

1 Introduction

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1.1 The Aim of the Study

The project sets out to provide a comprehensive framework for the fundamental factors of sustainability at the regional scale. The research was based on analysis of the flows of materials and energy through the South East region, and its environmental impacts at both local and global scales. The principal methods used were a mass-balance analysis, an ecological footprint, and a scenario framework:

- The mass balance approach takes a cross-cutting view of all physical activity in the region.
- The ecological footprint approach brings together most of the key environmental impacts, by expressing each in the common denominators of material flow, energy flow and their land-use demands.
- The scenario approach then extends present day information to a future perspective, in order to relate to the problems and opportunities of stakeholders.

The package as a whole then provides a baseline and reference point for a range of applications including:

- More detailed strategies and programmes for eco-efficiency
- Appraisal, evaluation, reporting and auditing methods and tools
- Benchmarking of areas, policies, programmes and industries
- Comparative analysis with economic, social and urban indicators
- Active consultation and consensus-building with stakeholders

1.2 Introduction

Between 1950 and 1997 there has been an unprecedented rise in consumption. Within this timescale, timber use and grain consumption have tripled, fossil fuel consumption has quadrupled, the amount of fish caught has increased fivefold and paper use has increased sixfold (FAO, 1998¹, USDA, 1999², UN, 1998³). While economic indicators show positive increases in investment, production and trade, the key environmental indicators illustrate increasingly negative results.

Over the last 25 years environmental policy has largely focused on cleaning and protecting air, water and soils. The issue of sustainability acquires a different and probably more fundamental relevance to the environmental crisis. Sustainability does not only consider the distribution of pollution but rather involves the social distribution of resource consumption. However, this issue does not arise in a pollution perspective that moves developing areas into the focus of attention, since pollution tends to be more intense in such areas. It is only in a resource perspective where over-consumption is defined as the critical problem that industrialised countries have to respond to. Such a shift in attention from the tail end to the front end of the economic cycle is a necessity. While the South East does experience some of the environmental pressures through its use of resources and services, it does experience a disproportionately low amount. The fact that the vast proportion of all the resources consumed in the South East are produced elsewhere means that the consumer does not experience the environmental pressures of industrial production. The consumer classes have succeeded in passing on environmental burdens to less advantaged groups, leaving the noise, dirt and pollution for the industrial areas of the world. In other words, the geographic location of environmental pressures has little relation to the location of consumption. According to a recent study by the Wuppertal Institute, this phenomenon is increasing. The study suggests that there has been a significant shift in resource requirements from domestic production to imports and this is shifting the environmental burden of resource consumption onto other countries⁴.

If we adopt a resource perspective, the immediate focus is on reducing the environmental burden of consumption, albeit through improvements in eco-efficiency or a more fundamental approach of reducing consumption.

¹ FAO (1998) *The FAO Yearbook: Production*, Vol. 51, Rome: FAO.

² USDA (1999) Statement by Secretary of Agriculture Dan Glickman World Trade Organisation, <http://www.usda.gov/news/releases/1999/12/december.htm>

³ UNDP (1998) *Human Development Report 1998*, Oxford University Press.

⁴ Moll S, Bringezy S, Schutz H. (2003) *Zero Study: Resource Use in European Countries*, European Topic Centre and Material Flows (ETC-WMF), Copenhagen, 2003.

While a detailed understanding of economic flows is conducted on a regular basis at the national and regional level, resource and energy flows have been partly, if not wholly ignored. At present, no government agency operates a systematic accounting system to assess what extent human use of nature fits within the capacity of the existing ecosystems (Wackernagel and Silverstein, 2000⁵).

