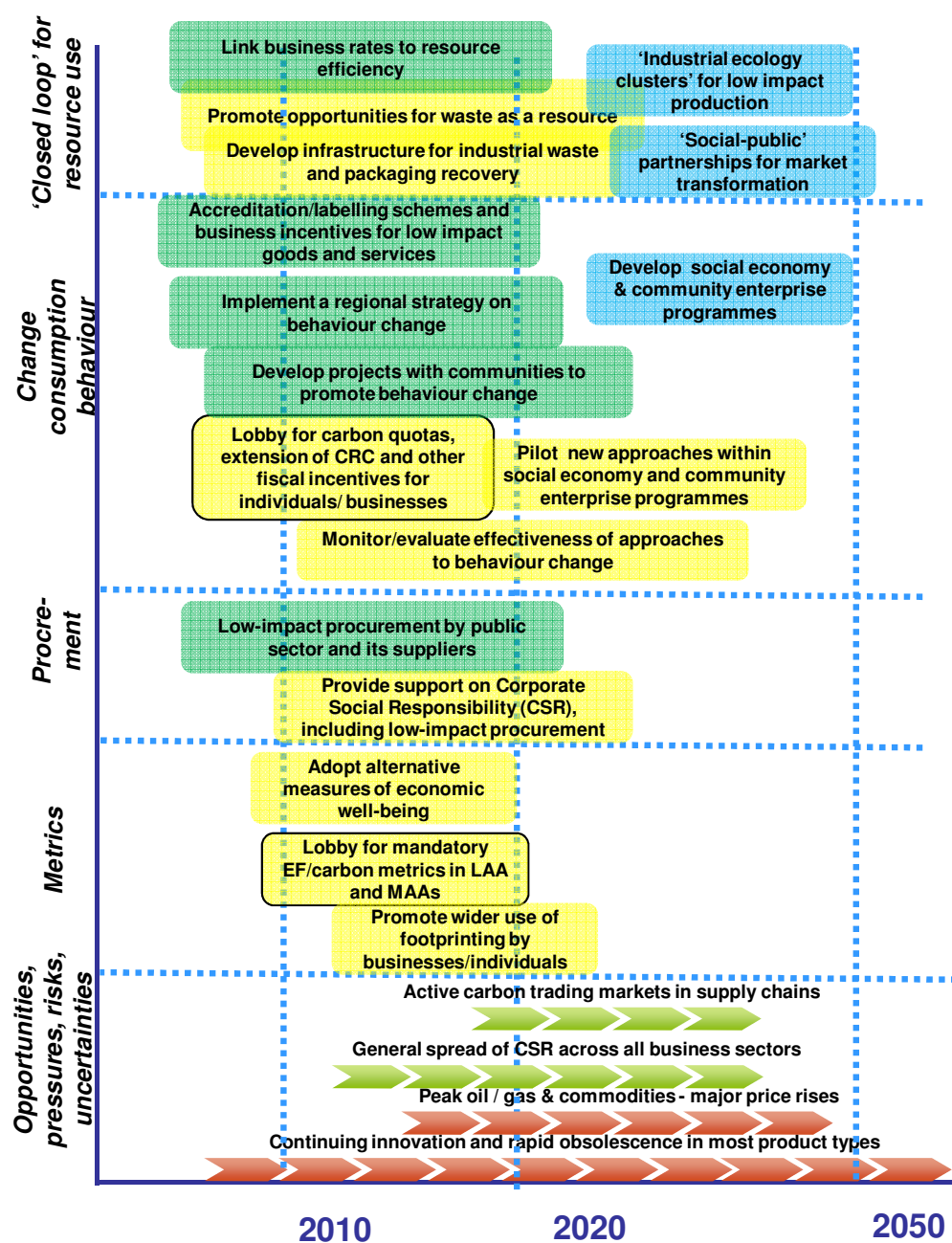


Table 18.1 Route map – Goods and services, public services and capital investment

Key: Stabilisation actions; short-term transformation actions; longer term transformation actions

Strategic priorities	Regional policies and programmes	Lead/ partners	Cost/other impacts	Potential benefits
Promote 'closed loops' for resource use within the economy as a whole	Relate business rates and other financial incentives to the resource efficiency of businesses Promote business opportunities based on using waste as a resource Develop infrastructure for industrial waste and packaging recovery Promote 'industrial ecology clusters' for low-impact regional production Promote social-public partnerships for innovation and market transformation	Lead: Local authorities; Diamonds Partners: businesses; Business Link/Carbon Trust; SEEDA; Envirobusiness	Should offer new business opportunities and savings from efficiency gains 'Carrots and sticks' can be balanced to keep measures revenue neutral	Potential improvement in resource and energy efficiency of production within the region.
Promote behaviour change to reduce the impact of consumption by individuals, businesses and organizations	Develop and extend retailer / distributor/ business incentives and labelling programmes for low impact products and services, incl. imports (CSR, Fair trade, eco-certification etc). Implement regional behaviour change strategy, targeting individuals, communities,	Lead: SEEDA Partners: local authorities; public bodies; Carbon Trust; businesses; communities etc	Moderate costs involved in developing and rolling out schemes. Significant cost/effort	Supports behaviour change and low-impact consumption choices. Significant reductions in

Strategic priorities	Regional policies and programmes	Lead/ partners	Cost/other impacts	Potential benefits
	businesses, government and other organisations Support the development of projects working with communities to change behaviour Monitor and evaluate the effectiveness of different approaches to behaviour change, and adapt programmes accordingly Develop social economy and community enterprise programmes to promote sustainable consumption and local value added		involved. Low cost Moderate costs involved – for publicity, for community facilitation and personal advisers.	consumption impacts – more effective if supported by national incentives. See also Chapter 13 on behaviour change. Develop new models of low-footprint living.
Promote consistent region-wide procurement standards across the public sector, and the region as a whole	Develop low-impact public-sector procurement standards and processes, and require suppliers to do the same Promote low-impact procurement to businesses	SEEDA to lead Partners: health service; local authorities; schools; businesses; Carbon Trust; Envirowise; BusinessLink	May increase supply costs in some cases, but this should largely be balanced by reduced wastage.	Moderate to high – and essential as part of leadership role
Adopt alternative measure of economic well-being (e.g. ISEW), alongside	Make ISEW, or an equivalent measure, central to the integrated regional strategy	SEEDA/the Assembly (e.g. Integrated Regional Strategy);	None	Indirect – sets framework for other changes

Strategic priorities	Regional policies and programmes	Lead/ partners	Cost/other impacts	Potential benefits
GVA and EF		Diamonds; LAs		
Promote personal carbon allowance and other fiscal incentives for sustainable consumption and production	Lobby national government. Pilot approaches as part of social economy and community enterprise programmes	SEEDA/the Assembly	Minimal	Very high – would increase the effectiveness of all other initiatives on goods and services.
Use the Ecological Footprint as a tool for promoting behaviour change and more sustainable decision making	Lobby national government to make Ecological Footprint and carbon metrics/ targets a mandatory part of LAAs and MAAs, and part of the approval process for major projects/plans (e.g. via Strategic Environmental Assessment)	Lead: SEEDA/ Assembly /GOSE	Minimal	Moderate/high – sets the overall framework for future policy and development.
	Encourage local authorities and developers to integrate Ecological Footprint and carbon metrics into their plans and targets on a voluntary basis	SEEDA/the Assembly; Local authorities; Diamonds	Minimal	As above
	Promote and support wider use of footprinting within the region (including Footprinter and 'corporate stepwise' for businesses)	SEEDA/ Business Link; Carbon Trust; Envirowise	Moderate	Moderate – part of behaviour change work with business

18.6. Progress to date

Initiatives which are already underway within the region, aiming to reduce the impact of goods and services, include:

- Work by SEEDA and partners on 'Pathways to Zero Waste' which aims to improve resource efficiency and find markets for specific waste streams;
- Development of priorities and commitments on footprint reduction by the 'Diamonds' Ecological Footprint working group, involving local authorities in growth areas;
- SEEDA's work to develop a more sustainable public procurement strategy, in partnership with other regional bodies;
- Behaviour change initiatives, some of them community-led, including the Transition Movement, Global Action Plan and Lewes District Council's Low Impact Householder programme;
- Regional and local initiatives on low-impact labelling programmes (e.g. LEAF marque);
- Consideration of ISEW as an indicator for the Regional Monitoring Report – although the indicator was not included owing to difficulties caused by methodology changes.

Significantly more effort is needed to reverse the current upward trend in the footprint of goods and services. The 'Diamond' groupings of local authorities offer important opportunities for progressing innovative work with commerce and industry. This is discussed further in Chapter 13 on 'Cross-cutting issues'.

18.7. Reference documents

The following documents have been used in preparing the route map for this sector:

- Sustainable finance – WWF;
- Sustainable Consumption and Production – SDC;

Fuller references are given in Appendix 3.

19. Waste and resource use

Key points – waste and resource use

Waste and resource use are key issues for the Ecological Footprint, since improvements in resource efficiency will tend to reduce the region's footprint. We focus here on modelling the levels of waste arising from different sources, and the types of waste management applied to this waste. We are not so much concerned here with the level of CO₂ emitted by the waste industry itself, which is relatively low. Although emissions of other greenhouse gases (e.g. methane) can be significant if landfill is not properly managed. Also we have not used REAP to focus on the footprint of the waste management industry, as this is included within public/private services in Chapter 18.

Waste arisings within the region were 40 million tonnes in 2005. The overall trend in waste arisings is upwards in both the Reference and Current policy scenario. Waste volumes are predicted to be higher in the Current policy scenario, because of faster economic growth relative to the Reference scenario. But more sustainable waste management methods in the Current policy scenario result in lower volumes of waste going to landfill (compared to 2005). Much of the recycled waste is from the construction and demolition sector.

In the Transformation scenario, waste arisings are predicted to be lower than in both the Reference scenario and Current policy scenario, owing to assumed reductions in the waste-intensity of industrial inputs. But waste arisings are still predicted to grow over time, owing to economic growth. When waste management policies are applied, similar to those in the Current policy scenario, we find that there is marked shift away from landfill towards more sustainable and 'closed loop' waste management options.

These scenarios do not take account of the new target set by BERR in the 'Strategy for Sustainable Construction'⁵² which requires a 50% reduction in construction, demolition and excavation waste going to landfill between 2008 and 2012. Effective implementation of this target would further reduce volumes going to landfill.

Considerable efforts are already being made to reduce waste volumes and reduce the impacts of waste management, driven partly by EU and UK government waste targets and regulation. But significant reductions will only be achieved if incentives for waste reduction are strengthened.

⁵² <http://www.berr.gov.uk/sectors/construction/sustainability/page13691.html>

The structure of this section is as follows:

- Definitions and boundaries
- Where are we heading?
- What type of transformation is required?
- How can we reach the targets?
- Recommendations for the route map
- Progress to date
- Reference documents

19.1. Definitions and boundaries

19.1.1. Sector profile

In this section, we examine both waste generation and resource use. We consider all waste streams, including:

- Household and other municipal waste;
- Commercial and industrial waste;
- Agricultural waste;
- Construction and demolition waste; and
- Other waste (including mining).

The figures below do not include power station bottom ash and sewage sludge. In relation to waste, we need to consider:

- Waste arisings as a 'lost resource'; and
- Waste recycling as a 'new resource' which contributes to material inputs.

By resources, we mean all material flows, with particular emphasis on bulky materials such as building materials and aggregate. Here, we need to consider:

- Material inputs which deplete stocks of natural resources;
- Material inputs from 'closed loop' or 'renewable' systems, including waste recycling;
- Material stocks in the built environment and economic environment.

19.1.2. Modelling of waste impacts

We have modelled waste arisings and trends in waste management using the REEIO model. We focus here on modelling the levels of waste arising from different sources, and the types of waste management applied to this waste. Waste and resource use are key issues for the Ecological Footprint, since improvements in resource efficiency will tend to reduce the region's footprint across the board.

We are not so much concerned here with the level of CO₂ emitted by the waste industry itself, which is relatively low. However, emissions of other greenhouse gases (e.g. methane) can be significant if landfill is not properly managed. Similarly, we have not used REAP to focus on the footprint of the waste management industry, which is included within public/private services (see Chapter 18).

19.2. Where are we heading?

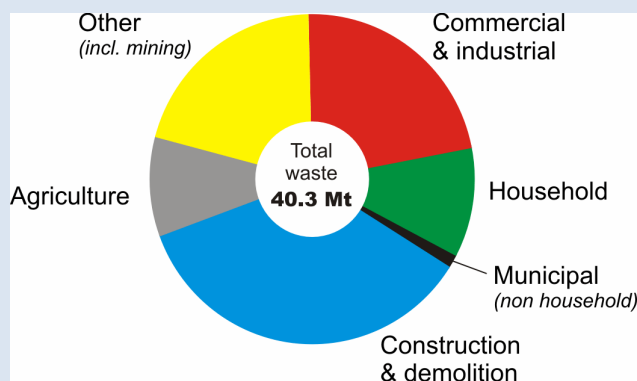
Current situation

While there is considerable timeseries data on the level and composition of municipal waste, there is little information on the level and characteristics of other streams, particularly the commercial and industrial waste streams. There is also little information on which to determine trends in waste characteristics of industry production (e.g. trends in waste arisings from a given level of production inputs).

Chart 19.1 shows the estimated source of waste arisings in the South East in 2005⁵³. Total waste arisings were 40.3 million tonnes, of which around 35% is construction and demolition waste, much of which is recycled or reused. Household waste accounts for 10% of all waste arisings and commercial and industrial waste 20-25%. The majority of 'other waste' is residue from mining and quarrying activity.

The volume of waste entering the commercial waste stream is around 30-35% more than enters the industrial waste stream. The services sectors producing the most waste include retailing, other distribution, hotels and catering, supporting business services and health and social services while in industry the most waste is generated in printing and publishing, food and drink, pharmaceuticals and non-metallic mineral products.

Chart 19.1 Source of waste arisings for the South East - 2005



(Source: REEIO model, Cambridge Econometrics)

⁵³ For some streams the estimates have involved projecting forward data published for an earlier year. Where this has been necessary the method adopted has been that used by REEIO for projecting waste arisings.

19.2.1. Predictions on waste arising

REEIO assumptions

The key waste trends assumed in the **Reference scenario** are:

- Per capita household municipal waste declines by 0.2% pa (this is the underlying change that has occurred over 2000-06);
- Changes in the structure of inputs to production are projected based on analysis of the ONS Supply and Use Tables of the past decade. The effect is typically to reduce the importance of material inputs into the production process;
- There is no change in the level of waste arisings per unit of material used in the production process;
- The pattern by which different waste streams are managed remains unchanged.

The **Current policy scenario** assumes higher rates of economic activity, which will tend to increase waste arisings. In addition, it assumes that key targets in the regional waste strategy are achieved. In particular, by 2020:

- Energy is extracted from 20% of municipal waste (compared with a current level of 10%);
- 50% of household waste is recycled;
- The proportion of commercial and industrial waste going to landfill is reduced by 35%⁵⁴;
- The proportion of construction and demolition waste entering landfill is reduced by a third.

Since our modelling work was finalised, BERR has published the Strategy for Sustainable Construction⁵⁵ which sets a more demanding target for a 50% reduction of construction, demolition and excavation waste going to landfill between 2008 and 2012. This is not reflected in the scenarios presented here.

In the Reference scenario total waste arisings are projected to rise by just under 1% pa. This means that by 2020 the level of waste arisings will be almost 15% (almost 6 million tonnes) higher than in 2005. The strongest growth is projected for construction and demolition waste (with waste arisings growing in line with industry output), and non-household municipal waste (as a result of strong growth in the service sector).

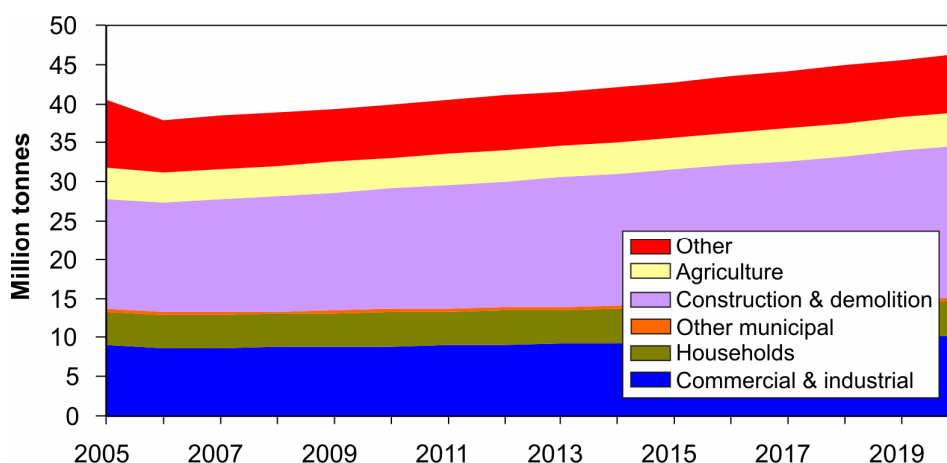
⁵⁴ The target in the regional waste strategy is for levels of Commercial and Industrial waste landfilled in 2010 to be 20% lower than in 2004. This incorporates both a reduction in waste arisings and assumptions for how the waste stream is managed. We have assumed that the direction away from landfill continues post 2010.