1.3 What is Consumption?

In its simplest form consumption can be defined as current expenditure on goods and services. To the business/industry sector, sustainable consumption means the ‘greening’ of the supply chain, producing more environmentally friendly or eco-efficient products, and providing consumers with information about sustainable consumption through advertising, marketing and product information⁶. While efficiency can often be improved and waste reduced, any consumption item requires an irreducible minimum of energy and materials⁷. Therefore, this study has attempted to establish the environmental impact of all the consumption items purchased by South East residents, as well as items indirectly consumed through the use of services. Moreover, if these consumer items are consumed outside the South East region they are still taken into account (for example, holidays). Such an approach fits in with the resource perspective described above. With a global economy and global travel, boundaries based on the production of goods have little relevance, while a focus on consumption helps to assign environmental burden to the individual who benefits from consumption. As mentioned, the structure of the research is based on the methodologies of material flow analysis and the ecological footprint.

Figure 1 highlights the basic structure of the material flow analysis (MFA). It outlines the flow of energy and resources through the human economy. After resources have been extracted from the natural environment they are processed into goods and services for households. Waste is produced at this stage as well as later by households. After extraction, water will be used by industry and services or directly by households. Wastage occurs at the extraction and distribution level. Industry and households will also produce waste water. Greenhouse gas emissions (GHG) are produced at every stage of the material and energy flow (energy production, production of goods and services, household consumption and waste management).

This approach is applied to all the studies and incorporates all the material and energy flows of a given population. Each of these components is included within the calculations. Energy is either used directly by households or by industry and commerce to provide goods and services for households and within the MFA is accounted for in terms of energy carriers.

⁵ Wackernagel M., Silverstein J. (2000) Big things first: focusing on the scale imperative with the ecological footprint, *Ecological Economics*, Vol.32, No.3, pp391-394.

⁶ Moving Business/Industry Towards Sustainable Consumption: The Role of NGOs, *European Management Journal*, Volume 20, Issue 2, April 2002, Pages 109-127, Nancy Kong, Oliver Salzmann, Ulrich Steger and Aileen Ionescu-Somers

⁷ Beyond the economics of more: the place of consumption in ecological economics, *Ecological Economics*, Volume 25, Issue 3, June 1998, Pages 239-248, John Lintott

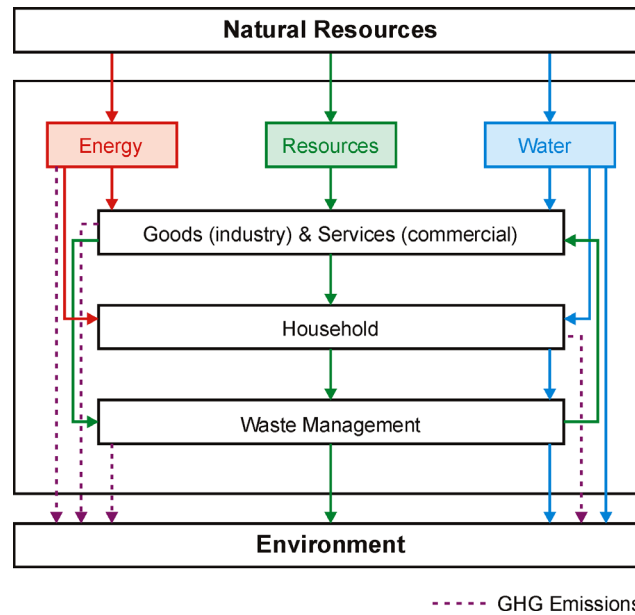


Figure 1.1 Flow of Resources through the Economy (Adapted from Noorman and Uiterkamp 1998⁸)

The study provides a comprehensive description of material flows between the environment and economy as well as within the economy (production and consumption), distinguishing not only categories of materials but also branches of production⁹. UK national accounts detail the activities and transactions of producer and consumer units that are undertaken within the economic territory of the UK. However, some relevant activities or transactions may occur outside the UK economic territory. The studies will consider consumption of producer and consumer units, wherever they may be, as opposed to UK-only based production and consumption units. Furthermore, for physical accounts (material or natural resources) to be consistent with the national accounts (money) the application of the residence (rather than territory) principle is required. Both material flows and energetic flows will be quantified. The structure of the MFA is divided into material inputs, stocks and outputs.