⁵⁵ <http://www.berr.gov.uk/sectors/construction/sustainability/page13691.html>

Even so, growth in this stream (which is small in absolute tonnage) is projected to be slower than for the economy as a whole.

The level of waste entering the commercial and industrial waste stream is projected to increase by less than 1% pa, with the strongest growth in commercial, rather than industrial waste (reflecting the strength of sector growth prospects). Of the industry sectors producing the most waste only pharmaceuticals is projected to see waste increase. Household waste is projected to rise by less than 0.5% pa on the assumption that per capita waste arisings continue to fall, as they have done over the period 2000-06.

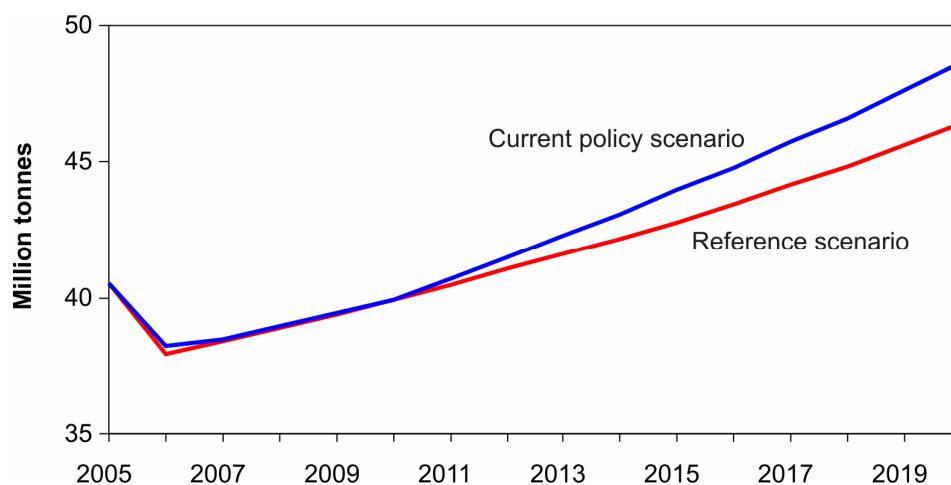
Chart 19.2 Source of waste arisings in the Reference scenario



(Source: REEIO model, Cambridge Econometrics)

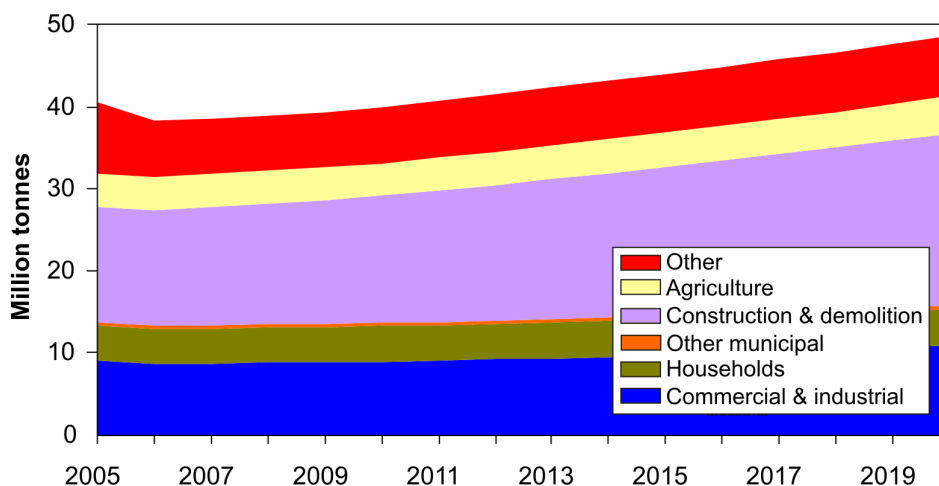
In the Current policy scenario, the stronger economic growth raises the growth in waste arisings from just under 1% pa to 1.25% pa. By 2020 the level of waste arisings is 5% (2.2m tonnes higher). Most of the additional waste is construction and demolition waste. The rate of growth of commercial and industrial waste is also strongly affected by the pattern of faster economic growth. The level of household waste is the same as in the Reference scenario (as the population is the same in the two scenario and no differences are assumed in per capita waste arisings).

Chart 19.3 Projected waste arisings – Reference and Current policy



(Source: REEIO model, Cambridge Econometrics)

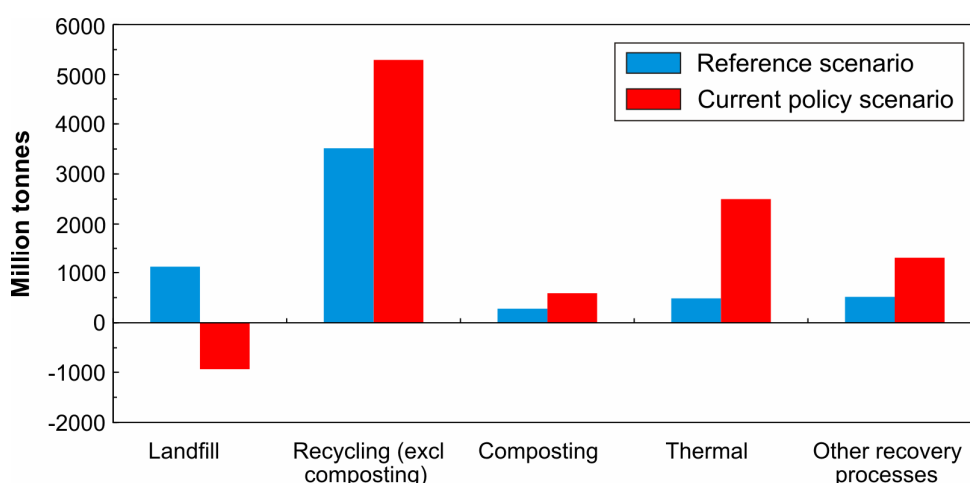
Chart 19.4 Source of waste arisings - Current policy scenario



(Source: REEIO model, Cambridge Econometrics)

Despite the increase in waste arisings, the impact of meeting the targets to divert waste from landfill means a modest fall in the volumes entering landfill each year. By 2020 waste going to landfill is around 1m tonnes lower than the 2005 level. In contrast, the amount of waste being recycled in 2020 is 2m tonnes higher than in the Reference scenario. Again, the additional construction and demolition waste will be a major component of the additional waste being recycled.

Chart 19.5 Growth in waste entering management routes 2005-2020



(Source: REEIO model, Cambridge Econometrics)

19.2.2. Commentary on 'where we are heading'

The overall trend in waste arising is still upwards in the Current policy scenario, because of increased economic growth relative to the Reference scenario. But the assumed shift in waste management methods means that the amount of waste going to landfill in 2020 is predicted to be significantly lower than in 2005.

A stronger shift away from landfill would be seen if the new target from the Strategy for Sustainable Construction was applied (for a 50% reduction in construction, demolition and excavation waste going to landfill between 2008 and 2012).

Greater reductions would be needed to support the Transformation scenario targets for both waste impacts and resource use. This is discussed in the next section.

19.3. How can we reach the targets?

We have used the REEIO model to examine the 'transformation' of the waste sector in more detail. As we have not directly modelled the Ecological Footprint or CO₂ emissions from waste management, we focus here simply on ways of reducing the levels of waste arising and improving the sustainability of waste management within the region. Reductions in waste impacts will contribute to footprint reduction across the full range of consumption categories, particularly the built environment and food (see Chapters 14 and 17).

This section sets out the assumptions and findings for waste arisings under the Transformation scenario.

19.3.1. Reaching the targets – waste arisings

As shown in section 19.2, waste arisings are predicted to continue rising under the Current policy scenario, although the amount of waste going to landfill is predicted to fall. In the Transformation scenario, we look at potential reductions in waste arisings themselves, as well as changes in waste management routes.

REEIO assumptions – waste sector

Within the Transformation scenario we assume that firms become more focused on their use of resources and the cost of waste generated through current practices. As a result they achieve a sustained trend in reducing the levels of waste associated with the use of inputs in their production process.

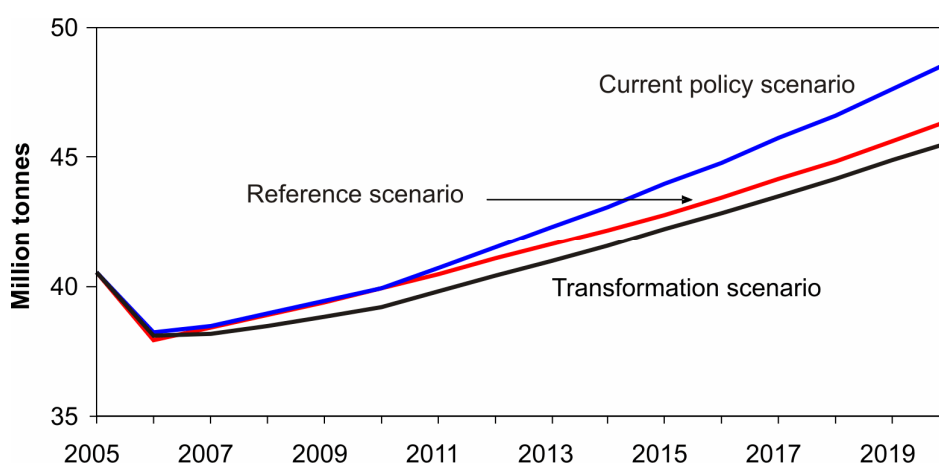
In particular, industries are assumed to reduce the waste-intensity of their inputs by up to 5% pa. The strongest improvements are assumed in a number of key sectors, including pharmaceuticals and chemicals, electronics, and professional services. Construction is assumed to improve the waste intensity of its operations by 0.5% pa.

Our assumptions on waste management are unchanged from the Current policy scenario. Since our modelling work was finalised, BERR has published the Strategy for Sustainable Construction⁵⁶ which sets a more demanding target for a 50% reduction of construction, demolition and excavation waste going to landfill between 2008 and 2012. This is not reflected in the scenarios presented here.

The impact of the assumptions is to reduce the level of wastes in 2020 by 3 million tonnes, compared to the Current policy scenario. The level of waste entering the commercial and industrial waste stream is 1.5m tonnes (14%) lower than in the Current policy scenario. However, the level of waste entering the stream continues to rise in the long term, despite the improvements in resource efficiency. The reduction in construction and demolition waste is similar, though this represents a smaller proportion of the waste stream than for the commercial and industrial waste stream.

⁵⁶ <http://www.berr.gov.uk/sectors/construction/sustainability/page13691.html>

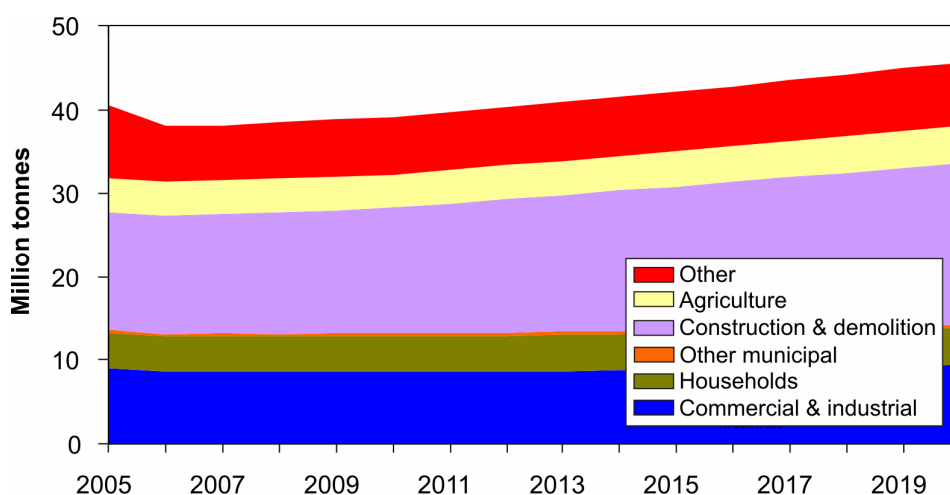
Chart 19.6 Waste arisings in the Transformation scenario



(Source: REEIO model, Cambridge Econometrics)

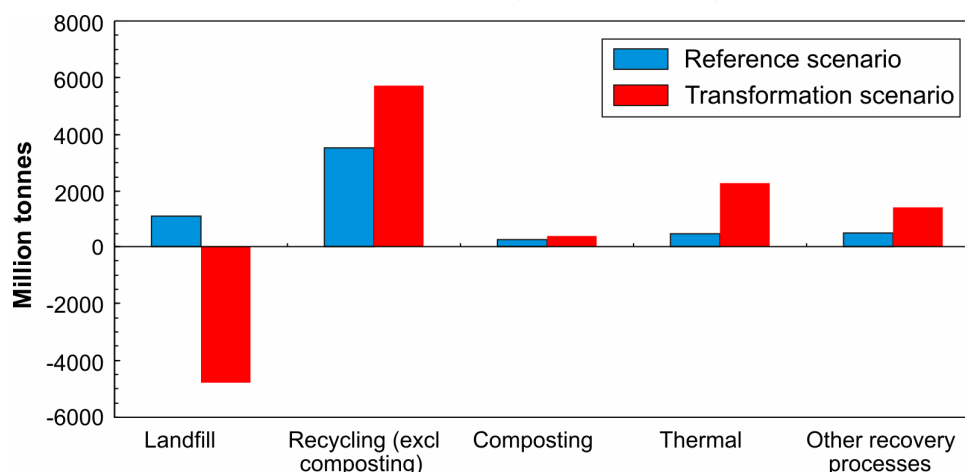
The source of waste arisings is similar to the other scenarios (see Chart 19.7). The construction and demolition industry is still a major contributor to growth in waste arisings.

Chart 19.7 Source of waste arisings in the Transformation scenario



(Source: REEIO model, Cambridge Econometrics)

In this scenario, there is a marked decrease in the volumes of waste entering landfill: a reduction of 4m tonnes over the period 2005-2020. As shown in Chart 19.8, there is an increase in the volumes being recycled and in volumes being used by 'Energy from Waste' schemes.

Chart 19.8 Growth in waste entering waste management routes 2005-2020

(Source: REEIO model, Cambridge Econometrics)

19.3.2. Commentary on 'reaching the targets'

In the Transformation scenario, waste arisings are predicted to be lower than in both the Reference scenario and Current policy scenario. But waste arisings are still predicted to grow over time. When waste management policies are applied, similar to the Current policy scenario, we find that there is marked shift away from landfill towards more sustainable and 'closed loop' waste management options.

A stronger shift away from landfill would be seen if the new target from the Strategy for Sustainable Construction was applied (for a 50% reduction in construction, demolition and excavation waste going to landfill between 2008 and 2012).

19.4. What would transformation involve?

This section outlines some of the uncertainties underlying 'transformation' and the types of policies that would be required in the Transformation scenario. Overall, this scenario aims to reach the medium-term target of reducing the Ecological Footprint by 30% by 2020, and the long-term target of reducing the Ecological Footprint by 80% by 2050. For the waste sector, where we are considering waste arisings rather than emissions or footprint, the issue is not only how much waste is generated but also how it is managed. The well-established 'waste hierarchy' defines an order of priority for waste management: 'reduce – re-use – recycle/recover', with disposal being the last resort.

This section explores some of the issues and uncertainties underlying transformation of this sector, and then sets out policy outcomes and policy options for transformation.

19.4.1. Issues and uncertainties

Particular issues and uncertainties in this sector include:

Policy

- The extent to which national agreements with key industries can reduce the resource-intensity of products, and promote 'closed loop' production systems?
- Whether the region should continue to accept waste from London?
- Whether the public can be convinced of the benefits of certain 'energy from waste' technologies?

Economy

- The extent to which resource efficiency will be incentivised by fiscal measures and regulatory frameworks at national level?
- Will the upfront investment for improving efficiency be a cost to households/ businesses/ government: or unlock new opportunities for growth and competitiveness?

Technology

- Whether more publicly-acceptable 'energy from waste' technologies will be developed?

19.4.2. Policy outcomes

Policy outcomes

- Design products for waste minimisation, extended product life, ease of repair and eventual recycling;
- Shift from material-based output, to dematerial value-added output on the service principle;
- Reduce waste arising (pre- and post-consumer);
- Increase high level recycling;
- Reduce the Ecological Footprint, land take and GHG-intensity of waste management processes.