⁸ Noorman and Uiterkamp (Ed.) (1998) *Green Households? – Domestic Consumers, Environment and Sustainability*, Earthscan.

⁹ Eurostat (2000) *Economy-wide Material Flow Accounts and Balances with derived resource use indicators: A Methodological Guide*, Eurostat.

1.4 Policy Relevance

In terms of the results of the project, it was important to recognise the risk of a ‘so what’ response. In other words, that policy makers and decision-makers could fail to see the relevance of a set of numbers, no matter how persuasive, to their own immediate problems and opportunities. Our response has been to explore the possibility of extending resource flow studies in various directions:

- a software tool that offers both a benchmarking facility and the possibility for scenario development;
- analysis of current policy;
- organised by policy relevant components;
- information systems, indicators and appraisal methods;
- publication of materials in different formats and detail.

To ensure that the research is applied, the Steering Group was essential. The Steering Group comprised of a number of relevant stakeholders from the South East region involved at the policy level. This included policy makers from the areas of waste, water, sustainable development, energy and economic development.

1.4.1 Analysis of current policy

Analysis of current policy has concentrated on key environmental concerns within the South East. These were particular issues raised by the Steering Group and included passenger transport, waste and housing. The current environmental impact has been established. The impact of future policy decisions that has already been suggested by the South East England Development Agency or other bodies has been analysed to assess how effective they will be in reducing environmental burden. Finally, a range of future policy options have been identified that could bring about a more decisive reduction in environmental burden.

1.4.2 Organised by policy relevant components

Displaying the results by policy relevant components is essential. This allows the individual to select and understand a particular policy area within the research and apply the findings. Therefore, this report has been divided into the following sections:

- Food
- Passenger transport
- Consumables and waste
- Durable goods and waste
- Commercial sector
- Energy use
- Construction and housing

The linkages between the various issues have also been explored. For example, the construction of houses and direct energy use.

1.4.3 Information systems, indicators and appraisal methods

The authors acknowledge the fact there is already an excessive amount of indicators used to define change. Therefore, the project will suggest the improvement and simplification of the current approach. The use of two aggregated indicators (i.e. material flow analysis and the ecological footprint) has many advantages to policy makers and these are identified below:

- With different indicators producing results in different units comparability between them is impossible. The results of this project allow the individual to explore the relationship among the variables, be it waste, transport or energy.
- With a multitude of indicators the situation could occur where they are “pulling in different directions”. While GDP has been criticised on a number of grounds, one of the reasons for its popularity lies with the fact that it provides an overall picture of the performance of the economy. A similar aggregated indicator for environmental issues could fulfil a similar role.
- There is a need to limit the number of indicators used to describe the state of the environment in order to avoid confusion and misunderstanding. An aggregated indicator could signal the relative sustainability or unsustainability of a state or trend, rather than simply displaying the numerical data in a different form.
- The indicators explored in this project could help concentrate information collection and analysis and facilitate the presentation of information to decision-makers.

High level decision-makers dealing with sustainable development issues—government ministers, foundation executives, heads of corporations—routinely call for a manageable number of indices that are easy to understand and use in decision-making. Many voice their desire for a single index to compete with the broad appeal and enormous political power of the gross domestic product, a commonly used index of economic growth. This project has identified a number of contenders to fulfil this role.

1.4.4 Publication of materials in different formats and detail

Materials displaying the results of the project are available in a number of formats designed to reach different audiences. Specific components, such as transport, have been detailed in factsheets for policy makers as well the general public. Other material also includes summary reports for dissemination, case studies and web-based material. All the material used is based on the research documented in this technical report.