Policy programmes or 'wedges' to promote these outcomes are outlined below.

Policy 'wedges' – promote 'closed loops' for resource use

- More pro-active public procurement and subsidy framework, to encourage 'integrated supply chain partnerships';
- More pro-active role for partnership investment in high-level waste recovery (e.g. eco-industrial parks, integrated resource recovery systems);
- Stronger promotion of 'producer responsibility' for difficult waste streams (e.g. carpets, mattresses) which will help to drive the shift from products to services;
- Integration of efficiency investment costs into production supply chains.

Policy 'wedges' – demand-side management (businesses/households)

- Increased taxation or pricing of waste generation and disposal;
- Pro-active approach to the role of the social economy and community enterprise in waste minimisation, reuse and recycling.

Policy 'wedges' – reduce impacts of waste management processes

- Fiscal incentives for low-impact processes, within the overall framework for carbon trading or carbon allowances;
- Technology development for lower impact waste management processes, including energy from waste.

19.5. Recommendations for route map

Based on our vision of the types of transformations required (section 19.4), and our quantitative analysis of the scale of change required to meet targets (section 19.3), we have developed a set of recommendations for the waste sector in the region. This is summarised in the table and diagram below. The region's existing progress towards this route map is discussed in the next section (19.6).

'Stabilisation' actions in the table and diagram (highlighted in green) refer to stabilisation of waste arisings and their impacts. 'Transformation' actions would contribute to reductions in waste arisings and in the impacts of waste management. Short-term transformation actions are highlighted in yellow while longer-term actions are highlighted in blue. Actions involving lobbying for change at national level or above are indicated with a black border in Chart 19.9.

Priorities for short-term action on waste and resource use are summarised in Table 8.1.

Chart 19.9 Waste and resource use – route map chart

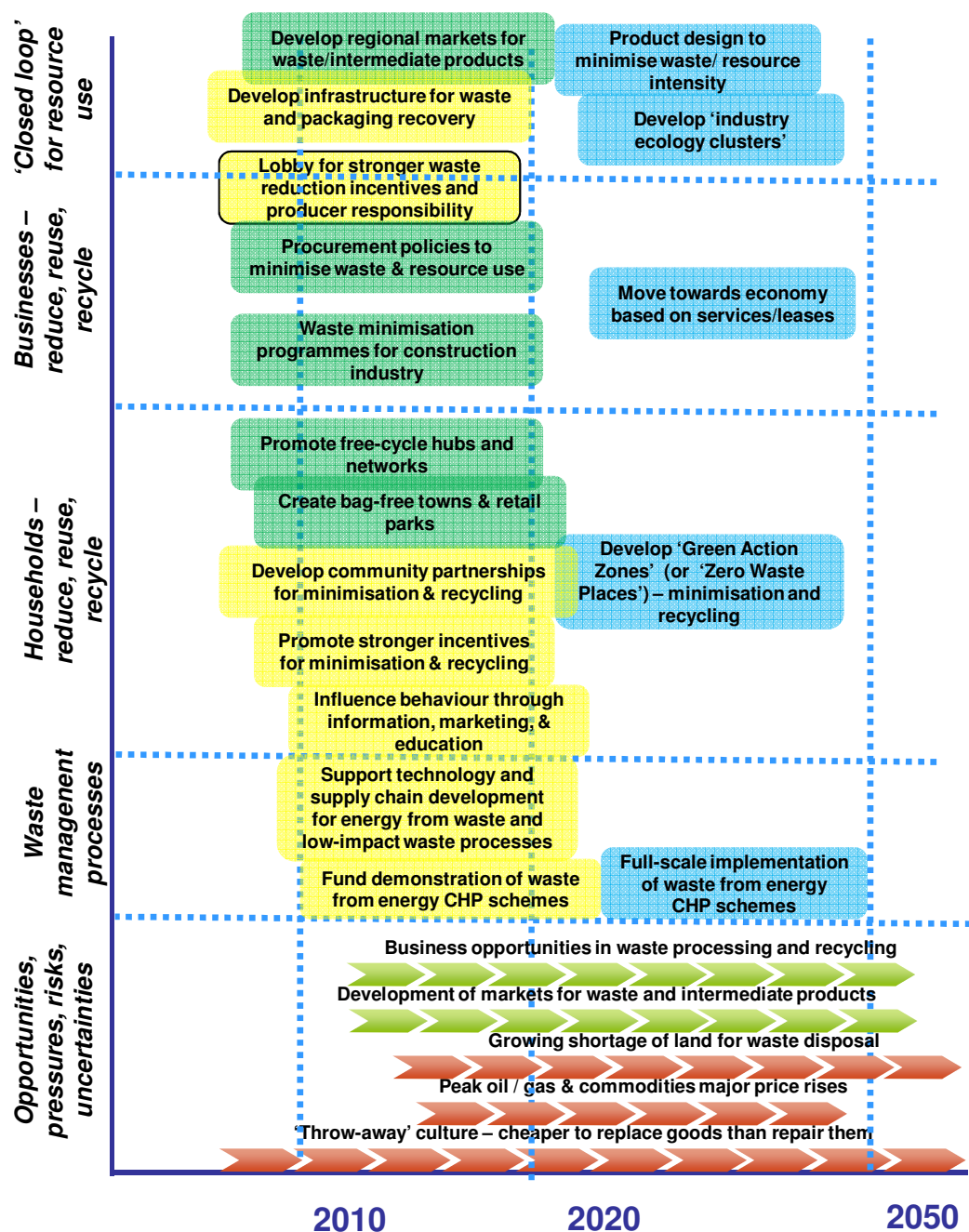


Table 19.1 Route map – waste and resource use

Key: Stabilisation actions; short-term transformation actions; longer term transformation actions

Strategic priorities	Regional policies and programmes	Lead/partner	Cost/other impacts	Potential benefits
Promote 'closed loops' for resource use within the economy as a whole, and reduce the impact of waste management (see also 'Goods and Services')	Develop regional markets for waste and intermediate products; Lobby national government for stronger waste reduction initiatives involving producers, distributors and retailers (e.g. producer responsibility, regulation; labelling schemes; financial incentives); Promote design of products to minimise waste and resource intensity over whole life cycle; Develop 'industry ecology clusters' for low impact regional production.	SEEDA/ businesses SEEDA/ the Assembly SEEDA/ businesses SEEDA/ Envirobusiness/ businesses/ partnerships	Reuse and resale of resources should be self-financing.	Potential improvement in resource efficiency of production within the region.
Encourage businesses and other organisations to 'reduce, reuse, recycle', particularly in the construction sector	Promote, and adopt, procurement policies which minimise wastage and resource use in the whole supply chain Promote programmes to reduce waste and resource use in the construction industry, including support for the preparation of Site Waste Management Plans ⁵⁷	SEEDA/GOSE Carbon Trust/ Business Link SEEDA/SECBE/ developers/ business	Reduced wastage should generate cost savings for business and other organisations.	Potential improvement in resource efficiency of production within the region. Also the need for new landfill sites would be reduced.

⁵⁷ As required by the Waste Strategy for England, 2007.

Strategic priorities	Regional policies and programmes	Lead/partner	Cost/other impacts	Potential benefits
	Lobby national government for stronger incentives for minimisation/recycling (e.g. landfill tax; weight-related waste charges) Move towards an economy based on services/leases rather than purchase and disposal of goods	SEEDA/ the Assembly National government/ SEEDA/ businesses		
Encourage households and communities to 'reduce, reuse, recycle'	Promote free-cycle hubs and networks Set up 'bag free' towns and retail parks, in collaboration with community partnerships Develop and support community partnerships for minimisation and recycling, possibly as part of sustainable living initiatives Promote stronger incentives for minimisation and recycling (e.g. weight-related charges for household waste) Influence consumer behaviour through information, marketing and education Develop 'Green Action Zone' area transformation programmes – including focus on waste minimisation and recycling – possibly linked to Defra's 'Zero Waste Places'⁵⁸ initiative	Local authorities/ community partnerships Local authorities/ communities Local authorities Local authorities/ SEEDA/retailers SEEDA/ developers/ community/ local authorities	Waste minimisation and recycling should be self-financing: reducing the consumption of new resources.	Potential improvement in resource efficiency of production within the region. Also, need for new landfill sites would be reduced.

⁵⁸ As described in the Waste Strategy for England, 2007.