1.4.5 Data Issues

Throughout the report assumptions have been taken in an attempt to provide a more detailed analysis of policy. In many cases the “ideal data” does simply not exist. Sometimes a model has been constructed to understand the proportion of UK consumption that can be attributed to the South East region. This was possible for almost every aspect at the regional level. We believe this has provided policy relevant information at the regional level and any assumptions have been fully documented to ensure transparency and accountability. However, at the sub-regional level this was not possible for all the components. The best available data at the sub-regional level was waste. Therefore, particular attention has been given to the analysis of this data.

1.5 The South East Region

A profile of the South East region has been given below exploring the defining characteristics of the region.

1.5.1 Location and population

The South East region covers a significant arc-shaped land area to the south and west of London, including 19 counties and unitary authorities and 55 district authorities (GOSE, 2003). The nine areas covered by the region are Berkshire, Buckinghamshire, East and West Sussex, Hampshire, Isle of Wight, Kent, Oxfordshire, and Surrey.



Figure 1.2 The counties and unitary authorities of the South East (taken from ONS 2002: Region in Figures – South East; boundaries as at 1 April 1998)

Environmentally, the region is very attractive, containing a third of England’s ancient woodland, two fifths of its lowland heathland, a third of its wildflower meadows and a quarter of its chalk grassland. There are over 700 Sites of Special Scientific Interest (SSSI) covering 7% of the region, and 72km of the coastline is designated Heritage Coast (GOSE, 2003). Two thirds of the region’s land area is used for agriculture, and while it is lacking a single dominant urban centre, the region is home to 7 cities with populations of more than 100,000.

In terms of population the South East is the largest region in the UK with just over 8 million people making up some 3 million households. In 2000, minority ethnic groups accounted for 3.5% (282,000

people) of total South East population. This has increased from 3.09% in 1991: a proportional increase of 13% in 9 years. Indian and Pakistani communities represent the largest ethnic groups in the South East with populations of 68,000 and 43,000 respectively (SEEDA, 2003).

The region as a whole has seen a population growth of 5.7% since 1991, mainly as a result of immigration and is expected to continue rising at a rate of 10 percent over the next 20 years (GOSE, 2003). The fastest growth rates have been in the north and west of the region: Oxfordshire (8%), Buckinghamshire (7.8%) and Berkshire (6.2%) (ONS, 2001).

1.5.2 Economy

Between 1990 and 2000, the South East economy grew faster than any other UK region, expanding at an average annual growth rate of 3.1% against 2.2% for the UK as a whole (SEEDA, 2003). Due to the scale of the South East economy, which has been critical to the performance of the UK as a whole, and its location, the region acts as the engine of growth and the gateway to Britain.

- The South East had an estimated GDP of £140 billion in 2002 (current prices) making it the second largest regional economy in the UK and the 22nd largest in the world. In the UK context, GDP per head in the South East is higher than any other region outside London. It stood at £15,098 (current prices) in 1999, and is expected to increase to £23,700 by 2010.
- With over 255,000 VAT registered businesses and 373,600 business sites, the South East accounts for 15% of the UK's total business base. It is the capital of the UK's pharmaceutical, information and communications technology, bio-tech and healthcare, aerospace, defence and environmental industries.
- The South East accounts for over 25% of UK business expenditure in Research and Development (R&D) and close to a third of government R&D spending. In addition it has 20% of the UK's technical testing industry. There are over 100 universities, further education colleges and research centres.
- The region is the hub of the UK's communications network, with transport infrastructure of national and international importance. Heathrow, Gatwick, Southampton and six other commercial airports, along with 11 international seaports (Dover is the largest passenger port in the UK and is used by 16 million passengers annually, accounting for 56% of all sea passenger movements to and from the UK) four container ports and the channel tunnel, make the South East the natural access point for mainland Europe and the rest of the world (SEEDA 2003).
- The South East is the largest net contributor (tax minus public spending in the region) to the Exchequer. In the 1999-2000 fiscal year, it contributed an estimated £17 billion net to government finances. This is far more than any other region, and is equivalent to nearly 15% of South East GDP. The region exported overseas nearly £28 billion worth of manufactured goods in 2000, the highest among all UK regions.
- Total employment in the region stands at 4 million, equivalent to 15 per cent of UK employment. There are more self-employed people in the South East than in any other region. Service industries employ almost 80% of the workforce with a further 19% employed by production and construction industries and a small fraction in agriculture, forestry and fishing.

- The average level of income in the South East is relatively high and leads to higher than average levels of health indicators for the population. Life expectancy is 1.3 years higher than the UK average, 1.3 years and 1 year higher than the national average for males and females respectively.

The general picture given above disguises considerable variation within the region.

- The eastern and southern parts of the region, mainly coastal fringes, are performing below regional average (GDP per head (current prices) was lowest in the Isle of Wight £8,300), primarily due to weak economic infrastructure. On the other hand, western and northern parts (GDP per head (current prices) in Berkshire stood at £19,000) are facing the challenges of overheated economies i.e. congestion, skills shortages etc.
- The workforce is generally well educated, with over 85% holding some form of qualification and more than 20% having a higher education qualification. However, despite the incidence of knowledge based economy in the region, a large proportion of the workforce is employed in low skills/low paid jobs. Over 600,000 people of working age have no qualifications, approximately 548,000 fail to meet basic literacy standards and 483,000 lack basic numeracy skills in the South East.
- There are 372,000 households in the South East living in houses classified as poor – the highest figure outside London (Cabinet Office, 1999).

In broad terms the economy can be categorised as being advanced, high cost, high income, broadly based and service oriented. The region's economy is closely linked to that of London, and also significantly influenced by its proximity to mainland Europe (GOSE 2003).

1.5.3 Defining characteristics

The most defining characteristic of the South East is its level of consumption, primarily due to its economic prosperity. Residents of the South East travel further than residents of any other region, they go on more holidays, produce more waste, purchase more consumer items and have the highest demand for housing.

For housing, office accommodation and industrial property/warehousing units, the South East is the second most expensive location in the country, after London (SEEDA). Parts of the region have a high proportion of one and two person households. Continuation of this trend combined with further migration into the region means the demand for households in the South East will be expected to increase by 20% over the next 20 years. Alongside this there are parts of the region suffering significant social and economic deprivation placing additional demand on the availability of affordable housing. The Government's solution: to meet the demand and provide 200,000 new homes, most of which will be in West Sussex, Berkshire and Buckinghamshire (GOSE, 2003). Although no figure was given, some homes will be affordable to the region's public sector workers, however most will be for sale or rent at the market price (Lucas, C. 2002). The people's plea for less development has clearly not been heeded, and the government's short-sighted solution will only aid the unsustainable migration into the region and further aggravate the issue of encroaching urban areas onto greenfield sites.

Serious transport problems and the worst traffic congestion of any region, except London, is another negative impact being imposed by the massive economy on the people of the South East. The region contains 24% of the national motorway network and 12% of the trunk road network (GOSE, 2003). Millions of hours are lost every year by businesses and communities as a result of traffic jams. Transport is now the dominant source of air pollution in urban areas and although vehicles have become less polluting, the effect in absolute terms is offset by the increase in the number of vehicles, together with increases in the length and number of trips made (European Environment Agency, TERM 2001). The significance of this was demonstrated by a recent study which revealed that air pollution now causes a higher mortality rate than road accidents (Kunzli N., et al 2000). However, people have no option but to take to the roads in their cars as they are unable to rely on public transport in the region, particularly the rural areas where road networks, rail links, bus services and safe routes for cyclists and pedestrians are almost non-existent. Enormous pressure is being placed on the poor transport system and its infrastructure.