Strategic priorities	Regional policies and programmes	Lead/partner	Cost/other impacts	Potential benefits
Reduce the footprint and greenhouse gas impact of waste management processes	Support technology and supply chain development for waste sorting, recycling, anaerobic digestion, methane recovery from landfill, and other methods of recovering energy from waste (with CHP) Fund demonstration projects for waste from energy CHP schemes Full-scale implementation of waste from energy CHP schemes	SEEDA/ local authorities/ Envirobusiness SEEDA/ local authorities/ businesses SEEDA/ local authorities/ businesses	Cost to be determined – potentially costly. Potential conflicts between local air quality objectives and some types of 'energy from waste' schemes.	Potential synergy between energy supply and waste management objectives.

19.6. Progress to date

Initiatives which are already underway within the region, aiming to reduce the impact of waste and resource use, include:

- Commitments in the South East Plan, and Local Development Frameworks and Waste and Minerals Plans within the region, to reduce waste, increase recycling and composting rates, and divert waste from landfill;
- Waste authority and waste management industry initiatives to meet EU standards for waste management (e.g. removing bio-degradable waste from landfilled waste streams), to capture and use landfill gas and otherwise to reduce the impact of waste management and disposal;
- Development of the 'Pathways to Zero Waste' programme by SEEDA and partners, which aims to tackle specific waste streams by reducing waste and by identifying markets for waste products;
- The preparation of Site Waste Management Plans for large construction projects, and the development of Supplementary Planning Documents by some local authorities on how to prepare these plans, as a driver for improving the resource efficiency of the construction sector;
- Local authority initiatives to increase recycling rates and encourage households and businesses to minimise their waste, including fortnightly collections and charges for municipal waste;
- Progress towards waste reduction, recycling and more sustainable procurement by public bodies and businesses – including the construction industry – as part of wider environmental management programmes, supported by Business Link, ISO 14001 and the Eco-Management and Audit Scheme (EMAS);
- Behaviour change initiatives focusing on waste reduction and recycling, some of them community-led, as part of programmes such as the Global Action Plan and Lewes District Council's Low Impact Householder programme.

While considerable efforts are already being made to reduce waste volumes and reduce the impacts of waste management, significant reductions will only be achieved if incentives for waste reduction are strengthened.

19.7. Reference documents

Documents that we have used in preparing the route map for waste include:



- The South East Plan
- Regional Economic Strategy
- Climate Change Mitigation and Adaptation Implementation Plan
- Waste Strategy for England 2007
- Strategy for Sustainable Construction 2008

Fuller references are given in Appendix 3.

20. Water

Key points – water

Although the direct impacts of the water system represent only a small part (1.7%-1.85%) of the region's overall Ecological Footprint and CO₂ emissions, future water supplies are a critical sustainability issue for the South East. The effects of increasing population, coupled with progressive climate change, are likely to exacerbate this issue in future.

In 2006/7, per capita consumption in the South East from measured supplies was 137 litres/head per day. Consumption for unmeasured supplies was 157 litres/head per day. The weighted average was 152 litres/head per day, which is the highest regional average water consumption rate. Per capita consumption has reduced by about 10% from its peak in 2003/4.

Water use is predicted to increase in the Reference scenario by just under 1% per annum between 2005 and 2020, stimulated by population and economic growth. In the Current policy scenario, water use would still increase – albeit at a slower rate owing to widespread introduction of water meters.

Stronger policies appear to be necessary to reduce overall water demand in the region, even if per capita consumption is stabilising. Water meters are a pre-requisite for the types of innovative tariffs that are likely to be required to curb demand. Technological solutions will also play an important part, in terms of water-efficient systems and appliances for new and existing housing. More costly solutions such as the creation of a national water grid, or desalination plants, could themselves have a significant impact on the footprint of water supply.

The structure of this section is as follows:

- Definitions and boundaries
- Where are we heading?
- What type of transformation is required?
- How can we reach the targets?
- Recommendations for the route map

- Progress to date
- Reference documents

20.1. Definitions and boundaries

In this section we examine water use and water supply within the South East region. The region is served by two water companies: Thames Water and South East Water.

Although the direct impacts of the water system represent only a small part (1.7%-1.85%) of the region's overall Ecological Footprint and CO₂ emissions, future water supplies are a critical sustainability issue for the South East. Key issues for future water security are the rate of population growth in the region, increases in per capita consumption and increases in the frequency of droughts, caused by the progressive effect of climate change.

One linkage between water and energy use is the use of hot water by households, businesses and organisations. The energy used to heat water, for example in the home, exceeds the energy required to supply the water itself. Energy use for domestic water heating is included within analysis of the built environment (see Chapter 14).

Water use is predicted by the REEIO model. There is little comprehensive data on water use in the regions of the UK. The datasets that underlie this part of the REEIO model have not been fundamentally updated since the original data collection exercise in 2002. Instead, estimates for household water use in more recent years have been constructed using trends in per capita water use reported by key water companies. Non-domestic water consumption in recent years has been estimated from trends in industry output and assumptions for trends in water efficiencies.

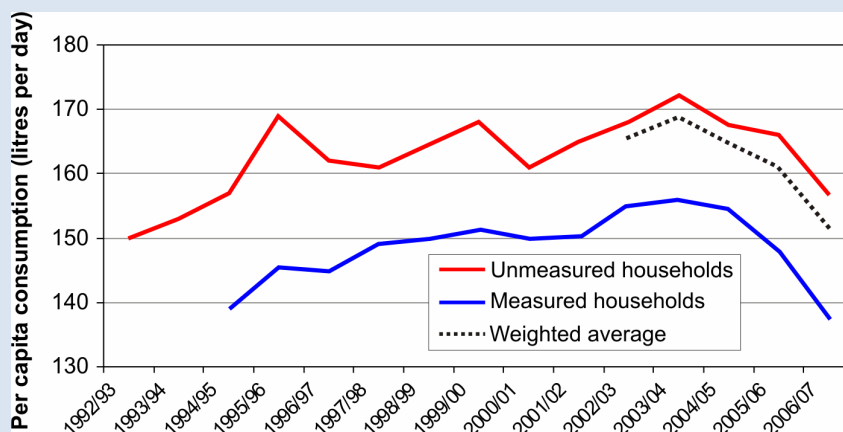
20.2. Where are we heading?

Current situation

In 2006/7, per capita consumption in the South East from measured supplies was 137 litres/head per day. Consumption for unmeasured supplies was 157 litres/head per day. The weighted average was 152 litres/head per day, which is the highest regional average water consumption rate.

Recent figures from the Environment Agency suggest that per capita water use, in both measured and unmeasured households, has fallen in recent years from a peak in 2003/4. This may be attributable to steady increases in the number of households with water meters, the impact of a region-wide hosepipe ban which was not fully lifted until April 2007, and targeted water efficiency campaigns.

Chart 20.1 Per capita water use in the region



(Source: Regional Monitoring Report/Environment Agency)

REEIO data suggests that households account for 60-65% of water demand in the region, with demand from industry accounting for a further 30%. Demand from services is around 5-10% of the total.

20.2.1. Predictions on water use

The REEIO model has been used to predict likely future water use under the Reference and Current policy scenarios.

REEIO assumptions – water use

The key assumptions adopted in the **Reference scenario** are:

- Industry achieves trend savings in its use of water of 1.5% pa but at the same time demand for water has an output elasticity of 0.7 (i.e. a 1% increase in industrial output results in a 0.7% increase in water use);
- Service sectors achieve trend savings in its use of water of 1% pa and have an employment elasticity of 1 (i.e. a 1% increase in employment results in a 1% increase in water use);
- Growth in per capita consumption by households slows from 2% pa in initial years to 0% pa by 2020 (and the level of per capita water use is lower in metered households than in unmetered households);
- The proportion of households that are on meters rises from an estimate of just under 20% currently to around 27% in 2020.

The **Current policy scenario** reflects the stronger emphasis that water companies in the region are now putting on metering domestic customers as a result of much of the region being identified by the Environment Agency as an area of 'serious water stress'. For example, Southern Water expects to have 95% of households on meters by 2020. This scenario assumes that:

- Per capita water use in measured households stabilises by 2010;
- Per capita water use in unmeasured households stabilises by 2015 and then starts to fall back towards the levels in measured households;
- By 2020 just under 90% of households are on water meters.

In the Reference scenario overall water use rises by just under 1% pa over 2005-20, with the impact that demand in 2020 is some 360 million litres per day higher than in 2005. This trend in overall water use is dominated by development in the domestic sector which accounts for around 60% of estimated identified water use. Domestic water use is the strongest growing sector in the demand, as a result of population growth and continued growth (albeit at a slowing rate) in per capita water use.