This characteristic is probably a result of the fact that the South East experiences the lowest level of public investment per head of any English region. This is further reflected in the performance of the health service which was rated the worst in England (SEERA, 2003). The region was also rated the third worst for unemployment.

These characteristics are imposing negative impacts on the quality of life for the people in the region which looks set to continue with plans for a substantial scale new physical development that will be required in the region to accommodate forecast growth. The South East has to deal with both the effects of an overheated economy and areas of severe social and economic deprivation throughout the region.

1.5.4 Environmental pressures

High economic prosperity in the region has been haunted by an increase in the generation of waste, pollution and exploitation of the natural resource base raising great concerns as to the future quality and capacity of the region's environmental assets.

The generation of waste has increased, on average, in line with wealth. It is estimated that the production of municipal waste, for example, is growing at 3 per cent per annum in the South East (Environment Agency, 2001). In 2000, the region produced approximately 13 million tonnes of construction and demolition waste, over 7 million tonnes of industrial and commercial waste, around 4 million tonnes of household waste, 5.9 million tonnes of agricultural waste and almost 500,000 tonnes of 'special' waste (including clinical and hazardous waste) (Ecosys, 2003). While landfill sites are in relatively short supply (at current usage levels, existing regional capacity is sufficient to last less than 7 years), the region remains a net importer of industrial and commercial waste (SEEDA, 2003).

Assessments by the Environment Agency demonstrate that pollution levels in the region are declining, broadly in line with national trends. However, air pollution (ground level ozone concentration) in rural areas remains high.

Groundwater is the most important source of water in the region, both for domestic, commercial and environmental services. Compared with other regions, rainfall is low in the South East, while the population density and per capita consumption of water is high, particularly in periods of peak

demand. Expected future economic and housing growth will have a significant impact on the availability and use of water resources. Water is a scarce and often over-committed resource in the region, and opportunities for sustainable water resource developments are limited – this underlines the importance of increasing efficiency in water use in the region over the next 25 years (RSDF, 2001)¹⁰.

Fossil fuels meet the major part of the region's energy needs and are most likely to continue to do so over the next decade, contributing to the generation of greenhouse gases, the principal contributors to global warming. The current level of energy generation from renewable sources, at 73MW (equivalent to 0.6% of electricity generation), is one of the lowest proportions of all the English regions.

A high proportion of the land area in the South East is covered by environmental/planning designations. This means that land availability is a crucial constraint and brownfield sites must be used to the full when planning for new housing and infrastructure. Pressure on priority wildlife habitats, especially coastal grazing marsh, saltmarsh and intertidal mud, is also increasing as a consequence of sea level rise and development along the coastline. Extraction of marine aggregates is likely to increase with the increasing demand in relation to coastal defences. More than 230,000 properties are at risk from tidal flooding in the South East (Environment Agency, 2001). It is expected that climate change will lead to an increasing risk of breaches in sea defences, due to the combined effects of greater frequency of storms, changes in wave direction and rising sea level as experienced in the extensive flooding in several parts of the region in 2000.

While the South East on the whole performs well in terms of environmental quality, there are clear indications that further economic growth in the region without effective protection of the environment and wise use of natural resources will not be able to sustain the high standards of living currently enjoyed by most residents.

1.6 Conclusions

One of the major challenges for the South East region is making wealth creation less dependent on resources. This requires a broad-range and long-term de-materialisation of the economy. The transition towards sustainability can be achieved only through a twin-track strategy: an intelligent reinvention of means (increases in efficiency) as well as a prudent moderation of ends (questioning consumption) (Sachs, 1999¹¹) and the South East offers a unique opportunity to explore the possibilities. The project explores the gains that can be made through increase in efficiency and where fundamental changes are required in mobility, housing, household material consumption and the provision of services.

¹⁰ A Better Quality of Life in the South East, The Regional Sustainable Development Framework, 2001

¹¹ Sachs W. (1999) *Planet Dialectics*, Zed Books, New York.