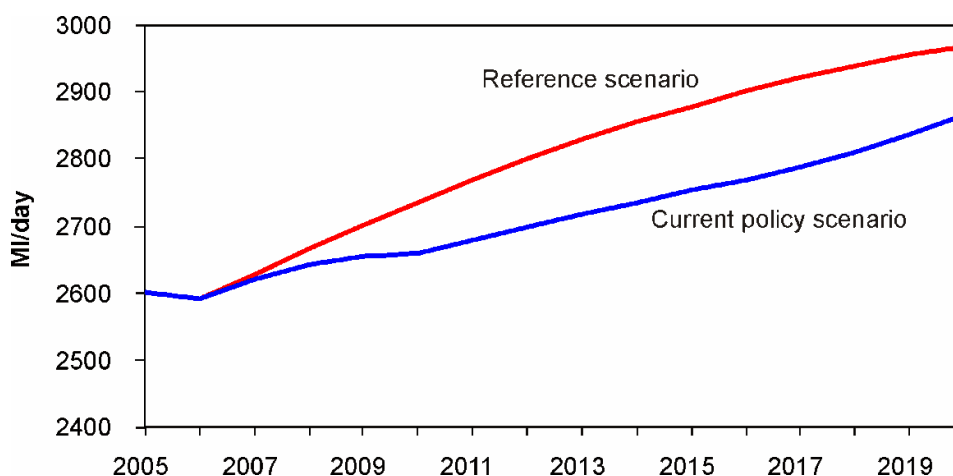
This predicted increase in per capita water use does not appear consistent with declining per capita water use observed in the last few years (see Chart 20.1 above). It remains to be seen whether the recent decline in per capita water use will continue, or whether it will be reversed as memories of recent droughts recede.

The major source of industrial demand is from chemicals, wood and paper, agriculture and retailing/distribution. Demand from most other sectors is projected to decline, albeit modestly, despite strong economic growth. The exception is the chemicals

sector, where, after output is estimated to have fallen sharply in 2006, modest increases in water use are then projected.

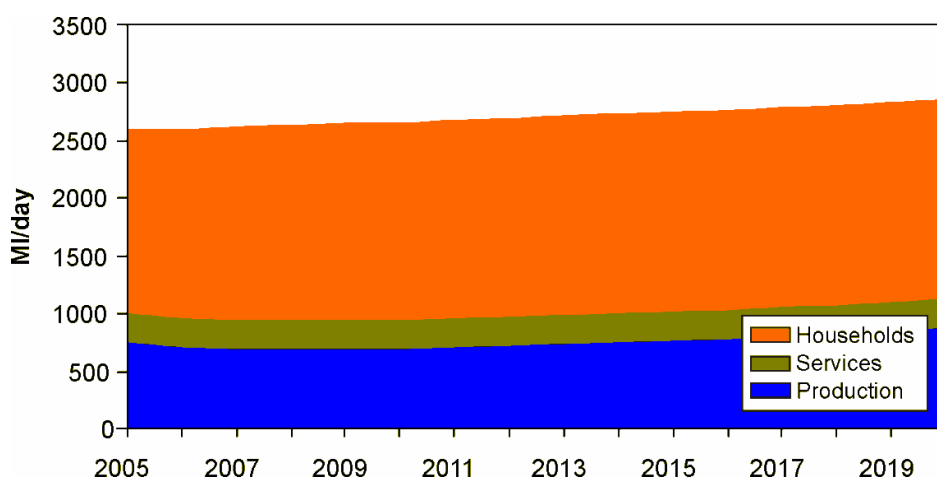
The effect of the additional policies in the Current policy scenario is to reduce the rate of growth in household water demand. But the increased metering in this scenario is not sufficient to prevent overall household water demand from continuing to rise. The result is that by 2020 domestic demand is some 9% higher than currently, but 14% lower than in the Reference scenario.

Chart 20.2 Water demand in the Reference and Current policy scenarios



(Source: REEIO model, Cambridge Econometrics)

The weaker demand by households in the Current policy scenario outweighs the increased demand for industry and services from stronger economic growth that is assumed in this scenario. Overall, demand in 2020 is 4% lower in the Current policy scenario than in the Reference scenario, although demand is still predicted to be 10% higher than current levels by 2020.

Chart 20.3 Source of water demand in Current policy scenario

(Source: REEIO model, Cambridge Econometrics)

20.2.2. Commentary on 'where are we headed'?

Water use is predicted to increase in the Reference scenario by just under 1% per annum between 2005 and 2020. In the Current policy scenario, we assume that stronger steps would be taken to reduce household consumption, but demand for water would also be stimulated by stronger economic growth. Overall water use would still increase in the Current policy scenario, albeit at a slower rate.

Significantly stronger policies would be necessary to reduce overall water demand in the region, as may be required to adapt to the future effects of climate change.

20.3. How do we reach the targets?

No modelling was done for water use under the Transformation scenario within this study, owing to the relatively weak data available. But the types of changes needed to stabilise and reverse the upward trend in water use are discussed in the next section.

20.4. What would transformation involve?

This section outlines some of the uncertainties underlying 'transformation' and the types of policies that would be required in the Transformation scenario. Overall, this scenario is aiming to reach the medium-term target of reducing the Ecological Footprint by 30% by 2020, and the long-term target of reducing the Ecological Footprint by 80% by 2050. But for the water sector, we are considering water use rather than emissions or footprint. The issue here is not only how much water is used but also how it is supplied and how waste water is recycled.

This section explores some of the issues and uncertainties underlying transformation of this sector, and then sets out policy outcomes and policy options for transformation.

20.4.1. Issues and uncertainties

Particular issues and uncertainties in this sector include:

Policy

- Is there direct conflict between water quality objectives and footprint objectives, as more water treatment means greater energy consumption?

Economy

- How far will the water companies be allowed to structure tariffs to provide incentives for reducing water use, or will this create 'water poverty' amongst some sections of the population?
- Will the upfront investment for improving water efficiency be a cost to households/ business/ government, or will it unlock new opportunities for growth and competitiveness?

Technology

- Will a national water grid be developed in future?
- What will be the impact of future climate change on water supply in the South East?

20.4.2. Policy outcomes

Policy outcomes

- Design water-using devices to minimise water and energy use throughout product life cycle;
- Strategic transformation of the existing housing and property stock to minimise water use (particularly hot water), harvest rainwater and promote reuse of 'greywater';
- Accelerated programme for Code 5-6 Code for Sustainable Homes standards for water and drainage;
- Safeguard water supplies in the context of climate change impacts;
- Minimise flood risks, in the context of climate change impacts;
- 'Upstream' approaches to improving water quality, reducing the need for additional water treatment.

Policy programmes or 'wedges' to promote these outcomes are outlined below.

Policy 'wedges' – product design

- Accreditation and labelling schemes for water-using devices;
- Support for supply chain development and technology clusters.

Policy 'wedges' – demand-side management (businesses/households)

- Increased application of taxes and tariffs for water use and waste water disposal, or equivalent use of quotas, for all customers;
- Public/private partnerships for investment in retrofitting of water efficiency measures to existing housing stock and property;
- Behaviour change initiatives to encourage water-saving behaviour by households, businesses and public organisations.

Policy 'wedges' – prepare for climate change impacts

- Investment to safeguard water supplies (e.g. reduce leakages; improve inter-seasonal storage);

- Investment to reduce the carbon footprint of water treatment systems (e.g. increased use of renewable energy);
- Development of Sustainable Urban Drainage systems, and their promotion through the land use planning system.

20.5. Recommendations for route map

Based on our vision of the types of transformations required (section 20.4), discussions at a stakeholder workshop on 20 February 2008, and a review of Thames Water and Southern Water's 25 year plans, we have developed a set of tentative recommendations for the region's water sector. This is summarised in the diagram and table below. The region's existing progress towards this route map is discussed in the next section (20.6).

'Stabilisation' actions in the diagram and table below (highlighted in green) refer to stabilisation of water use and its impacts. 'Transformation' actions would contribute to reductions in water use and reductions in the impacts of water supply. Short-term transformation actions are highlighted in yellow while longer-term actions are highlighted in blue.

Priorities for short-term action on water are summarised in Table 8.1.

Major investments in water supply (e.g. creation of a national water grid, or desalination plants) are options to be considered. But these have not been included in the route map, partly on the grounds of their high cost, and partly because they could themselves have a significant impact on the footprint of the region's water supply.

Chart 20.4 Water – route map chart

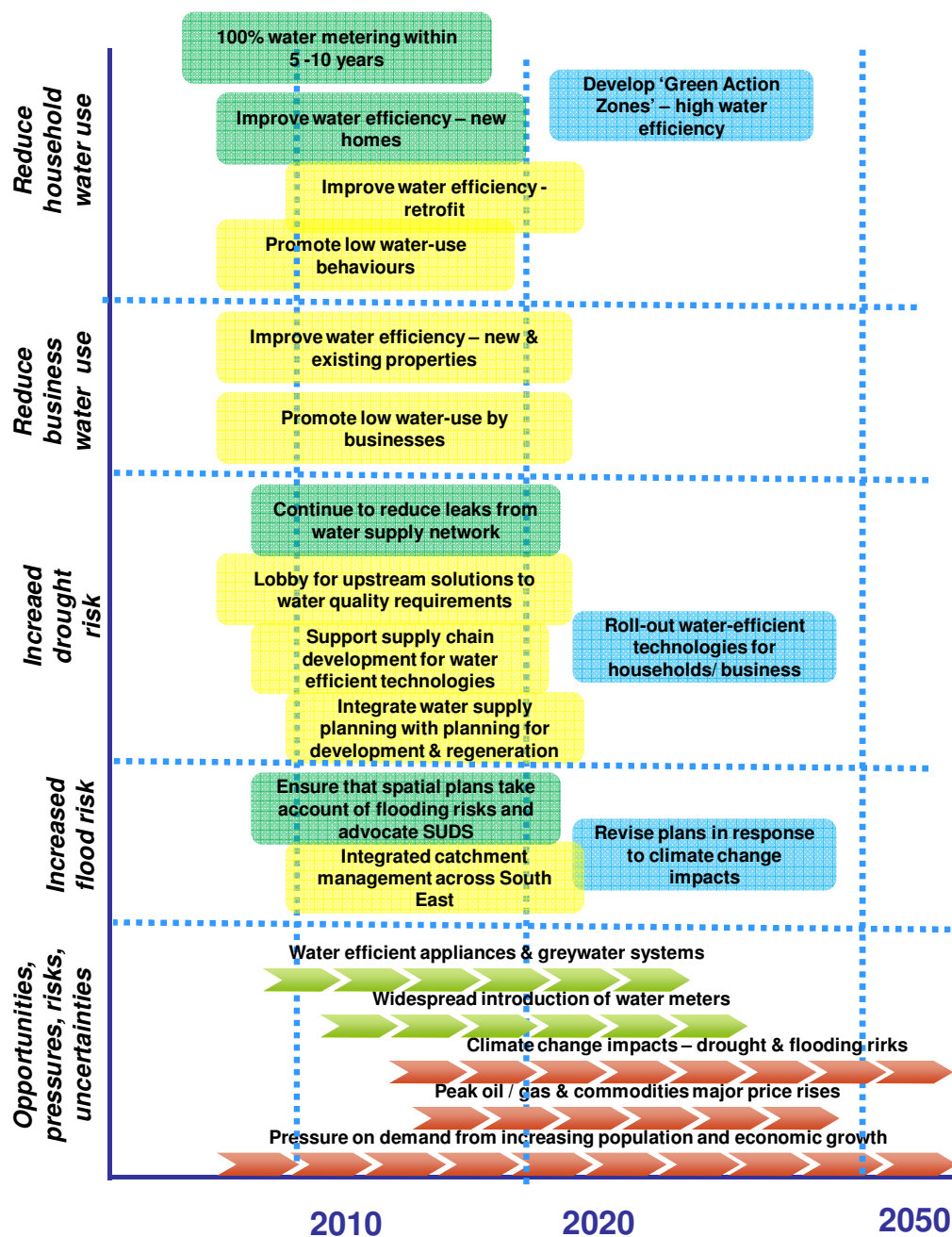


Table 20.1 Route map - water

Key: Stabilisation actions; short-term transformation actions; longer term transformation actions

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Reduce household water use, particularly hot water	Introduce 100% water metering as quickly as feasible (within 5-10 years) Improve the water efficiency of new homes (e.g. Code for Sustainable Homes level 6) Implement retrofit programmes to improve the water efficiency of existing homes Promote low water-use behaviours, through education programmes, community partnerships and innovative tariffs Develop 'Green Action Zone' area transformation programmes, incorporating low water use and high water efficiency	Water companies Water companies/ housing partnerships/ local authorities Water companies/ local authorities/ communities	Costs may be significant, but balance against water savings Moderate costs Significant costs.	Evidence suggests that metering can reduce water consumption by an average of 20 litres/head per day. Similarly, decreases in water use between 2003/4 and 2006/7 appear partly to reflect behaviour change in response to recent droughts.
Reduce water use by businesses and other organisations	Improve the water efficiency of existing and new properties (by implementing retrofit programmes and adopting appropriate planning standards for new developments) Promote low water-use behaviours, through business advice and innovative tariffs	Water companies/ businesses/ Water companies/ businesses/ Business Link/ Envirowise	Costs may be significant, but balance against lower cost of water supply Moderate cost	Again, water use by businesses is likely to be responsive to tariff levels.

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
Safeguard, and where possible improve, the supply of water in the face of increased drought risks owing to climate change	Continue to work to reduce leakages from the water supply network	Water companies	Significant costs	Would improve water efficiency.
	Lobby national government and Offwat re water quality requirements – advocate upstream rather than ‘end of pipe’ solutions (e.g. reduce the level of phosphates/nitrates entering the water system; rather than using energy-intensive processes to remove them from the system)	Water companies/ farming partnership	Minimal direct costs – indirect costs for farming or other sectors.	Remove potential conflict between water quality and energy efficiency objectives.
	Support technological and supply chain development for technologies to improve the efficiency of water use by appliances/ individuals	SEEDA/ water companies/ Envirobusiness	Moderate cost	Potentially significant.
	Integrate planning and investment between urban development (local authorities/regeneration bodies) and water companies	Local authorities/ regeneration bodies/ water companies	Minimal direct costs.	Essential to minimise the negative effects of droughts.
	Roll out new technologies for efficient water use by households and businesses	Businesses/ water companies	Potentially significant cost	Significant benefit.
Prepare for greater risk of flooding, owing to climate change	Ensure that spatial plans take account of flooding risks and advocate the use of Sustainable Urban Drainage Systems	The Assembly/ local authorities	Minimal direct costs	Essential to minimise – and respond to – flooding risks.
	Implement integrated catchment management, across the South East	Water companies	Significant costs in some cases.	

Strategic priorities	Regional policies and programmes	Lead/partners	Cost/other impacts	Potential benefits
	Revise spatial and management plans in response to climate change impacts, as understanding of risks improves		Need to consider the carbon/ ecological footprint of flood defences themselves.	

20.6. Progress to date

The existing 25-year 'Strategic Direction Statements' for Thames Water and Southern Water set out commitments to:

- Improve security of supply;
- Reduce water leaks;
- Encourage wise use of water;
- Extend water metering (e.g. using powers for mandatory metering in areas of 'serious water stress', such as Folkestone and Dover);
- Develop new sources of water;
- Manage waste water and sludge;
- Respond to climate change (adaptation and mitigation).

Southern Water's 'Strategic Direction Statement' makes no commitment for the company to reduce its own carbon footprint, as it points out that increasingly stringent water quality standards will make it difficult for the company to reduce energy use.

Thames Water is more positive about the scope for reducing emissions and using renewable energy sources (e.g. using methane from sewage sludge). Thames Water aim to reduce emissions by 20% (compared to 1990 levels) by 2015.

All the water companies are required to prepare 25-year 'water resource management plans', which will be put out to consultation in Summer 2008. These are likely to go beyond the commitments outlined in the existing 'Strategic Direction Statements'.

20.7. Reference documents

We have used the following documents in preparing the route map for water:

- Taking care of water – the next 25 years: Strategic Direction Statement 2010-2035 (Thames Water)
- Water services, customers and the community – Strategic Direction Statement 2010-2035 (Southern Water, December 2007)



- Environment Agency – Water efficiency in the South East of England – Retrofitting existing homes (April 2007)

A further document has just been published which provides much more detail on the carbon footprint of water supply, further to that considered within this study:

- Environment Agency briefing note – The greenhouse gas implications of future water resource options (July 2008).

A full list of references is presented in Appendix 3.

APPENDICES

1. Glossary

2. Contributors

3. References

4. Information on OPERA, REAP and REEIO

5. Ecological Footprint – further detail